



Mangroves of the Indian River Lagoon

Name: _____

The Indian River Lagoon

We are lucky to live along the Indian River Lagoon. The Indian River Lagoon is the body of water you pass over on your way to the beach. Although the word “river” is in its name, The Indian River Lagoon is not a river.

A river has headwaters, or freshwater source. A river flows downstream to a mouth, or larger body of water. The Indian River Lagoon has no headwaters and no mouth. The water moves with the wind and tides.

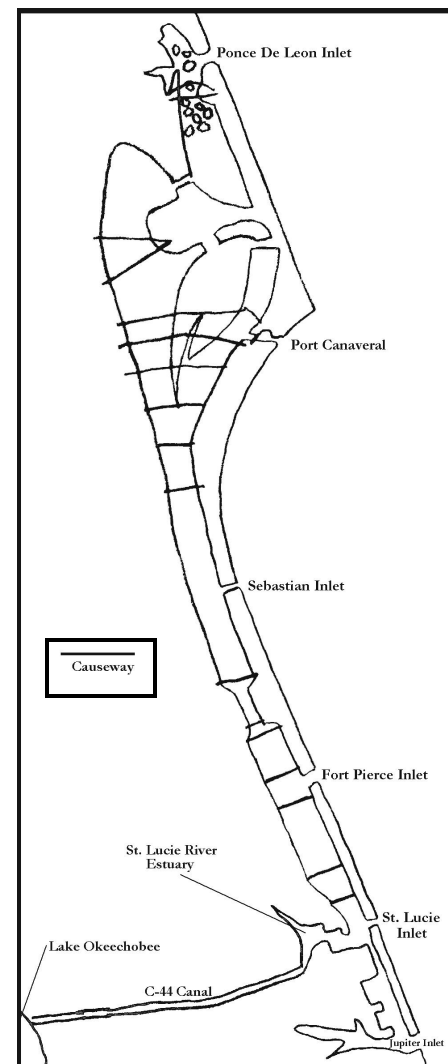
When the Spanish explorers arrived they found many Indians crossing the Lagoon in canoes. The local Indians were called the Ais. So the Spanish called the Lagoon the “Rio de Ais” or River of the Ais Indians. When the English showed up they changed the name around to the Indian River. It was not until later that they properly named it the Indian River Lagoon.

The Indian River Lagoon is a special place. It is called a lagoon because it is a shallow coastal body of water separated from the ocean by barrier islands. A lagoon has limited water exchange with the ocean through inlets. The Indian River Lagoon is an estuary. An estuary is a where fresh and salt water mix. A mixture of fresh and salt water is called brackish water. Estuaries are very productive places. They are important for the survival of life on land and in the ocean.

The Indian River Lagoon is about 150 miles long. It extends from Ponce De Leon Inlet to Jupiter Inlet. The Lagoon averages only 3 feet in depth The Lagoon width ranges from ½ to 5 miles wide.

The Indian River Lagoon is the most diverse estuary in North America. There are 2,200 different species of animals living along the Lagoon. There are 2,100 types of plants that grow along the Lagoon.

These plants and animals live in different types of habitats along the Lagoon. These habitats are: **freshwater marshes, salt marshes, mangrove marshes, seagrass beds, coastal hammocks, dunes, and beaches.**





Name: _____

The Mangrove Marsh

Mangrove marshes are important habitats in the Indian River Lagoon. They supply food for the animals. Mangroves are homes to many animals. Mangroves clean the water. Mangroves keep the shore from washing away.

Mangrove trees cannot survive cold weather. They only grow where it does not freeze. In areas where cold temperatures are common, salt grasses replace mangroves.

Mangroves are trees that once lived inland. They changed to live in the brackish water and high stress along the coast. Mangroves have special roots, leaves, and seeds. They need to be special to survive.

There are three types of mangrove trees in Florida; the red mangrove, the black mangrove and the white mangrove.

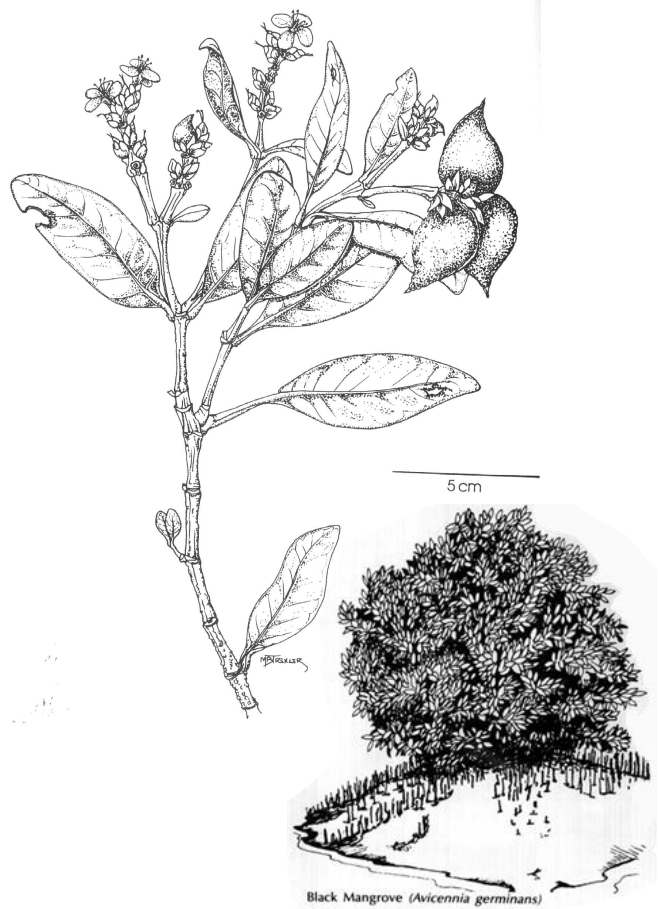
The Red Mangrove

The red mangrove is the most common mangrove along the Indian River Lagoon. It is easy to identify by its roots. Roots drop down out of the branches. They are called **prop roots**. They help hold the tree up in the soft mud. The red mangrove is called the walking tree. The prop roots make the tree look like it is walking on water. Red mangroves remove the salt from the water with their roots. The seeds are green and shaped like a pencil. The seeds plant themselves as they fall off the tree. The roots have many plants and animals that live on them.



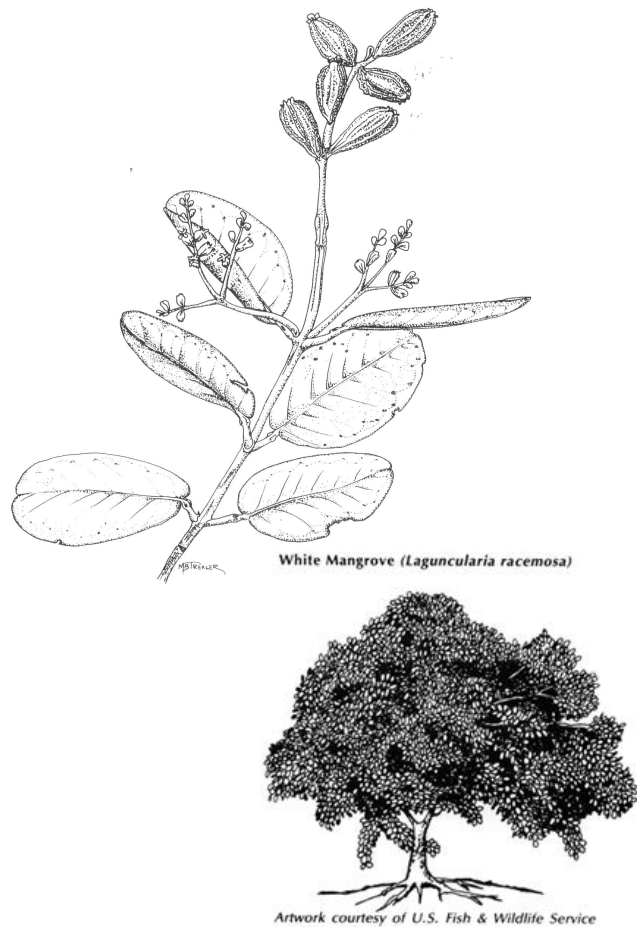
The Black Mangrove

The black mangroves grow behind the red mangroves. Black mangroves get their name from their black trunk. You can also identify black mangroves by their roots. Lots of finger-like roots stick out of the mud around their trunks. The tree breathes with these roots. If the roots stay under water too long, the tree drowns. Black mangrove leaves are dark green on top and silver on bottom. They remove salt with their leaves. You can see salt on the top of the leaves on hot days. The seeds of black mangroves look a little like large lima beans.



The White Mangrove

White mangroves grow the farthest from the water. They cannot live in the water. They have no special roots. You identify the white mangrove by its leaves. The leaves have special parts. The leaves are light green ovals. On the leaf stem are two bumps. These bumps are salt glands. The salt glands pump out the salt taken in by the roots. The seeds of the white mangrove are small and tear drop shaped with wrinkles.



Name: _____

Mangroves in the Food Chain

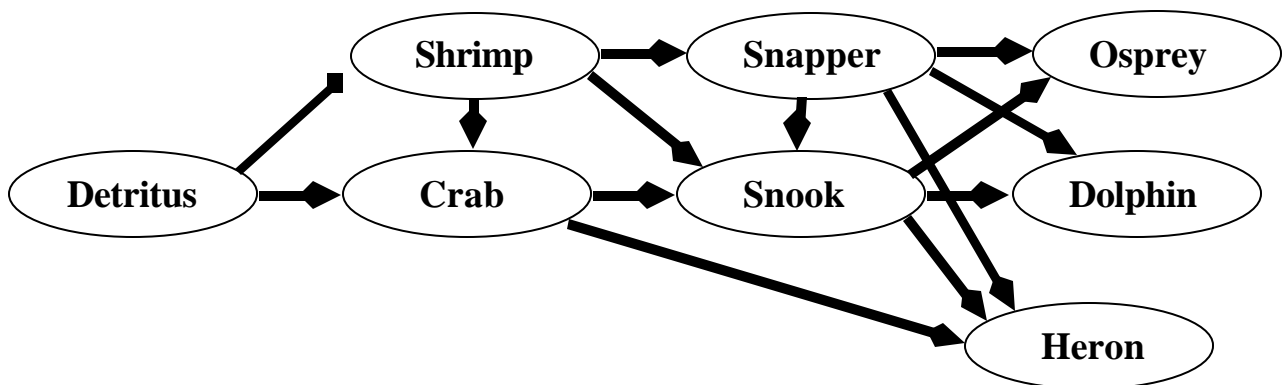
Few animals eat the leaves of the mangroves while they are still on the tree. The leaves fall into the water. There the leaves decompose, or break down. This creates a dark, smelly muck called detritus. Detritus is the base of the food chain for the Indian River Lagoon. Without the mangroves we would not have all of the fish, shrimp, crabs, and lobsters that we like to catch and eat.

How does the food chain work? Plants take sunlight and turn it into food. Plant eating animals, herbivores, eat the plants. Small meat eating animals, carnivores, eat the herbivores. Larger carnivores eat the smaller carnivores. At the end of the food chain is an animal that is not eaten.

Let's look at an example of a mangrove marsh food chain. The leaves fall into the water. Crabs eat the leaves. A young snapper then eats the crab. A hungry adult snook gobbles up the snapper. A dolphin eats the tasty snook. Nothing eats the dolphin.



This is just one example of a food chain. There are many different food chains occurring at one time. Animals do not eat just one type of food. Animals are not eaten by only one type of predator. When you connect the different food chains together you get a food web.

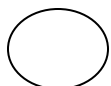


Food webs are complicated. The food web connects all plants and animals in the marsh. What happens if you remove animals from the web? What happens if there are no plants?

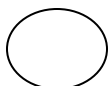
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Food Chain Mix Up

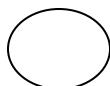
These food chains are out of order. Number these organisms to show the flow of energy through the food chain.



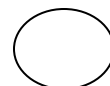
Grunt



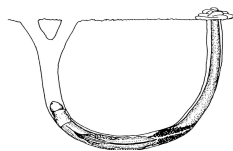
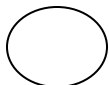
Heron



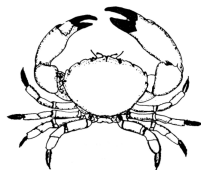
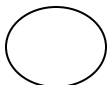
Marsh Crab



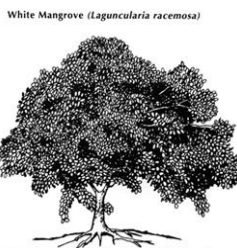
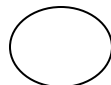
Red Mangrove



Acorn worm

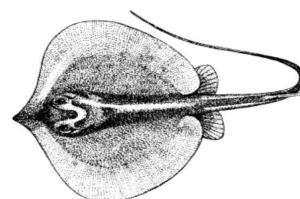
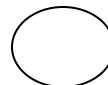


Stone Crab

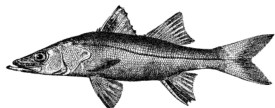
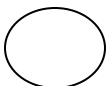


Artwork courtesy of U.S. Fish & Wildlife Service

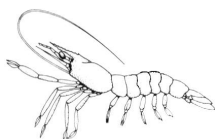
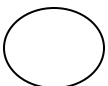
White Mangrove



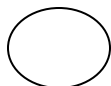
Sting Ray



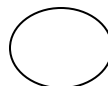
Adult Snook



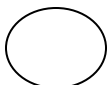
Grass Shrimp



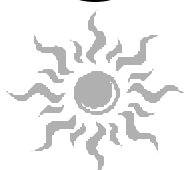
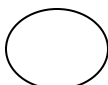
Black Mangrove



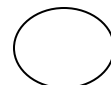
Dolphin



Seahorse



Sun



Young Mangrove Snapper

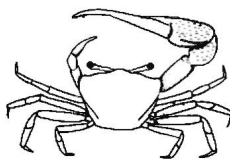


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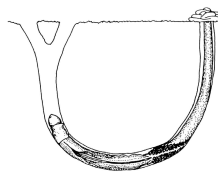
Mangrove Marsh as Habitat

What is a habitat? A habitat is where a living thing is supplied with what it needs to live. What it needs are food, water, shelter and space. There are many places for animals to live in a mangrove marsh. Some animals live in the mud. Some animals live in the water in the marsh. Other animals live on the roots and trunks of the mangroves. Even other animals live in the branches of the mangroves.

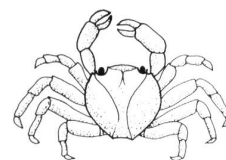
In the mud you find the detritus eaters. These animals get the food out of the mud and into the food web. Clams, marsh crabs, fiddler crabs, and worms all eat detritus.



Fiddler Crab

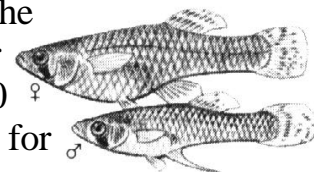


Acorn Worm



Marsh Crab

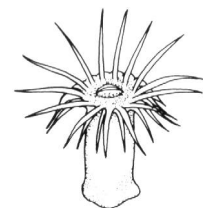
A common and important animal living in the water of the marsh is the mosquitofish. This relative of the guppy is named for its appetite for mosquitoes. A mosquitofish can eat up to 200 ♀ mosquitoes a day. The mosquitofish is an important food source for juvenile fish and wading birds.



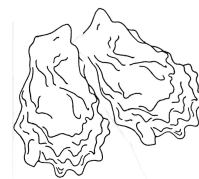
Mosquitofish

Young fish use the mangroves. They can swim through the dense roots of the mangroves. There is plenty of food living on the roots for them to eat. Larger fish cannot enter the roots to eat them.

Many invertebrates make their homes on the roots. Under the water; oysters, mussels, sea anemones, and barnacles attach to the roots and wait for the tide to bring them food. Above the water spiders set webs. They catch the many insects of the marsh.



Sea Anemone



Oyster

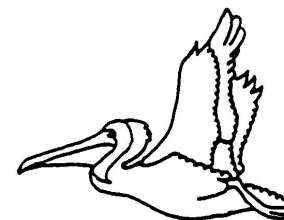


Osprey

Many birds use the branches of the mangroves. Osprey, pelicans, egrets, and herons all use the mangroves. They nest in the branches. They hunt in the marsh. During storms these birds move deep into the marsh for protection from the wind.



Heron



Pelican

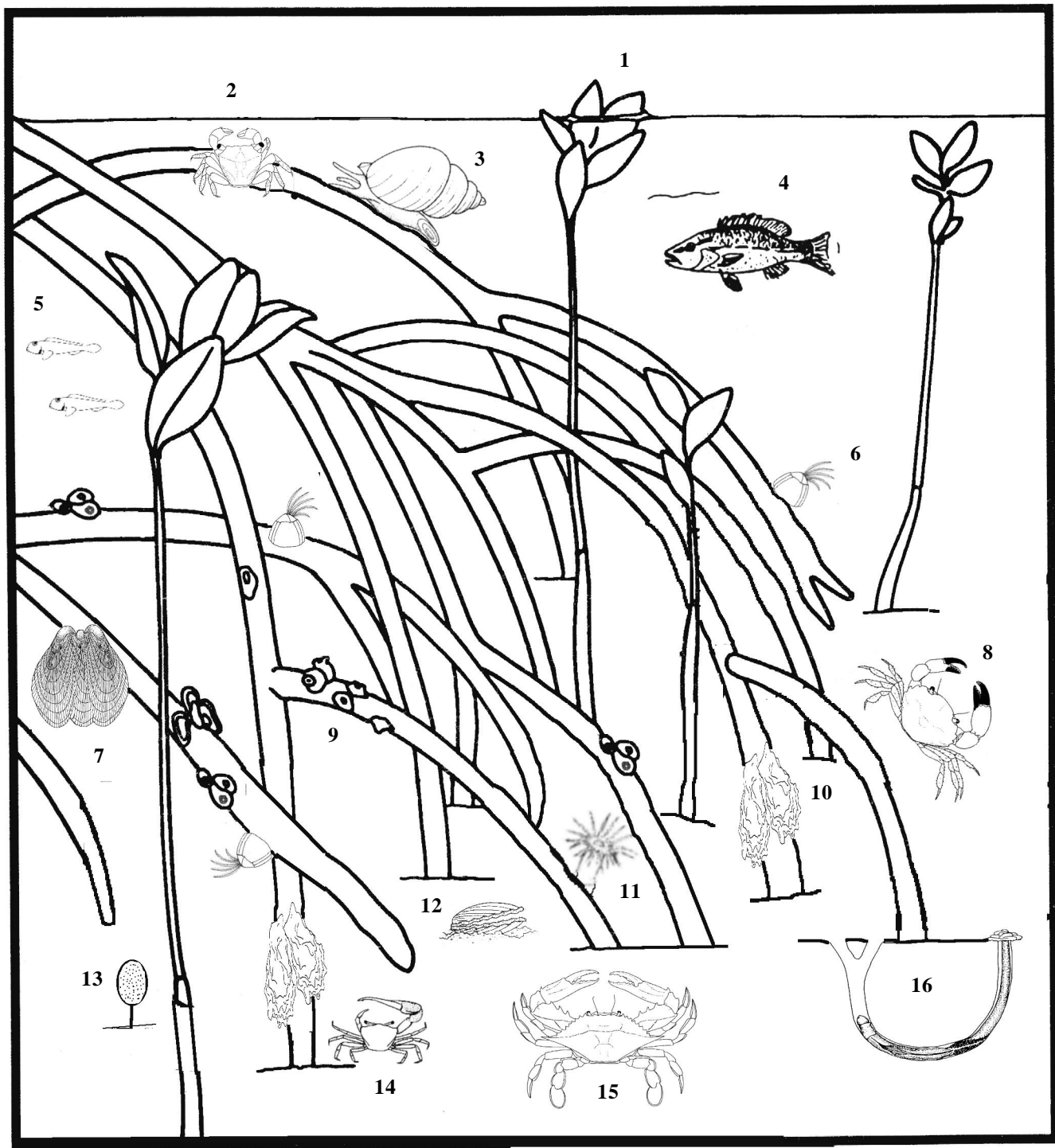


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Mangrove Habitat

Roots, Water & Mud



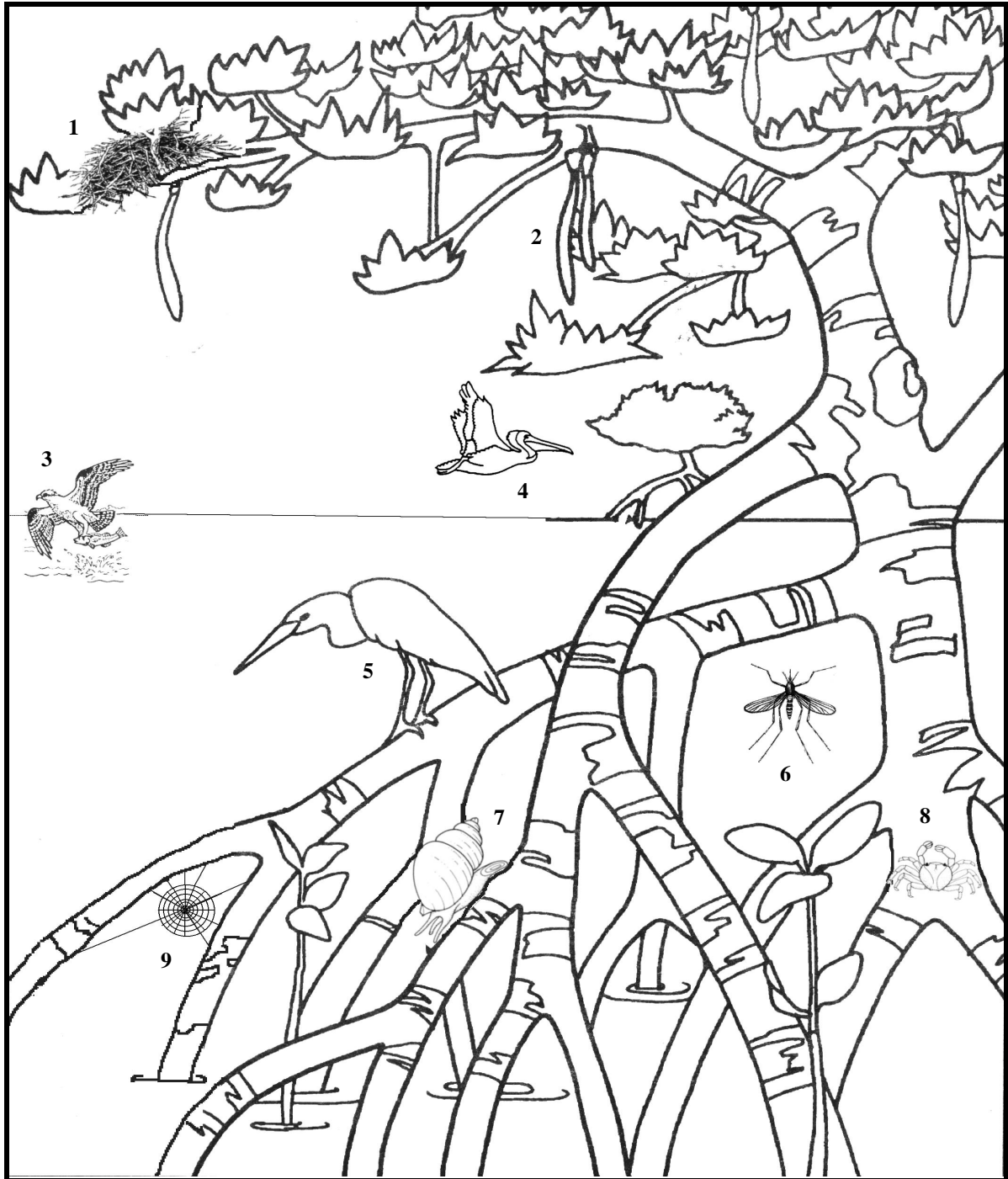
- | | | | |
|-------------------------|-----------------|------------------------|---------------|
| 1 Red mangrove seedling | 5 mosquito fish | 10 oyster | 15 blue crab |
| 2 marsh crab | 6 barnacle | 11 anemone | 16 acorn worm |
| 3 mangrove snail | 7 mussels | 12 clam | |
| 4 mangrove snapper | 8 mud crab | 13 bamboo worm egg sac | |
| | 9 sea squirt | 14 fiddler crab | |



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Mangrove Habitat Trunk & Branches



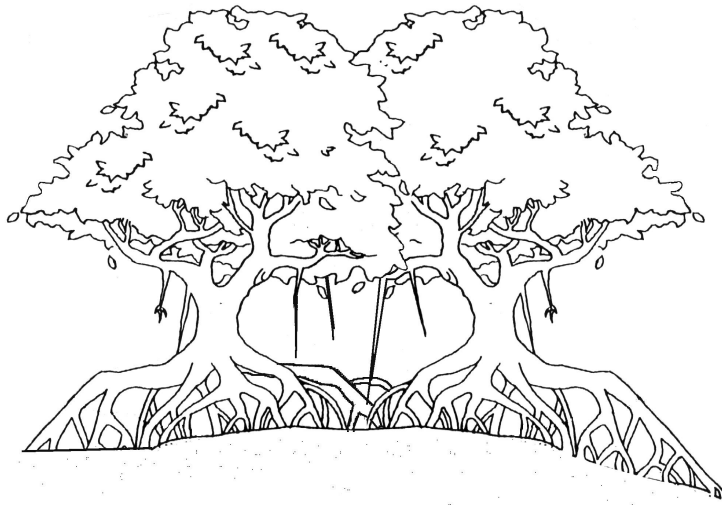
- | | | |
|---------------------|-----------------------|--------------|
| 1 Pelican Nest | 5 Egret | 9 Spider Web |
| 2 Red Mangrove Seed | 6 Salt Marsh Mosquito | |
| 3 Osprey | 7 Mangrove Snail | |
| 4 Pelican | 8 Mangrove Tree Crab | |



Name: _____

Filter the Water

Mangrove marshes help keep the water clean. Water moves slowly through the roots in the mangrove marsh. This allows the sediment floating in the water time to drop to the bottom. Runoff from the land has too many nutrients for the lagoon. The mangroves use the extra nutrients to grow. When the water leaves the marsh it is much cleaner than when it started.



Stop Erosion

Mangroves protect the shore. The roots hold the soil in place. Wind and boats create waves. These waves erode the shore. They also stir dirt into the water. Seawalls cause the waves to damage the seagrass beds. Shores with mangroves stop the waves. As the wave rubs against the roots it loses energy. When the wave passes the roots it is too weak to do damage. During calm weather mangrove roots trap sediment. The trapped sediment makes new land.

Mangrove Loss



The Indian River Lagoon has lost **80%** of its mangrove marshes to development!

Name: _____

Which One Am I?

Figure out which mangrove; red, black or white is described by each sentence.

1. I remove salt through the face of my leaves.
2. I am the most common mangrove.
3. I have long pencil shaped seeds.
4. Each of my leaves has two salt glands on the base of the stem.
5. My seeds look like large lima beans.
6. My roots drop out of my branches to help hold me up in the soft mud.
7. I have no special roots.
8. I have finger shaped roots sticking out of the mud.
9. I filter salt out of the water with my roots.
10. My seeds are tear drop shaped.

Mangrove Word Search

F	A	P	D	I	V	E	R	S	I	T	Y
P	I	L	E	C	A	D	R	E	N	I	V
N	O	L	R	E	H	E	E	D	R	B	H
U	I	V	T	O	R	T	E	I	P	R	A
T	E	D	I	R	T	R	O	M	R	E	B
R	M	A	B	F	A	I	R	E	E	R	I
I	S	T	A	U	R	T	L	N	Y	O	T
E	P	R	O	P	R	U	I	T	A	S	A
N	S	E	A	U	V	S	F	O	O	I	T
T	F	O	O	D	C	H	A	I	N	O	H
S	W	E	B	S	R	E	T	M	T	N	I
T	H	A	B	T	R	U	N	O	F	F	M

Find these words related to mangroves hidden in the puzzle. The words may be across, down or diagonal.

- 1 Detritus
- 2 Diversity
- 3 Erosion
- 4 Filtration
- 4 Food Chain
- 5 Habitat
- 6 Nutrients
- 7 Prop
- 8 Runoff
- 9 Sediment



Name: _____

Help Protect Mangrove Marshes

Scientists understand the importance of mangroves. Developers are not allowed to fill mangrove marshes any longer. However, mangroves marshes still need your help. What are some things **you** can do to protect mangroves?

1) Learn. The more you know about mangroves the more you can do to help. What can you do to learn more about mangroves?

2) Tell people. Spread the word. Many people do not know about mangroves. People only support things they understand. How can you spread the word about mangroves?



3) Clean up. Along the mangroves, garbage is a danger to the animals. Pick up garbage, especially fishing line, when you are out in the lagoon. How else can you help clean up?



4) Pitch in. Go to an environmental center and help collect and plant mangrove seedlings.



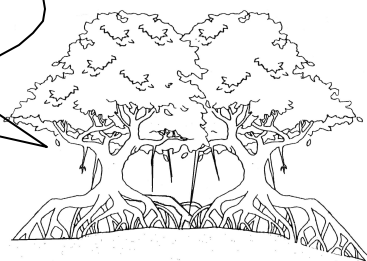
There are many ways you can spread the word and help. The best ways are already inside your head. Brainstorm with your class on ways to protect the wonderful mangrove marshes.



With your help we will have healthy mangrove marshes for generations to come.



Thank You!



Mangrove Vocabulary

brack-ish (brāk¹ish) *adjective* A mixture of fresh and salt water.

car-ni-vore (kär¹ne-vôr[˘]) *noun* An animal which eats the meat of other animals.

coast-al (kost¹el) *adjective* Near the ocean.

de-com-pose (dê[˘]kem-poz¹) *verb* To break down into small parts, decay.

de-tri-tus (dī-trī¹tes) *noun* Particles of dead and decaying plants and animals.

di-verse (dī-vûrs¹) *adjective* Having many different kinds.

e-ro-sion (ī-ro¹zhen) *noun* The wearing away of soil or rock by water, wind, or other forces of nature.

es-tu-ar-y (ès¹chĭ -èr[˘]è) *noun* Where fresh and salt water mix in coastal areas.

food chain (fĭ d chān) *noun* The flow of energy through animals involving prey being eaten by predators.

food web (fĭ d wèb) *noun* A connected group of food chains.

hab-i-tat (hàb¹î-tàt[˘]) *noun* An area where an organism is supplied with the food, water, shelter and space needed for life.

her-bi-vore (hûr¹be-vôr[˘]) *noun* An animal that feeds on plants.

la-go-on (le-gĭ n¹) *noun* A shallow body of water protected from the ocean by barrier islands.

nu-tri-ent (nĭ[˘]trê-ent) *noun* Element necessary for life and growth.

or-gan-ism (ôr¹ge-nîz[˘]em) *noun* A living human, plant or animal.

pred-a-tor (prêd¹e-ter) *noun* An organism that lives by hunting and eating other organisms.

prey (prâ) *noun* Animals that are hunted, killed and eaten by other animals.

prop root (pròp rɕ t) *noun* Roots dropping out of a mangrove that help hold the tree up in soft sediment.

riv-er (rīv¹er) *noun* A large natural stream of freshwater emptying into another body of water.

run-off (rùn¹ôf[˘]) *noun* Water that drains off the surface of the land.

sed-i-ment (sèd¹e-ment) *noun* Fine particles such as sand, silt or clay.



Name: _____

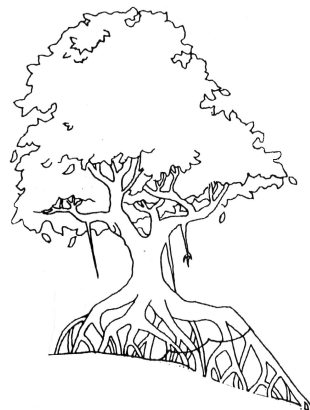
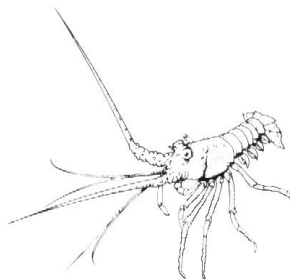
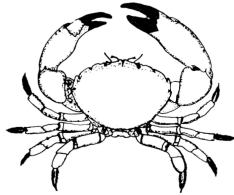
Vocabulary Crossword Puzzle

Across:

1. A shallow body of water protected from the ocean by barrier islands.
2. A large natural stream of freshwater emptying into another body of water.
3. To break down into parts.
4. A mixture of fresh and salt water.
5. An animal that feeds on plants.
6. Help hold mangrove up in soft mud.

Down:

1. Water that drains off the surface of the land.
2. An area where an organism is supplied with food, water, shelter and space.
3. Elements necessary for life and growth.
4. Particles of dead and decaying plants and animals.
5. An animal which eats other animals.
6. Where fresh and salt water mix in coastal areas.
7. Wearing away of soil or rock by water, wind or other forces of nature.
8. An animal that hunts and eats other animals.
9. Near the ocean.
10. An interlocking group of food chains.



Erosion Experiment

Rub two fingers together. Are they getting warm? The warmth is from friction. It is friction that steals energy from the waves. The more surface that rubs against the wave the more energy the wave loses. Rub your hands together. Did they warm up faster than your fingers? Does your hand have more surface area than your finger?

Hypothesis:

Mangroves protect the shore from erosion caused by waves. The roots take energy away from the wave.

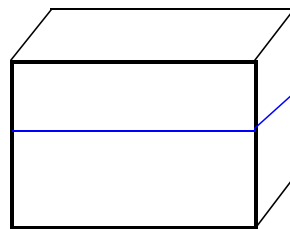
Materials you will need:

1. A five (5) gallon aquarium
2. Two and a half (2.5) gallons of water
3. A stopwatch
4. Two (2) pieces of mesh cloth
5. Ping pong paddle

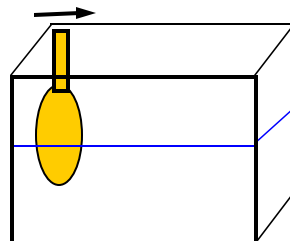
Directions:

1. Fill the aquarium half full of water. The aquarium represents the Indian River Lagoon without mangroves along the shore.
2. Pull the paddle through the water to create a wave. The paddle represents boats and wind that create waves.
3. Start the stopwatch.
4. Time how long it takes for the water to stop moving.
5. Record your answer.
6. Put a piece of mesh in the tank about an inch from the wall.
7. Create another wave.
8. Time how long it takes for the water to stop moving.
9. Record your answer.
10. Put the other piece of mesh at the other end of the tank.
11. Create another wave.
12. Time how long it takes for the water to stop moving.
13. Record your answer.

Step 1

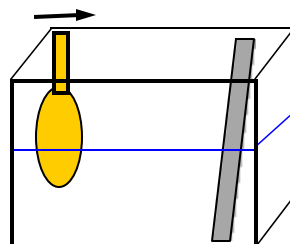


Step 2



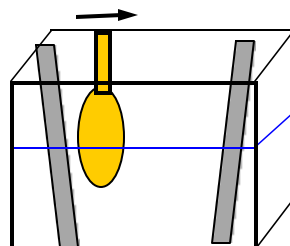
Test 1

Step 7



Test 2

Step 11



Test 3

**No Mangroves
(no mesh)**

**Mangrove on one shore
(one piece of mesh)**

**Mangrove on both shores
(two pieces of mesh)**

Time for wave to stop: _____

Time for wave to stop: _____

Time for wave to stop: _____

Discussion Questions:

1. In which test did the wave take the longest to stop?

2. In which test did the wave take the shortest to stop?

3. Which test has the most surface for the wave to rub against?

4. As the amount of surface in the tank increased did the time for the wave to stop increase or decrease?

5. Would you say mangroves are important to stop erosion? Why?

6. What would happen if there were no mangroves along the Indian River Lagoon?
