Objective:

Students will learn about manatees and their biology.

Projected outcomes:

Students will:
- be able to describe the components and conditions needed for a manatee's survival in its natural habitat.
- be able to describe threats to manatees.
- know that manatees are mammals, and be able to explain what makes mammals different from other animals

Pre-visit activities (teacher):

1. Review Vocabulary with students:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carnivore</td>
<td>A plant or animal that eats only meat</td>
</tr>
<tr>
<td>Conservation</td>
<td>The care, protection or management of natural resources</td>
</tr>
<tr>
<td>Consumer</td>
<td>In a food chain, something that obtains energy by eating other things</td>
</tr>
<tr>
<td>Ecosystem</td>
<td>The interacting system of a biological community and its non-living environment</td>
</tr>
<tr>
<td>Environment</td>
<td>All of the conditions, circumstances and influences surrounding and affecting the development of an organism or group of organisms</td>
</tr>
<tr>
<td>Habitat</td>
<td>The three-dimensional space that a species inhabits that includes all of the features needed for survival</td>
</tr>
<tr>
<td>Harassment</td>
<td>Persistent bothering or annoying of an animal, so as to change its behavior</td>
</tr>
<tr>
<td>Herbivore</td>
<td>An animal that eats only plants</td>
</tr>
<tr>
<td>Mammals</td>
<td>Animals that breathe air, nurse their young, have a backbone, are warm blooded and have body hair at some stage of their development</td>
</tr>
<tr>
<td>Marine</td>
<td>Living in the sea</td>
</tr>
<tr>
<td>Nictitating membrane</td>
<td>A thin membrane found in many animals’ eyes—it covers and protects the eyeball</td>
</tr>
<tr>
<td>Omnivore</td>
<td>An animal that eats plants and meat</td>
</tr>
<tr>
<td>Producer</td>
<td>In a food chain, things that can make their own food (e.g. plants)</td>
</tr>
<tr>
<td>Sirenia</td>
<td>The taxonomic order to which manatees belong</td>
</tr>
<tr>
<td>Taxonomy</td>
<td>A system of arranging animals and plants into natural, related groups based on factors common to each other</td>
</tr>
</tbody>
</table>

2. Provide students (individually or in groups) with word scramble cards. Their goal is to unscramble the word and then use that word in a sentence. Scrumbles (and solutions) are:

Mslamam (mammals)
Tysmescoe (ecosystem)
Virobrhe (Herbivore)
Bathiat (Habitat)
Minear (Marine)
Enucrosm (Consumer)
Rontanscoei (Conservation)
Ropecurd (Producer)

3. Construct a KWL diagram for manatees

**Classroom visit:**

1. Use “reporter” cards to have students “interview” the manatee.

2. Explain that manatees usually come up to breathe every 3-5 minutes, but that they can hold their breath for 20 minutes! Ask the class how long they think they can hold their breath. On your command, have everyone in the class close their eyes, raise one hand in the air, and hold their breath. When they cannot hold their breath any longer, they can open their eyes and put down their hands. Use a stopwatch to see how long they were able to hold their breath. Most people can hold their breath for 25-40 seconds. [The world record for a human holding their breath underwater is just under 9 minutes—you can tell kids this if someone asks, but you should also explain that for people, holding our breath for a long time can be very dangerous as we might not get enough oxygen traveling to important organs like the brain.]

3. Ask students to help you construct a food chain for the manatee. Remind them that a food chain shows the flow of energy through a system. Arrows in the food chain should lead FROM the thing that is eaten TO the consumer. A sample food chain is below. You can use Velcro or magnetic pieces, or write on a white board for this activity.

```
SUN → Plants (seagrass, salt marsh, floating plants) → Manatees → Humans, possibly sharks and alligators
```

Ask the students to identify the producer (plants) and consumers (manatees, humans, sharks, alligators) in the food chain.

4. Ask how many students in the class have seen a manatee. Find out where they have seen them. If any have seen them in the wild, try and find out where and what time of year they saw them. Explain that even though manatees have some blubber to help keep them warm, they can get sick and die in water that is too cold. In winter months, manatees will try to find warm water areas. This is why we see lots of manatees around springs in the winter—the water there is 70-72°F year-round. At other times of the year, some manatees stay in one general location, while some swim all around the state (and occasionally even up the Atlantic coast to New England!) We think that baby manatees learn their migration pattern from their mothers. Baby manatees will stay with mom for about the first two years of life. [If anyone asks, a baby manatee is about 3-4 feet long.] In winter, some manatees go to places where power plants pump warm water into coastal waters. Four out of ten manatees are found at power plant sites in the winter. Ask
students what percent this is equal to [40%]. As we try to switch from burning fossil fuels to produce electricity to cleaner methods, ask the students what they think would happen to those manatees if one of the power plants was closed down? [Manatees could die; they will go into cold shock and need to be rescued and transported to warmer water.] This is a major concern for biologists in Florida.

Post-visit activities

1. Writing assignment: Sea World has a special day camp for elementary boys and girls interested in learning more about manatees. You decide to attend the camp and discover they have an assignment for you! Sea World in California is planning to add a manatee exhibit, and need help deciding how to "build" a habitat for two manatees. How would you design the exhibit? What would you include in the exhibit, and why?

2. Animal cubes—have students create them for manatees…

3. Breeding for Survival (Sea World—logic puzzle)

4. Marvelous Manatees (Sea World-game showing threats to manatee survival)

5. Manatee Mortality (Florida Sea Grant-math)

6. Manatee Anatomy & Physiology (Volusia Co.)

7. Manatees (Pelotes Island Nature Preserve—language arts, math)

8. Mermaids & Manatees (Project Aquatic Wild—language arts)

9. Journey North-Manatees (various activities—mapping, journaling)

Standards addressed:

<table>
<thead>
<tr>
<th>LA.4.1.6.1 LA.5.1.6.1</th>
<th>The student will use new vocabulary that is introduced and taught directly;</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA.4.3.1.1 LA.5.3.1.1</td>
<td>The student will prewrite by generating ideas from multiple sources (e.g., text, brainstorming, graphic organizer, drawing, writers notebook, group discussion) based upon teacher-directed topics and personal interests;</td>
</tr>
<tr>
<td>MA.4.A.1.2</td>
<td>Multiply multi-digit whole numbers through four digits fluently, demonstrating understanding of the standard algorithm, and checking for reasonableness of results, including solving real-world problems.</td>
</tr>
<tr>
<td>MA.5.A.1.4</td>
<td>Divide multi-digit whole numbers fluently, including solving real-world problems, demonstrating understanding of the standard algorithm and checking the reasonableness of results.</td>
</tr>
<tr>
<td>MA.5.A.4.2</td>
<td>Construct and describe a graph showing continuous data, such as a graph of a quantity that changes over time.</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>MA.4.A.6.5</td>
<td>Relate halves, fourths, tenths, and hundredths to decimals and percents.</td>
</tr>
<tr>
<td>SC.4.L.16.3</td>
<td>Recognize that animal behaviors may be shaped by heredity and learning.</td>
</tr>
<tr>
<td>SC.4.L.17.2</td>
<td>Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.</td>
</tr>
<tr>
<td>SC.4.L.17.3</td>
<td>Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.</td>
</tr>
<tr>
<td>SC.4.L.17.4</td>
<td>Recognize ways plants and animals, including humans, can impact the environment.</td>
</tr>
<tr>
<td>SC.5.L.15.1</td>
<td>Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.</td>
</tr>
</tbody>
</table>
Manatee Interview (grades 4-5)

1. Introduce yourself, the press secretary (the other volunteer) and the manatee.
2. Explain that everyone in the class is going to be a reporter today, and will be participating in a press conference with Mandy, the Florida Manatee.
3. Hand out the question cards to the students (one per student).
4. Explain that the reporters will initially only ask the question that is on their card. At the end of the interview, reporters will be able to ask any additional questions that are not on the cards. Everyone should pay attention during the interview so that questions are not repeated.
5. Ask the “reporter” with question # 1 to come up to the microphone (held by the press secretary) and ask their question

Press secretary: We are here today for an exclusive interview with Mandy, the Florida Manatee. Mandy has graciously agreed to answer any and all questions about her species and how they have adapted to living in the water. Please have your question ready when you are called upon, and speak up clearly into the microphone. Reporter # 1, please ask your question.

Reporter # 1: Miss Mandy, if I may call you that, I have a question that most ladies do not like to answer. How much do you weigh?

Mandy: uses squeaker a couple of times.

Volunteer (to class): Oh, I’m sorry—you all don’t speak manatee, do you? Manatees talk using clicks and squeaks, instead of words. I will translate for you. Mandy says that she doesn’t mind at all telling you that she weighs 1000 pounds. Some manatees can weigh up to 3500 pounds!

Press Secretary: Thank you. Reporter # 2?

Reporter #2: Miss Mandy, how well can you see underwater?
Volunteer: Manatees have amazing eyes! They have an eye on each side of their heads so they can see both sides when they are swimming. They also have inner membranes in their eyes that act like built-in swim goggles. They cover the manatees’ eyeballs for protection, but still allow the manatee to see. Isn’t that an amazing adaptation? Scientists call those special covers “nictitating membranes.”

Press Secretary: Reporter # 3?

Reporter # 3: Madam, is your nose amazing also?

Volunteer: But of course! Manatees can breathe through their nostrils at the surface of the water without any of the rest of the body showing at all. When the manatee goes underwater, the nose has a set of valves that close so water doesn’t get up it.

Press Secretary: Reporter # 4?
Reporter # 4: So since you breathe air like us, you must have lungs.

Volunteer: Yes, manatees have lungs that run down the whole length of their body. It’s like having water wings inside that help them float straight when they are full of air. Manatees also have lots of muscle in their lungs so they can push a great deal of air out fast, and pull more back in fast.

Press Secretary: Reporter # 5?

Reporter # 5: How often do you have to come up to breathe?

Volunteer: Manatees usually breathe about every 2-3 minutes, but they can stay underwater for up to 20 minutes when they are napping. If they are moving fast, they might have to breathe every 30 seconds.

Press Secretary: Reporter # 6?

Reporter # 6: How can manatees stay underwater for so long?

Volunteer: That’s an adaptation that manatees have developed over time. The normal manatee heartbeat is 50-60 beats per minute. When they stay
underwater for, let’s say, an 8-minute dive, the heartbeat slows to only 30 beats a minute. When manatees are taking a 20-minute nap, their heartbeat can slow to 8 beats a minute.

Press Secretary: Reporter # 7?

Reporter # 7: Where do all the manatees go in the winter?

Volunteer: Manatees only have a very thin layer of blubber, so when the water temperatures drop below about 68 or 70 degrees, they have to find a warm place to stay. Many manatees head to the springs, because the spring water is a fairly constant 70 degrees. Sometimes there will be hundreds of manatees crowded into the springs trying to stay warm!

Press Secretary: Reporter # 8?

Reporter # 8: I’ve seen viewing areas for manatees that are not at springs. What is special about those places?

Volunteer: Power plants and some manufacturing plants use water from coastal areas to cool down their big engines. The water is then quite warm. When people pump that warm water back into the environment, it creates a warm pool. Manatees have learned to come to these discharge areas in the winter months to find warm water.

Press Secretary: Reporter # 9?

Reporter # 9: Miss Mandy, what do you like to eat? Volunteer: Manatees are herbivores—they only eat plants. They like to eat seagrasses—there’s even a type of seagrass called “manatee grass”—it looks like green spaghetti! Manatees will also eat floating plants and sometimes nibble on plants that are growing on land, but hang over the water. A manatee that weighs 1000 pounds needs to eat about 100 pounds of plants a day!

Press Secretary: Reporter # 10?

Reporter # 10: Miss Mandy, why do you have such a big upper lip?
Volunteer: Manatees have a split upper lip that helps them gather and tear the plants that they love to eat. Manatees are related to elephants—even though they do not have a long trunk like the elephant, manatees can use their mouth much like an elephant uses its trunk. Manatees will also use their front flippers to help get food into their mouths,

Press Secretary: Reporter # 11?

Reporter # 11: I see that you have fingernails on those flippers of yours. What do you use them for?

Volunteer: My, how observant of you! Like their elephant cousins, and even people, manatees have nails! Sometimes manatees eat wet, slippery leaves and grass—the nails help the manatees get a good hold on that food. They also protect the flippers when the manatee swims close to the bottom. Manatees shed their nails every few months, and new nails grow in.

Press Secretary: Reporter # 12?

Reporter # 12: I know that manatees can live in salt water, but do you drink salt water, or do you have to find fresh water to drink?

Volunteer: Actually, manatees do not need to drink fresh water. Because they eat so many plants, they get all of the fresh water that they need from the water contained in those plants. Sometimes people put a hose out over the water so manatees can drink from it, but that’s not necessary, and it’s actually illegal.

Press Secretary: Reporter # 13?

Reporter # 13: Why is it illegal to give water to manatees? Isn’t that just being kind to animals?

Volunteer: It is illegal to pet, feed or give water to manatees. That’s because manatees are really quite intelligent, and if someone feeds them or gives them water at a dock, they learn quickly that they should go to
docks to look for food or water. Because people often keep boats at docks, we don't want to encourage manatees to hang around docks, since they might be hit by a boat that doesn't realize that they are there.

Press Secretary: Reporter # 14?

Reporter # 14: How many teeth do you have in your mouth, Miss Mandy?

Volunteer: Good question! Manatees do not have any biting teeth, just chewing teeth. They have two rows of molars on the top, and two rows of molars on the bottom. There can be six to eight molars in each row. So...six teeth times four rows is how many teeth? [let kids answer]. Yes, at least 24 teeth. Now here's the really neat thing about manatee teeth—they keep replacing themselves from the back of the manatee's mouth! They move forwards until eventually the teeth in the front of the mouth are pushed back by the teeth behind them. [Press secretary can pass around photograph of manatee skull]

Why does this happen? It's because manatees grind sand when they eat aquatic plants and their teeth wear down from all of the sand chewing. Sometimes people say that manatees have Marching Molars! The best part is, manatees never have cavities and never have to see the dentist!

Press Secretary: Reporter # 15?

Reporter # 15: I'm sorry, but YUCK! How can you eat sandy food?

Volunteer: Oh, that’s easy! Manatees have specially adapted digestive systems that can deal with a lot of rough, high fiber, low protein food. They also have an amazing digestive gland that produces slimy mucus to coat the swallowed food and protect the lining of their organs from being scratched by the sand.

Press Secretary: Reporter # 16?

Reporter # 16: Pardon me, madam, but you look all gray, wrinkled and (dare I say) flakey. Is that normal?
Volunteer: [as Mandy parades around the room, showing off] The manatees’ brownish-gray color helps them blend in with their environment—just like people do when they wear camouflage clothes. Even though manatees are large animals, they often swim in murky water, where their coloration can make them quite difficult to find. The wrinkles and flaky skin helps manatees get rid of algae or barnacles that grow on their skin during the year.

Press Secretary: Reporter # 17?

Reporter # 17: How do you move around underwater?

Volunteer: Manatees move around quite well in the water. They use their two front flippers for steering and paddling. Their rounded tail pumps up and down to propel them through the water. They can move really fast when they are frightened. Manatees especially like to do barrel rolls—it’s quite fun!

Press Secretary: Reporter # 18?

Reporter # 18: (Shout) HELLO MISS MANDY. CAN YOU HEAR ME OKAY? I don’t see any ears on your head. How can you hear us?

Volunteer: Yes, you are quite loud and clear! Another good question—you reporters are so smart! Manatees actually have tiny ear openings behind their eyes, but they hear best when sound waves enter their fat-filled lower jaw and are felt by the ear bones nearby.

Press Secretary: Reporter # 19?

Reporter # 19: Miss Mandy, how old are you?

Volunteer: Well, ladies don’t usually reveal their ages, but Mandy is willing to tell you that she is 25 years old. Manatees can live up to 50 or 60 years if they stay healthy.

Press Secretary: Reporter # 20?
Reporter # 20: What sorts of things can make a manatee sick?

Volunteer: Just like all animals, manatees can get sick from viruses and get infections from bacteria. The major causes of manatee deaths are, unfortunately, because of people. Manatees can get hit by boats or other watercraft, they can become tangled up in fishing line or crab trap lines, and they can even consume plastics that are tangled up in the plants that they eat.

Press Secretary: Reporter # 21?

Reporter # 21: Is it true that early sailors thought that manatees were mermaids?

Volunteer: That is the story that I have heard! However, I have never seen a manatee with long, blonde hair, or a green scaly tail!

Press Secretary: Reporter # 22?

Reporter # 22: How many manatees are there in Florida?

Volunteer: That's a really good question! In 2008, scientists counted 3800 manatees around Florida. Scientists cannot see all of the manatees, of course, when they fly over the water, since manatees sometimes stay in murky water.

Press Secretary: Reporter # 23?

Reporter # 23: Are manatees considered an endangered species?

Volunteer: Manatees are on the federal endangered species list—they are currently considered to be a “threatened” species, which means that there are many things that pose a threat to their survival, but their populations are not in danger of becoming extinct in the very near future.

Press Secretary: Reporter # 24?

Reporter # 24: What can people do to help protect manatees?
Volunteer: Great question! Please respect manatees and do not chase them or disturb them. Be careful with your trash, including fishing line, and make sure that you throw it away in proper trash containers, and not into the water. Remember to go slowly when boating in manatee areas—shallow waters and seagrass beds since manatees often feed in those areas. Help clean up coastal waterways to leave manatees with clean habitats in which to live.

Press Secretary: Reporter # 25?

Reporter # 25: Miss Mandy, can you please tell me about manatee babies?

Volunteer: Baby manatees, called calves, are about 3 feet long and weigh about 60 pounds when they are born! The mother manatee is pregnant for about 13 months. Baby manatees will stay with their mothers for about 2 years. Usually manatees just have one baby, but occasionally they have twins.

Press Secretary: Reporter # 26?

Reporter # 26: Do manatees have any natural predators?

Volunteer: No. Manatees are such large animals, and they swim so close to shore, that they are either too big for other animals to eat, or are in water that is too shallow for big predators (like whales or white sharks) to get into. Humans are the only animals that threaten manatees.
Estuary Animal Cubes
Teacher Page
By: Sara J. Marhenke

Grade Level: 7
State Standards: III A 6, III D 1, III D 2
National Standards: Physical Science Content Standard B transfer of energy, Life Science Content Standard C populations and ecosystems
Type of Activity: research____; lab____; computer based____; hands-on X

Focus or Inquiry Question:
How do the animals in the estuary interact with each other? How is energy transferred through the estuary? How can estuary animals be classified for study?

Objectives: Students Will:
- Research the needs and habits of estuary animals
- Describe how a particular animal interacts with its environment
- Construct a model food web and describe the transfer of energy
- Group and sort animals into populations and communities

Key Words:
- Predator
- Prey
- Competition
- Consumer
- Photosynthesis
- Ecosystem
- Population
- Community
- Decomposers

Materials: copies of student page and old manila file folders. Clear tape, scissors, colored pencils, or markers. Access to the library and internet for student research.

Teacher Preparation: Gather photos of animals and books about them from the list below. Prepare a box for storing the cubes. If you want to make more lasting blocks, wood can be cut into 2 inch cubes and the manila can be glued to the wood.
Time Frame: Several hours for student research, one hour or less for cube decoration, activities can vary from one brief food web activity to several days of games and teaching younger students.

Learning Environment: Students will work individually to create their cube and then work as a class and in small groups during the games and activities.

Background Information: see appendices and resources

Procedures: (see student page for more detailed procedure description.)

Ask the students to name animals they know that live in the estuary. Write all the animal names and add any not mentioned.

Assign animal(s) to each student. After you have assigned the animals and explained the timeline and available resources, the students should be able to complete the cubes on their own.

The student page contains many ideas for activities for the cubes. The teacher may choose which activities to utilize, or consider making up new games or having the students make up games to teach younger students about the estuary animals.


Appendices: student pages, cube pattern, cube example, teacher background page

Resources:

*Georgia's Amazing Coast* by David Bryant and George Davidson

*Of Sand and Sea: Teachings from the Southeastern Shoreline* by Paula Keener-Chavis and Leslie Reynolds Sautter

http://www.dnr.state.sc.us/marine/index.html for a menu of Sea Science publications
Make Your Own Animal Cube

Use the pattern provided to make a cube out of an old file folder. Before folding it into a cube shape, decorate it. Here’s how:

1) Draw a picture of your animal in one square.
2) Draw some of the things the animal eats in one square.
3) Draw a place where your animal might find shelter or raise young. This can be something the animal finds (like a hollow log) or makes (like a nest.)
4) Draw a picture of the clean water the animal needs to survive in another square.
5) Draw a picture of the animal’s space in another square. Where in the estuary does the animal spend most of its time?
6) In the last square, draw some other animals that live in the community, including people. These other animals can be predators of your animal, prey of your animal, or competitors.

Here are some animals that live in estuaries. Your teacher may assign one of these animals to you. You will need to research your animal to find out where it lives and what it eats. Does it eat anything else on this list? How does it shelter itself? What other animals live around it? Use the information you find while decorating your cube.

<table>
<thead>
<tr>
<th>Alligator</th>
<th>Flounder</th>
<th>Moon Snail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Crab</td>
<td>Ghost Crab</td>
<td>Mullet Fish</td>
</tr>
<tr>
<td>Bottlenose Dolphin</td>
<td>Great Blue Heron</td>
<td>Osprey</td>
</tr>
<tr>
<td>Clapper Rail</td>
<td>Human Kid</td>
<td>Oyster</td>
</tr>
<tr>
<td>Coquina Clam</td>
<td>Kingfisher</td>
<td>Plankton</td>
</tr>
<tr>
<td>Diamondback Terrapin</td>
<td>Laughing Gull</td>
<td>Shrimp</td>
</tr>
<tr>
<td>Fiddler Crab</td>
<td>Marsh Periwinkle</td>
<td>Zoea</td>
</tr>
<tr>
<td></td>
<td>Marsh Rice Rat</td>
<td></td>
</tr>
</tbody>
</table>
Animal Cube Activities

Once your cube is decorated, carefully fold it and use clear tape to hold it together. Then you and your classmates can get together for some cube activities.

Introduce Your Cube
Show your cube to the class and tell some basic information such as the name of your animal and one of its favorite foods or an interesting fact you learned about it while researching. While you listen to your classmates' presentations, think about their animals' relation to yours. Do you live in the same area? Eat the same things? Does their animal eat yours?!

Build a Food Web
Everyone sits with their animal facing out so everyone else can see it. Can you find anyone who has an animal that your animal eats? Can you find anyone that has an animal that eats your animal? Get together and build a simple food web model. You can use paper to draw any plants that are in your food web.

After you build your model, identify the layers of your web. Which organisms are the producers? Which are the primary consumers? Which are decomposers?

Describe the Transfer of Energy
Use a yellow ball or paper to represent the sun. Draw pictures of estuary plants such as seaweed, plankton, and spartina grass. Use your animal cubes to make a model of the transfer of solar energy through photosynthesis. Show how energy is distributed through an energy pyramid.

Populations and Ecosystems
Everyone sits with their animal facing so that everyone else can see it. Can you gather with other animals in a population? What populations live together to form a community? Once you have gathered into a community, describe what physical factors are in your ecosystem. Do you all live in a
marsh? A fresh water river? The ocean? Draw a mural or create a diorama of your ecosystem and place your animal blocks in your creation where they live.

**Biodiversity in the Estuary Mobile**
Use sticks or dowels and string to create a mobile highlighting your favorite estuary animals.

**Roll the Animal Cubes**
Put all the cubes in a box. One person reaches into the box without peeking and picks one cube. That is their animal. Now pick 5 more cubes and roll them in the playing area. The side facing up when the cube stops rolling is the side used. Try to get your animal some food, clean water, and shelter without rolling a predator.

**Use Your Cubes to Teach Young Students**
You can teach kids preparing for a field trip to an estuary. Use the blocks to show a simple food chain. You can make up easier games with the cubes (like matching games) for the students to play. You could try matching predators with prey, for example. You can also have younger students sort the blocks. Here are some groups you could try:

- reptiles, birds, mammals, fish, etc.
- Animals that swim, animals that do not swim.
- Animals that eat plants (herbivores) and animals that eat other animals (carnivores.)

Sara J. Marhenke
Charleston County Park and Recreation Commission
- Activity designed for COSEE-SE Ocean Science Education Leadership Institute
- Cubes adapted from *Navigating Nature*, a publication of the Denver Zoo
Breeding for Survival

OBJECTIVE
The student will correlate manatees into prospective breeding groups given studbook information.

MATERIALS
☐ six copies of page 21, cut into individual sets of cards

BACKGROUND
When developing captive breeding programs, zoological specialists and keepers make the best matches between animals by studying studbook information. A studbook is a comprehensive record of all births, deaths, and interinstitutional transfers of a particular species. This record helps keepers avoid inbreeding individuals by tracking related animals. Studbooks can also tell about each animal’s personality and what individuals they do and don’t get along with. The U.S. Fish and Wildlife Service currently has a moratorium on breeding manatees in captivity. However, this exercise provides a hands-on manatee management scenario.

ACTION
1. Begin the activity with a class discussion on breeding animals in captivity. What measures would ensure success? What problems would keepers want to avoid?

2. Divide the class into groups of five to six students. Tell them they’re to be manatee keepers responsible for developing a new breeding program.

3. Give each student group a set of Manatee Logic cards and Manatee Name cards.

4. Tell students to use cards to place manatees into three breeding groups, each containing at least one male and four to five females. Use name cards to form groups; use logic cards to ensure individuals are compatible.

5. When students have finished, review their groupings and allow discussion between groups as to why their breeding groups would or would not be good choices. (There may be more correct choices than those in the Answer Key.)

DEEPER DEPTHS
Continue this activity by developing a Species Survival Plan (SSP). SSP is a program for managing captive populations of certain threatened or endangered animals. Plans include an education component, breeding plan, animal care plan, and reintroduction plan. Learn more at the American Zoo and Aquarium Web site: www.aza.org/ConScience
### Manatee Name Cards

<table>
<thead>
<tr>
<th>Ethel</th>
<th>Delta</th>
<th>Rosie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oma</td>
<td>Star</td>
<td>Dolly</td>
</tr>
<tr>
<td>Cleo</td>
<td>Bea</td>
<td>Dawn</td>
</tr>
<tr>
<td>Sheba</td>
<td>Isis</td>
<td>Reva</td>
</tr>
<tr>
<td>Blossom</td>
<td>Ruby</td>
<td>Lotus</td>
</tr>
<tr>
<td>Dock (M)</td>
<td>Rube (M)</td>
<td>Oscar (M)</td>
</tr>
<tr>
<td>Bink (M)</td>
<td>Rock (M)</td>
<td>Skipper (M)</td>
</tr>
</tbody>
</table>

### Manatee Logic Cards

<table>
<thead>
<tr>
<th>Skipper and Rock don’t get along with Oscar</th>
<th>Skipper is Lotus’ son</th>
<th>Blossom is so young, she needs to stay with Lotus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dock is aggressive toward all other males</td>
<td>Rock is an immature male</td>
<td>Oscar is an immature male</td>
</tr>
<tr>
<td>Skipper is an immature male</td>
<td>Dawn is Dock’s daughter</td>
<td>Ruby and Bea are aggressive toward Dock</td>
</tr>
<tr>
<td>Ruby and Dolly don’t get along</td>
<td>Sheba is Dock’s daughter</td>
<td>Sheba and Bink were unsuccessful at breeding with one another</td>
</tr>
</tbody>
</table>

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Manatee Migration

OBJECTIVE

Students will learn many threats to manatee survival and work together to complete a successful manatee migration.

ACTION

1. Print a copy of the statement cards on the following pages, cut them apart and attach each to an index card. On the other side of the index card write the statement’s number.

2. Measure and mark a 25 x 35 foot rectangle in an open field or parking lot. Using the rectangle, develop a grid that has seven rows and five columns (each grid square will be 5 feet by 5 feet) as shown to the right.

3. Place the index cards face down in the center of the appropriate spaces.

4. Ask the students to break up into two equal-sized groups. Each group will represent a manatee. While one group is playing the game, the other group shouldn't watch.

5. Tell the students that manatees face many obstacles in their environment. Students in each group will take turns trying to find the appropriate migration pathway through the maze. A student in the group will read the card aloud and follow the directions at the end of the card. After each move, a different student in the group will choose. Teams can choose to start at box numbers 1, 2, 3, 4, or 5.

6. If a student selects an obstacle, the team's turn is over and it's the other group's turn to select. If a team selects an -obstacle, they must start from the beginning on their next turn. Students must find the most direct path so they should pay attention and learn from the mistakes of their teammates.
DEEPER DEPTHS

After the game, have the students develop their own board game or activity that emphasizes conservation or human-related threats to manatees.

MATERIALS

- chalk or string
- 35 index cards
- copy of statement cards below

MANATEE MIGRATION STATEMENT CARDS

1. Brrrr. The water temperature has dropped quickly and you're experiencing hypothermia. In 1990, 47 Florida manatees died due to cold weather. Lose your turn!

2. Slow-speed signs are in the area you're going to move through. Boaters are following the speed limit. Take another turn! Move one space in any direction.

3. As you begin your migration, you encounter a closed flood gate. The flood gate won't let you migrate any farther. The water is getting colder and you experience hypothermia. Lose your turn!

4. Disease and parasites have plagued you all summer long. You're too weak to make the long journey back to your winter habitat. Lose your turn!

5. The water temperature is getting colder so you start your migration to warmer waters. You prefer water temperatures above 70°F. Take another turn! Move one space in any direction.

6. Industry by-products have been dumped into the river, making the water too acidic for plant life. Since there are no plants to eat, you starve. Lose your turn!

7. You begin your migration too late and fall victim to hypothermia. Lose your turn!

8. As you attempt to swim through a drainage pipe, you get stuck. You'll starve unless someone rescues you. Lose your turn!

9. A school group is cleaning the edge of the river. By cleaning up the fishing line and plastics, there is less chance that you'll become entangled. Take another turn! Move one space in any direction.

10. People are observing you from a distance. They don't disturb you. Take another turn! Move one space in any direction.

11. As you travel through a flood gate, it closes and crushes you. Most flood gates are remote controlled and can crush a manatee passing through it. Lose your turn!

12. Poachers hunting for manatee hides and meat spot you. Unfortunately you're no match for their powerful guns. Lose your turn!
13. You reach an area in the river where most boaters use propeller guards to protect manatees from being injured by the propeller. Take another turn! Move one space in any direction.

20. Someone has discarded used motor oil in the river. You accidentally eat some plants with oil on them and become very sick. Lose your turn!

14. Someone has dumped pesticides into the water. The pesticides are absorbed into the vegetation you eat and make you very sick. Lose your turn!

21. Toxic chemicals used as pesticides have been sprayed on vegetation you have eaten. Your body can't get rid of the toxins and you become very ill. Lose your turn!

15. You've reached an area with boat speed limits. Boaters will now be able to see you more easily which reduces your chance of being hit. Take another turn! Move one space in any direction.

22. You have been released after successful rehabilitation from an injury. A rescue team from SeaWorld took care of you as you regained your health. Take another turn! Move one space in any direction.

16. A speeding boat passes overhead as you come up to breathe. The propeller blades accidentally hit you and you're severely injured. There were no slow-down signs to warn boaters. Lose your turn!

23. Development along the river has altered the environment. Vegetation you need for food no longer exists. You can't continue your migration until you find food. Lose your turn!

17. You accidentally ingest fishing line discarded in the river. The fishing line doesn't break down and causes digestion problems. Lose your turn!

24. You have found a large growth of water hyacinth, one of your favorite plants. You eat 100 lb. of the tasty vegetation and continue your migration. Take another turn! Move one space in any direction.

18. Someone has accidentally left his/her hose on near the shoreline. You enjoy the drink of fresh water. Take another turn! Move one space in any direction.

25. The river has been dammed and you can no longer pass upstream. You won't be able to reach your refuge. Lose a turn!

19. You have become entangled in a crab trap. The nylon cord has wrapped around your pectoral flippers making it impossible to reach the surface to breathe. Lose your turn!

26. You swim into a manatee sanctuary. Sanctuaries are areas free from human-related threats (such as boats) to your survival. Take another turn! Move one space in any direction.
<table>
<thead>
<tr>
<th>MANATEE MIGRATION STATEMENT CARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Swimmers in the river harass and scare you. As you swim to escape, you become disoriented and don't follow your normal migration route. Lose your turn!</td>
</tr>
<tr>
<td>32. While you're eating in a shallow area, a speeding boat accidentally hits you. Unless you receive medical attention, you will not survive the injury. Lose your turn!</td>
</tr>
<tr>
<td>28. You observe a boater driving slowly and wearing sunglasses to help spot manatees. The boater's thoughtful driving has prevented your injury. Take another turn! Move one space in any direction.</td>
</tr>
<tr>
<td>33. A speeding boat accidentally hits you while you surface to breathe. Although the propeller doesn't cut you, the impact breaks your ribs and punctures your lung, which makes you sink. Lose your turn!</td>
</tr>
<tr>
<td>29. The power plant that supplies the warm water for your winter refuge has closed down. Soon the water will be too cold and you'll have no place to live. Lose your turn!</td>
</tr>
<tr>
<td>34. Your refuge has been destroyed by human development. You have no place to spend the cold winter months. Lose your turn!</td>
</tr>
<tr>
<td>30. You have become entangled in fishing line. The fishing line is wrapped around your pectoral flippers and is cutting into your skin. A serious infection is soon to follow. Lose your turn!</td>
</tr>
<tr>
<td>35. A scuba diver harasses you. In an attempt to flee, you become disoriented and lose your normal migratory route to the refuge. Lose your turn!</td>
</tr>
<tr>
<td>31. CONGRATULATIONS! You've successfully completed the migration to your winter refuge. Over 200 manatees may congregate at one refuge.</td>
</tr>
</tbody>
</table>
MANATEE MORTALITY

We think that there are about 3000 Florida manatees alive. Every year, manatees are born and manatees die. Scientists try and find out why manatees have died. Sometimes they die from natural things like cold weather, old age and illness. Sometimes baby manatees just are not strong enough to survive. We call these deaths “perinatal.” Sometimes manatees are killed accidentally by people in boats. If a boat hits a manatee, it can hurt the manatee by cutting it with the propeller. Some boats kill manatees if they hit the manatee really hard. The causes of manatee deaths are shown in the table below.

Use the table to answer these questions:

a. Find the average number of manatees killed by each cause from 1999-2008. To find the average, add all of the numbers in each column (from top to bottom) and divide that result by the number of numbers (10). Write the averages in the bottom row of the table.

b. Which two years had the highest number of manatees killed by watercraft? _______ & _______. By cold shock? _______ & _______.

c. Not counting the “unknown” column, what results in the highest number of manatee deaths, on average? ________________________________.

d. Create a graph showing the total manatee mortality for each year (1999-2008). Would you say that manatee deaths have increased, decreased or stayed about the same over that 10-year period?


<table>
<thead>
<tr>
<th>YEAR</th>
<th>Watercraft</th>
<th>Gate/lock</th>
<th>Human, other</th>
<th>Perinatal</th>
<th>Cold shock</th>
<th>Natural</th>
<th>Unknown</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>82</td>
<td>15</td>
<td>8</td>
<td>54</td>
<td>5</td>
<td>37</td>
<td>68</td>
<td>269</td>
</tr>
<tr>
<td>2000</td>
<td>78</td>
<td>8</td>
<td>8</td>
<td>59</td>
<td>14</td>
<td>37</td>
<td>68</td>
<td>272</td>
</tr>
<tr>
<td>2001</td>
<td>81</td>
<td>1</td>
<td>8</td>
<td>61</td>
<td>31</td>
<td>35</td>
<td>108</td>
<td>325</td>
</tr>
<tr>
<td>2002</td>
<td>95</td>
<td>5</td>
<td>9</td>
<td>53</td>
<td>17</td>
<td>59</td>
<td>67</td>
<td>305</td>
</tr>
<tr>
<td>2003</td>
<td>73</td>
<td>3</td>
<td>7</td>
<td>71</td>
<td>47</td>
<td>102</td>
<td>77</td>
<td>380</td>
</tr>
<tr>
<td>2004</td>
<td>69</td>
<td>3</td>
<td>4</td>
<td>72</td>
<td>50</td>
<td>24</td>
<td>54</td>
<td>276</td>
</tr>
<tr>
<td>2005</td>
<td>79</td>
<td>6</td>
<td>8</td>
<td>89</td>
<td>31</td>
<td>89</td>
<td>94</td>
<td>396</td>
</tr>
<tr>
<td>2006</td>
<td>92</td>
<td>3</td>
<td>6</td>
<td>70</td>
<td>22</td>
<td>81</td>
<td>143</td>
<td>417</td>
</tr>
<tr>
<td>2007</td>
<td>73</td>
<td>2</td>
<td>5</td>
<td>59</td>
<td>18</td>
<td>82</td>
<td>78</td>
<td>317</td>
</tr>
<tr>
<td>2008</td>
<td>74</td>
<td>2</td>
<td>6</td>
<td>87</td>
<td>18</td>
<td>28</td>
<td>61</td>
<td>276</td>
</tr>
</tbody>
</table>

Activity by Maia McGuire, Florida Sea Grant Extension Agent, 150 Sawgrass Road, Bunnell, FL 32110. mpmcg@ufl.edu.
Manatee Anatomy and Physiology

Grade level: Elementary 5
Subject Area: Biology, Anatomy and Physiology, Marine Biology

Duration: Teach: 15 minutes, Activity: 20 minutes, Discussion: 20 minutes.
Setting: Classroom

Sunshine State Standards:
Reading (LA.A.1.1, LA.A.2.2)
Writing (LA.B.2.1, LA.B.1.2)
Listening, Viewing and Speaking (LA.C.2.1, LA.C.1.2, LA.C.2.2, LA.C.3.2)
Processes of Life (SC.F.1.1, SC.F.2.1, SC.F.1.2, SC.F.2.2)
The Nature of Science (SC.H.1.1, SC.H.3.1, SC.H.1.2, SC.H.3.2)
Processes that Shape the Earth (SC.D.2.1)

FCAT Prompt: How might humans help manatees survive?

Objectives: Students will learn about manatee bodies and explain some anatomical and physiological differences between manatees, humans and other animals.

Materials: Handouts of basic manatee anatomy, dolphin anatomy & human anatomy, crayons or markers, coloring direction sheet, question worksheet, Quiz sheet

Vocabulary: Mammal, endangered species, habitat, conservation, vibrissae, nares, blowhole, flipper, herbivore, omnivore, carnivore.

Background/Preparation: Handouts of manatee, dolphin, and human anatomy. Fact sheets comparing and contrasting specific and unique anatomical aspects of each species. Basic Manatee fact sheet highlighting personality, limited habitat, endangered status and conservation efforts. Teachers can review the manatee fact sheets, and select points of interest they would most like to incorporate into a lesson. This activity may fit best into the week where the human anatomy lessons are addressed. Teachers can present the information via traditional lecture, group discussion, question and answer session, or doing the coloring activity as the lesson points are addressed, etc.

Teach/Activities:

Activity 1: Color the anatomy handouts for each species using a single color for key organs or body part. (Ex. Lungs- red, Large Intestine- yellow, diaphragm-blue, heart-orange, Fluke-green)

Discussion 1: Use these color-coded handouts to stimulate discussion about the differences between the species and why these differences exist from a biological point of view.

Activity 2: Place students in groups to complete the Manatee worksheets using the colored anatomy handouts and fact sheets.

Discussion 2: Break out of groups and discuss the worksheet answers with students. Discuss manatee or ocean conservation efforts that are relative to your community.

Assess: Quiz students on a “blank” manatee for major anatomical parts.

Resources:
http://www.volusiamanatees.org/
http://myfwc.com/manatee/
Manatee Fact Sheet

- Florida manatees are marine mammals. Mammals share 6 common traits: they are warm-blooded, breathe air, have defined teeth, have at least some hair, give birth to live young, and produce milk to feed their young.
- Manatees are generally herbivores and depend on fresh water, which is obtained through the vegetation they eat.
- Florida Manatee habitat is restricted primarily to the Florida peninsula and southern Georgia. They live in slow moving rivers, canals, and coastal areas. They can live in fresh or salt water. Manatees need to be in water that is no colder than 68 degrees Fahrenheit in order to maintain a safe internal body temperature. If they are in water that is any colder than this for an extended period of time, they become susceptible to “cold stress,” which makes them vulnerable to disease and death.
- Manatees are an endangered species, meaning unless appropriate action is undertaken to conserve their population, they are in danger of becoming extinct. Because of this, there are strict laws set to protect them. This includes enforcement of speed zones along the waterways of Florida and rules against human interaction with them. Human interaction includes touching, harassing, feeding or watering.

Similarities

- Manatees, like horses, are called hind-gut digesters. This means that the majority of food nutrients are extracted further along in the digestive tract, namely in the large intestine and cecum.
- Manatees are most closely related to elephants. Manatees have a large, muscular flexible prehensile upper lip that acts in many ways like a shortened trunk.
- Manatees have nails on their flippers, like finger nails, and similar to the nails seen on elephant hoofs. These are another indicator of their evolutionary relation to elephants.
- Manatees have vibrissae or tactile hairs distributed over the entire body and concentrated in the snout. This information would be useful for the detection of approaching animals, objects in the environment, and tidal flows. All mammals have hair at some point. Dolphins are born with small vibrissae on their rostrum, which fall out in the first few days of life.
- Like dolphins and seals, manatees have reniculated kidneys. This means the kidneys are composed of small segments that each functions like a tiny individual kidney. Human beings do not have reticulated kidneys.

Differences

- Manatees exhibit “tooth-replacement” that occurs throughout their lifetime (polyphyodont). This is different from other mammals that replace their teeth once in a lifetime (diphyodont). The teeth are replaced from the back of the jaw and are called “Marching Molars”.
- Manatee nostrils are on the upper surface of their snout, as opposed to dolphins, which have blowholes located on the top of their heads.
Manatees often raise just their nostril above water to breathe and breathe every 10-15 min while resting.

- Manatees and dolphins do not have hind limbs, whereas humans and terrestrial mammals do.
- Manatees have a large paddle-like fluke whereas dolphins have a notched fluke.
- Manatee lungs have a unique shape. While other mammals have lungs that are located around the heart and extend down to the stomach, manatee lungs are long and flat. They run along approximately the entire backside (dorsal side) of the manatee and are positioned just above the diaphragm. While the location of the lungs in a manatee aid in buoyancy control, they also make the manatee prone to serious injury in the event of a boat strike. Because of the positioning of the lungs, if a boat strikes a manatee, the ribs may fracture and puncture the lungs, or the lungs may be directly punctured. Lung punctures can cause inability to breathe, air pockets that affect ability to dive, move and eat, and may even result in infection or death.
- Manatees can’t turn their head sideways, they must turn their whole bodies.
- Manatees are herbivores, whereas dolphins are carnivores and humans are omnivores.

*Created by Bryan Keller, adapted by Allexa Bracht*
Vocabulary

endangered species – a species of plant or animal of which numbers are decreasing at an alarming rate and is threatened with extinction by human-made or natural changes in the environment.

conservation- the preservation and careful management of the environment and of natural resources.
-the act of conserving; prevention of injury, decay, waste, or loss; preservation: conservation of wildlife; conservation of human rights.
-official supervision of rivers, forests, and other natural resources in order to preserve and protect them through prudent management.

extinct- a form of life that no longer exists on earth.

habitat -the natural environment of an organism; place that is natural for the life and growth of an organism, the place where a person or thing is usually found

herbivore- an animal that eats primarily plants.

omnivore- an animal that feeds on both animal and vegetable substances

carnivore- a flesh-eating mammal of the order Carnivora, comprising the dogs, cats, bears, seals, and weasels.

mammal- Any of various warm-blooded vertebrate animals of the class Mammalia, including humans, characterized by a covering of hair on the skin and, in the female, milk-producing mammary glands for nourishing the young

vibrissae- stiff, sensitive whiskers or hairs on the head or body of an animal

flipper – a broad, flat limb containing bones and modified for swimming.

buoyancy- the ability of an object to float
**Manatee Worksheet**

**Question 1:** What are 5 things that are common to all mammals?

**Question 2:** What are 3 major differences or similarities between the anatomy of a manatee and a human?

1. 

2. 

3. 

A manatee and a dolphin?

1. 

2. 

3. 

**Question 3.** How is the manatee lung different from the human or dolphin lung?

**Why is this important?**

**Question 4.** What makes the Florida Manatee special?

**Questions 5.** What kinds of things can you do to help the Florida Manatee?
Manatee Worksheet
Teacher Key- example answers

Question 1: What are 5 traits that are common to all mammals? Breathe air, give birth to live young, warm blooded, have hair, & produce milk for their young.

Question 2: What are 3 major differences or similarities between the anatomy of a manatee and a human?
1. Manatees have lungs that run along their dorsal or back side of their bodies. This makes the manatee more prone to serious injury in the case of a boat strike.
2. Manatees are hind-gut digesters and use their large intestine and cecum for the majority of digestion.
3. Manatees have a muscular snout, similar to the trunk of an elephant.
4. Manatees have reniculated kidneys. Humans don’t.
5. Manatees have sensory vibrissae, or hairs that help them feel the different food sources in their environment.
6. Manatees and humans are both mammals.
7. Manatees and humans both have _______(organ or bone).

A manatee and a dolphin?
1. Manatees have a muscular snout, where as most dolphins have a pointed nose or rostrum.
2. Dolphins have a melon, or a large fatty tissue at the top of their head that they use to communicate with each other by echolocation.
3. Manatees have lungs that run along the back of their body, where dolphins' lungs are located around their heart and stomach.
4. Manatees have naris or nostrils while dolphins use blowholes to breathe.
5. Both manatees and dolphins have flukes that move up and down to propel them through the water.

Question 3. How is the manatee lung different from the human or dolphin lung? Manatee lungs run along the back (or dorsal side) of the manatee’s body, where as humans and dolphins have their lungs located around their heart, and more towards the front (ventral side) of the body.
Why is this important? While the lungs help manatees regulate their buoyancy (ability to float), their location makes them prone to injury in the event of a boat strike.

Question 4. What makes the Florida Manatee special? Manatees are endangered. Their habitat is limited to Florida and Georgia slow moving rivers and canals. Manatees are herbivores. Manatees have very gentle dispositions (Gentle Giants) and move slowly and quietly thorough the water.

Questions 5. What kinds of things can you do to help the Florida Manatee? Learn about conservation efforts in your community. Do things that preserve the manatees’ environment like recycle monofilament, keep the waters, beaches and environment clean by participating in organized “clean-ups”, use responsible boating habits like following speed restrictions and being aware when you are in manatee habitats. Stay educated about manatee issues and support manatee and habitat protection plans.
Florida Manatees

Standards-Based Activities
(4th-5th Grades)

1) Reading
2) Writing
3) Math
4) Answer Page

Designed by Erika Winn-Hill (Ruth Upson Elementary), and Kelley Weitzel (Pelotes Island Nature Preserve)

Created at a Pelotes Island Nature Preserve FCAT Workshop
Sponsored by Pelotes Island Nature Preserve (JEA & FPL), The League of Environmental Educators in Florida (LEEF), and the Crown Region Environmental Service Project (RSPII)

For more Standards-Based activities, check out Http://pelotes.jea.com
(904) 665-8856

Provided by the Pelotes Island Nature Preserve, JEA & FPL
“Florida Manatees”

This activity can stand alone or be used as extension materials for the following Environmental Activity Curricula:

Aquatic WILD “Mermaids & Manatees” p. 44

To learn about attending a workshop in Florida to receive these Environmental Curricula Texts, see below.

Project WET – contact Project WET State Coordinator at (386) 329-4752.

Project Learning Tree (PLT) – contact PLT State Coordinator at (850) 222-5646.

Project WILD – contact Project WILD State Coordinator at (850) 488-4676.

Project Aquatic WILD - contact Project WILD State Coordinator at (850) 488-4676.

Schoolyard Wildlife - contact Project WILD State Coordinator at (850) 488-4676.
Florida Manatees

Standards-Based Reading Questions

What Swimmers, Boaters, and Divers Should Know About Manatees

Manatees are large, curious mammals that never attack people, but prefer to be left alone. These reclusive creatures can live in saltwater or fresh water and are often seen by swimmers, boaters, and divers visiting springs and rivers. Manatees aren’t noisy animals, so if you hear one squealing, the manatee may be frightened and should be left alone.

When people are near manatees, there are several rules they should keep in mind. It’s better not to reach out and touch a manatee unless it touches you first. Then it’s alright to pet it gently, but don’t ever poke it. If a manatee swims away from you, don’t follow it. It doesn’t want to be around people. Be very careful not to get between a mother and her calf; they belong together. Also, you should never try to feed a manatee. If you are driving a boat over the sea grasses that manatees like to eat, you should drive slowly so your boat doesn’t hit them. And finally, if you see a sign that tells you to slow your boat down because you are in a manatee area, slow it down!

People who break these rules and endanger manatees are subject to strict penalties. Manatees are protected by the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act of 1978. A person breaking these rules can get a fine of up to $20,000 and a year in jail. So do the right thing and respect manatees when you meet them!

Resource: “Guidelines for Protecting Manatees” Pamphlet, by FPL, 1-800-552-8440

1. Read the following sentences from the article: “Manatees are large, curious mammals that never attack people, but prefer to be left alone. These reclusive creatures can live in saltwater or fresh water and are often seen by swimmers, boaters, and divers visiting lakes and rivers.” Based on context clues in the sentence, what is the meaning of the word “reclusive”?

   a) Manatees like to swim up to people.
   b) Manatees like to hide from people.
   c) Manatees like to race people.
   d) Manatees like to attack people.

2. Based on your reading of the article, if a manatee is making squeaks and squeals, what is he probably feeling?

   a) Happy
   b) Sad
   c) Sleepy
   d) Scared

Provided by the Pelotes Island Nature Preserve, JEA & FPL
Florida Manatees

Standards-Based Reading Questions

What Swimmers, Boaters, and Divers Should Know About Manatees

3. Which of the following is NOT a law that protects manatees?

   a) Marine Mammal Protection Act
   b) Manatee Recovery Act
   c) Endangered Species Act
   d) Florida Manatee Sanctuary Act

4. Who is the target audience for this article?

   a) Swimmers and Lifeguards
   b) Teachers and Students
   c) Boaters and Divers
   d) Hunters and Fishermen

5. Think about the different ways we should act around manatees. Explain what you believe are the three most important Do’s and Don’ts around manatees. Use details and information from your reading to support your answer.
Florida Manatees

Standards-Based Writing Prompts

1. Manatees are an endangered species in Florida. Think about the dangers that manatees may face in Florida’s waters. Write to explain one danger that manatees may face in Florida.

2. In Florida, a manatee’s favorite food is a sea grass that grows in shallow water. Think about what it would feel like to be a hungry manatee. Write a story about a day in your manatee life while you are searching for food.

3. Hundreds of winter tourists visit warm water spots and try to pet manatees. Think about what it would feel like to be a manatee chased by hundreds of swimmers. Write to explain your imaginary experience as a manatee.

4. Many manatees are cut and killed by boat motors. Think about the reasons that many boaters ignore the “no wake zone” signs that tell them to drive slowly in manatee areas. Write a letter to convince these speeding boaters that they should slow down.
Florida Manatees

Standards-Based Math Questions

1. A manatee born off the coast of Florida weighed 60 pounds and 6 ounces. If 1 pound equals 16 ounces, which of the following represents the manatee’s weight in ounces?
   a) 69.9 ounces  
   b) 96.6 ounces  
   c) 699.0 ounces  
   d) 966.0 ounces

2. Manatees can hold their breath for 20 minutes. While they sleep, they float to the surface every 20 minutes to take a breath, then they sink again. If a manatee sleeps for eight hours, how many trips to the surface must he make while he’s sleeping?
   a) 2 times  
   b) 10 times  
   c) 24 times  
   d) 32 times

Use the manatee data below to answer the following questions.

Ms. Johnson’s 4th grade class Manatee Data, 2/1/01 through 2/8/01

<table>
<thead>
<tr>
<th>Date</th>
<th>Sighting Details</th>
</tr>
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<tbody>
<tr>
<td>2/1</td>
<td>Sighted 2 males and 1 female</td>
</tr>
<tr>
<td>2/2</td>
<td>Sighted 4 males</td>
</tr>
<tr>
<td>2/3</td>
<td>Sighted 2 females with 1 baby and 1 male</td>
</tr>
<tr>
<td>2/4</td>
<td>Sighted 1 male and 0 females</td>
</tr>
<tr>
<td>2/5</td>
<td>Sighted 2 males and 3 females with 1 baby</td>
</tr>
<tr>
<td>2/6</td>
<td>Sighted 0 males and 0 females</td>
</tr>
<tr>
<td>2/7</td>
<td>Sighted 1 male and 2 females</td>
</tr>
<tr>
<td>2/8</td>
<td>Sighted 2 males and 2 females with 1 baby</td>
</tr>
</tbody>
</table>
Florida Manatees

Standards-Based Math Questions, continued

3. Ms. Johnson’s class visited a warm spring everyday for a week to observe the manatees. Use the data they collected to create a line graph showing how many manatees they saw each day. Be sure to graph the data accurately, title your graph, label your axes, and use consistent units.

<table>
<thead>
<tr>
<th>Day</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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4. Read the following statements. Which of them can NOT be proven with the data collected by Ms. Johnson’s class.

i. All 4 males were sighted swimming together in a group on February 2.
ii. 1 male and 2 females were sighted on February 7.
iii. The baby was always sighted with an adult female.
iv. The baby was always sighted with the same adult female.

a) i, ii
b) ii, iii
c) ii, iv
d) i, iv
Florida Manatees – Answers

Writing

For All - Use the rubric for Florida Writes! – 6 points

1. LA.B.1.2.2, LA.B.2.2.3, LA.B.2.2.6
2. LA.B.1.2.2, LA.B.2.2.3, LA.B.2.2.5, SC.G.1.2.5
3. LA.B.1.2.2, LA.B.2.2.3, LA.B.2.2.6
4. LA.B.1.2.2, LA.B.2.2.3, LA.B.2.2.6

Math

1. d) MA.A.3.2.2, MA.A.3.2.3
2. c) MA.A.3.2.2, MA.A.3.2.3
3. Use the rubric for Extended Response Math Questions – 4 points MA.E.1.2.1

Example of a Top-Score Response

Manatees Sighted by Mr. Johnson’s Class

<table>
<thead>
<tr>
<th>Days in the Study</th>
<th># of manatees sighted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
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<tr>
<td>2</td>
<td>4</td>
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<tr>
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<tr>
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<td>6</td>
</tr>
</tbody>
</table>

4. d) MA.E.1.2.1

Reading

1. b) LA.A.1.2.3, Bloom’s Taxonomy Level one
2. d) LA.A.2.2.1, Bloom’s Taxonomy Level one
3. b) LA.A.2.2.1, Bloom’s Taxonomy Level one
4. c) LA.A.1.2.1, Bloom’s Taxonomy Level one
Florida Manatees – Answers, continued

5. Use rubric for Short Response Reading Questions – 2 points
LA.A.2.2.1, Bloom’s Taxonomy Level one

**Example of a Top-Score Response**
The three most important do’s and don’ts around manatees are that you should never chase them. You should only touch them if they touch you, and you should never feed them.
MERMAIDS AND MANATEES

Objectives
Students will be able to: 1) describe how imaginary creatures may be inspired by actual animals; 2) distinguish between mythical and actual aquatic wildlife; and 3) give examples of how wildlife can inspire myth and art.

Method
Students describe aquatic animals using a narrative style of writing which in turn is the basis for a drawing or painting done by classmates.

Background
For years wondrous and terrifying accounts of water-dwelling creatures were brought back by sailors and early explorers. These tales gave birth to mermaids, sea serpents, and monsters “too terrible to mention.” The Loch Ness monster, Champy in Lake Champlain, and the strange happenings of the Bermuda Triangle are a few contemporary examples of the lure of the sea’s mysteries. Modern day myth chasers are actively on the trail of these and their terrestrial kin from the high Himalayas to the equatorial forests, from coastal swamps to chasmic depths. But were there ever such real creatures? Early sailors claimed to have seen beautiful mermaids with long flowing hair and undulating fish-finned tails. Later accounts shifted the mythic images to the wondrous but all too real manatee. This aquatic mammal, sometimes called the “sea cow,” inhabits rivers, estuaries and the open sea. Manatees bear no typical resemblance to the legendary mermaid. An active imagination plus, perhaps, a long isolated sea voyage seem necessary to convert the manatee into the more conventionally captivating image of the mermaid.

Bizarre perceptions are possible if one chooses to describe ordinary organisms with detailed imagination, such as aquatic insects or other organisms found in pond water. Investigating such life forms in this way can provide an increased awareness of the characteristics of

Age: Grades 4–12
Subjects: Language Arts, Science
Skills: analysis, communication, comparing similarities and differences, description, drawing, inference, interpretation, reading, research, small group work, synthesis, visualization, writing
Duration: two 45-minute periods
Group Size: an even number of groups with three to five persons each
Setting: indoors or outdoors
Key Vocabulary: myth, mythical, imaginary, real

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local habitats and species. The major purpose of this activity is for students to increase their appreciation for the qualities of difference between real and mythical aquatic animals. Additional purposes are to explore some of the folklore and myth related to aquatic creatures, and to learn more about the fascinating animals they are in reality.

Materials
- Library resources: art materials; a variety of photographs of real aquatic animals (insects, amphibians, fish, mammals, etc.)

Procedure
1. Ask the students to sit quietly with their eyes closed and try to imagine a mythical creature that lives in a water environment. A mythical creature means an animal that you create in your mind and one that probably never lived outside your mind. Ask each student to visualize a creature and prepare to describe it to the class.
2. Ask a few of the students to volunteer to describe the creature that they imagined. Many of their images will likely be the result of film or television experiences.
3. Offer the students an opportunity for discussion about classic marine myths regarding mermaids, sea serpents, and lake monsters. Explore their beliefs about whether they think these creatures were and are real or imagined.
4. Tell the students that they are going to go off on a mythic voyage where they will meet a wondrous aquatic creature. Their responsibility will be to have each crew of three to five sailors write as accurate a description of the creature as they can. The crew is to work together to produce a single written description.
5. Divide the students into an even number of crews with three to five students in each crew. Provide each crew with an image of an actual aquatic animal. Use the photographs you have collected. Be sure to select aquatic insects as well as larger animals. Some of the images in the Aquatic WILD Activity, “Are You Me?,” could be helpful. Tell each crew to keep their animal a secret and insure their privacy so that the students on other crews do not see the creature.
6. Have the different crews find out as much as they can about their animal’s actual appearance, behavior and habitat. Allow them to use any references or resources that are available.
7. Once the research is finished, ask each crew to begin to develop the written descriptions they are going to present to the other crews. Each student should contribute at least two or three lines to the group description. Each student could describe a different characteristic. For example: “This creature eats fish and other things in the ocean. It has a parrot-like beak in the middle of long tubes. It swims by forcing water out of its body. It has gigantic, glistening eyes.” (octopus)

“This is a hump-backed creature with stout, powerful wings. Its offspring live in capsules under water where they hang onto stationary objects in flowing streams. When they grow up, the females often feed from the blood of humans. The humans that are attacked by these creatures develop huge sucker-like welts which ooze fluid from their centers. Discomfort to the humans lasts for days.” (blackfly)
8. Once the descriptions are complete, each crew should prepare to read their group’s description to another crew. It is useful to have the descriptions copied so they can be exchanged in writing, as well as prepared to be read aloud.
9. Have each crew choose one other crew to work with. With the crews paired up, ask one crew to read aloud their description to the other crew. Provide the written descriptions at this point. The crew who receives the description then must create an image of the creature that was described. Reverse and repeat the process so that both of the paired crews have written descriptions to work with. Now each crew must draw or paint images of what they understood the other crew to have described. Individual drawings or paintings can be done by each student or a composite can be created by the entire crew. Limit the number of questions the crews can ask of each other.
10. Once both crews have completed their images, they should compare the written or oral descriptions with the resulting artwork. They should also now reveal their original source photos or specimens, looking for similarities and differences.

11. Display the original source images, written descriptions and interpretive art works in clusters on the bulletin board or other display area.

12. Ask the students to summarize and review the steps they took, analyzing where they seemed most accurate and inaccurate. Emphasize how readily descriptions can be distorted so as to provide exaggerations of what is described. Review the actual physical characteristics, habitats, and behaviors of all the real-life source animals as a way to emphasize the fascinating variety of real-life wildlife that exists. Ask the students to give examples of any artwork or myths they think may be based on actual wildlife.

Extensions
1. Write a mythic story about a real aquatic creature. Show how the myth might have a basis in fact.
2. Research historical mythic creatures and propose animals that may have provided the source.

Evaluation
Manatees may have inspired people to think of mermaids and mermen. Name three mythic creatures that may have been inspired by a real animal, and identify the real animal in each case. Describe what the mythical creature is supposed to be able to do that the real animal cannot do.
Lessons, Activities, and Information

WINTER

- Satellite Tracking and Manatees
- GPS: Where on Earth?
- How to Map Satellite Telemetry Data
- Latitude, Longitude and Distance Traveled
- Home on the Range/Comparing Movements Year to Year
- How is a Human Vacation Like an Animal Migration?
- Suggestions for Student Research Using Satellite Data
- Map Archives

SPRING

Satellite Tracking with the Sirenia Project:

- Meet the Sirenia Team
- Ten Thousand Islands/Everglades Restoration Study
- How do Scientists Capture a Manatee? (Video clip)
- Student Portfolios as Visual Organizers
- The Road Less Traveled: Why Manatees Go Where They Go?
- The Road Less Traveled: Write a Moving Poem

Ranger Wayne and the Manatees at Blue Spring State Park

- Wayne's World: Meet and Hear From Ranger Wayne (Audio & Video clip)
- How Does Ranger Wayne Know When a Manatee Is Sick?
- Identifying Manatees: Who Are You, Anyway?
- Key to Ranger Wayne's Attendance Sheets
- Your Make the Call! (Roll Call That Is)
- Identifying Moving Manatees (video clip)
- Ranger Wayne describes Blue Spring State Park
- Why Does the Daily Manatee Count Change?
- Field Notes from Blue Spring State Park
- River and Run Tour: Manatee Field Trip in Florida 2002
- The Blue Spring Boil/Where Does the Water Come From? (Video clip)
- Alligators: You Look Good Enough to Eat
- Edible Map of the Blue Spring Run

http://www.learner.org/jnorth/tm/manatee/indexCurrent.html

3/4/2009
• A Tale of Two Rivers/Dark Water Experiment
• Where Would You Rather Dip Your Flippers Experiment
• A Drink of Ocean Water? No Thanks!
• Why Does Fresh Water Float?

Aerial Manatee Counts and Population Studies with Dr. Bruce Ackerman

• Meet Dr. Holly Edwards
• What's It Like to Fly the Aerial Manatee Count? (Video clip)
• Be Careful With Numbers

Protecting This Endangered Species

• What Does It Mean to be "Endangered"?
• What Can I do to Help Manatees?
• Why Manatees Need Protection
• Rules, Rules, Rules
• How Can You Be a Water Saver?

GENERAL MANATEE BIOLOGY

• How do you Say Florida Manatee in Science-speak? Or...All Kingdoms Aren't Just for Kings
• Adaptations--Evolution: Who are Your Relatives?
• Adaptations--The Match Game
• Adaptations--The Organs
• Adaptations--The Lungs (video clips)
• Adaptations--The Head (video clips)
• Manatee Movement (video clips)
• Explore the Eating Habits of Manatees (video clips)
• Adaptations--Skeleton, Flippers and Fat (video clips)
• Like Playing in the Snow Without a Jacket
• Staying Warm in the Ocean
• Holy Cow! What a Calf
• What Is Red Tide?
• Habitat: Sea Grass Beds
• Manatee Art
Comparing Spring Migrations
Year to Year

When a single animal is tracked over more than one season, this provides for an excellent opportunity to compare their movements over a longer period of time. Scientists can compare the animal's movements from year to year and see how similar or different they are, and form some hypotheses about why the Manatees moved where they did when they did.

If you are lucky enough to be tracking the same Manatee(s), over several seasons, follow the steps below to study their movements. Will you come up with more answers or more questions?

1) Print out the Comparing Chart in order to help you analyze the data (one copy for each Manatee you are comparing).
   - Link to Comparing Chart

2) Focusing on one Manatee at a time, study its data in the Migration Data Archives. Start by reviewing the archived migration map and archived tracking data for the first year it was tracked by Journey North. Follow the trail and the timing of that Manatee's migration. Study its locations, and fill the Chart with the information that is requested.
   - What was that Manatee's northernmost latitude? Its southernmost?
   - What was its easternmost longitude? Its westernmost?
   - Did it generally stay in one area? Or migrate widely?
   - Make big movements? Or small movements?
   - Did it visit any place more than once?

3) Then study and complete the chart with the same information for the most recent year(s), using maps and data for that year(s). If a manatee's migrations differed from one year to the next, think of all the reasons you can to explain why.

Extension: Comparing Spring Migrations
After your students have finished comparing migrations over several seasons, have them write a scientific paper about their hypotheses:
   - Scientist Says: How Scientists Communicate the Results of Their Research

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