

Mammals  
Mammoths

**MANATEES!**

(oh my)



**SEATREK**

Distance Learning Program

# Mammals...Mammoths...Manatees! (oh my)

## Unit Overview

### **MAIN UNIT OBJECTIVES:**

- Students will learn the basic anatomy and adaptations of manatees.
- Students will learn what conservation measures are being taken to protect manatees.
- Students will understand what captive care requirements there are for manatees.
- Students will design an environmental enrichment device for manatees in captivity.

### **MAIN UNIT STANDARDS\*\*:**

Diversity and Adaptations of Organisms (National Science Education Standards)  
Problem Solving (National Math Standards)  
Form and Function (National Science Education Standards)  
Nature of Science (National Science Education Standards)

\*\* See Appendix A for National Standards and Appendix B for Sunshine State Standards.

### **UNIT OVERVIEW:**

Florida manatees are marine mammals living along the coast of the southeastern United States. Although not terribly pretty, manatees are crucial to coastal habitats.

Manatees can grow to be up to 14 feet long and weigh up to 3,000 pounds. Baby manatees, called calves, measure about 4 feet long and weigh about 30 pounds at birth.

Manatees have many adaptations that allow them to survive well in coastal habitats, whether it is fresh, brackish, or salt water. Protective oil glands near their eyes, fat to help retain body heat, and being able to replenish 90% of lung volume per breath, among many other adaptations, all allow the manatee to be the world's largest marine vegetarian.

### **UNIT PRE-QUESTIONS:**

1. What are manatees?
2. Why are they beneficial to coastal habitats?
3. What is an environmental enrichment device?



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Description: This lesson will introduce basic manatee anatomy.

Activity: Small group project to determine the anatomy of a manatee

#### **Lesson 2: Manatee Adaptations** **14**

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Description: This lesson will have the students determine some of the adaptations of manatees.

Activity: Small group project where students find substitutions for adaptations

#### **Lesson 3: Captive Care for Manatees** **16**

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Description: This lesson will introduce some of the concerns of keeping manatees in captivity.

Activity: Costs of exhibit

#### **Lesson 4: Videoconference** **23**

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Description: This lesson will provide an interactive component with Mote educators and scientists to reinforce concepts about manatees.

Activity: Videoconference

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Description: This lesson has the students designing an environmental enrichment device for manatees in captivity.

Activity: Designing an EED

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#### **Appendix B: Sunshine State Standards** **28**

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### **UNIT EVALUATION:**

Pre/post test

### **UNIT FOLLOW-UP DISCUSSION:**

1. What are some of the major adaptations manatees have for living in the water?
2. What are some of the causes for manatees being threatened or endangered?
3. What are environmental enrichment devices? Why are they used?

Mote Marine Laboratory/SeaTrek grants the right to photocopy any or all of these materials for educational purposes.



# Manatee Websites



Mote Marine Laboratory's Hugh and Buffett

<http://www.mote.org/~hughbuffett/Welcome.phtml>

Florida Marine Research Institute

<http://www.floridamarine.org/features/default.asp?id=1001>

Save the Manatee Club

<http://www.savethemanatee.org/Default.htm>

Sea World- Manatee Information pages

<http://www.seaworld.org/infobooks/Manatee/home.html>

Florida Fish and Wildlife Conservation Commission

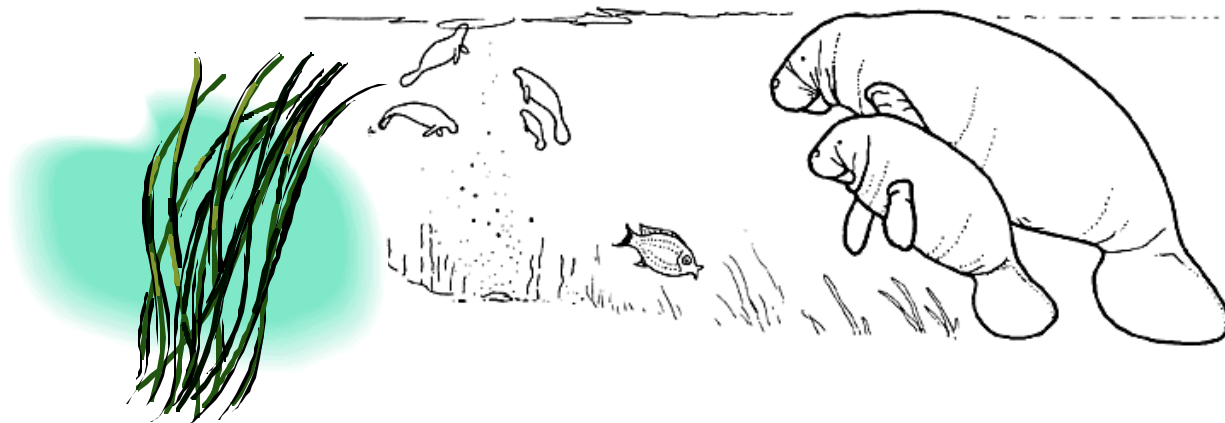
<http://floridaconservation.org/psm/manatee/>

Center for Marine Conservation

<http://www.cep.unep.org/kids/kids.html>

Enchanted Learning

<http://www.enchantedlearning.com/subjects/mammals/manatee/>



# Lesson 1

## Manatee Anatomy

**Objective:** The student will learn the basic anatomy of manatees.

**Main Lesson Standard:** Diversity and Adaptations of Organisms  
(National Science Education Standards)

**Time Required:** 1 class period

**Materials:**

- Research materials, including Internet and print sources
- “Manatee Mania!” student sheet (1 per student)
- “Manatee Web” student worksheet (1 per student)
- “Make a Life-Size Manatee!” page
- “Manatee Anatomy” worksheet (1 per student)
- Two 10 ft. lengths of butcher paper

**Procedure:**

1. Divide the students into several groups.
2. Have one group of students use the “Make a Life-Size Manatee” page to produce a full-size manatee. If you have enough groups, have the students make three manatees and do one with external anatomy, one with organs, and one with the skeletal system.
3. While one group is making the manatee, have the other groups research the anatomy of a manatee to decide what needs to be labeled once the manatee is complete.
4. Once the students making the manatee finish, have the other groups add the anatomical parts to the manatee just made.
5. Have the students label their “Manatee Anatomy” worksheet to match the large copy.
6. Handout the “Manatee Mania!” and “Manatee Web” sheets to the students. Have them begin filling out the web with the information they have learned so far.

**Teachers:** Use the Manatee Fact sheet included to check answers on lessons 1 & 2.

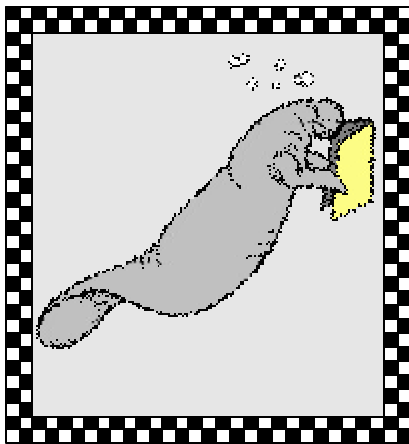


# Manatee Mania!

*Fun facts about the world's largest marine vegetarian!*

## Would you believe...

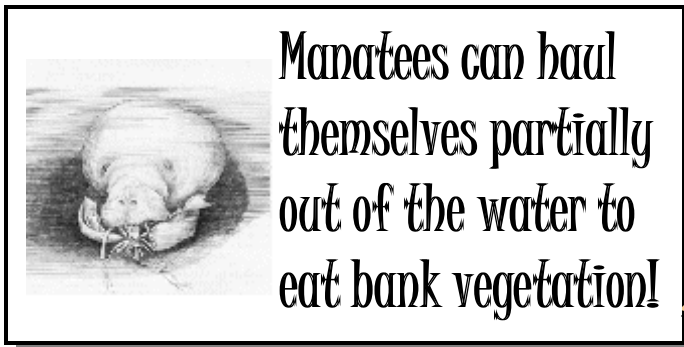
- Studies show that the closest modern relatives of manatees and dugongs aren't dolphins or whales but **elephants, aardvarks**, and small mammals known as **hyraxes!**



- Manatees can remain submerged for up to **20 minutes!**
- Manatees can renew up to **90%** of the oxygen in their lungs with each breath (compared to only 10% in humans)!
- A manatee's heart beats slower when it's diving—down to **30 beats per minute** during an 8-minute dive!
- **20%** of a manatee's body weight is fat!
- Manatees probably live **50-60 years**, but no one knows for sure!

## Manatees have—

- Fingernails!
- Hair that can detect water currents!
- Special glands to coat and protect the eyes from salt!
- An unending supply of teeth!

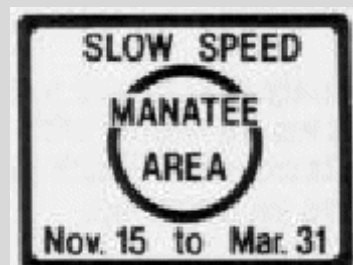


### Chew on this...

- Manatees in the wild can eat up to **15%** of their body weight daily!
- The largest manatee ever recorded was a pregnant female **13.5 ft.** long weighing **3750 lbs!**

## Whoa!

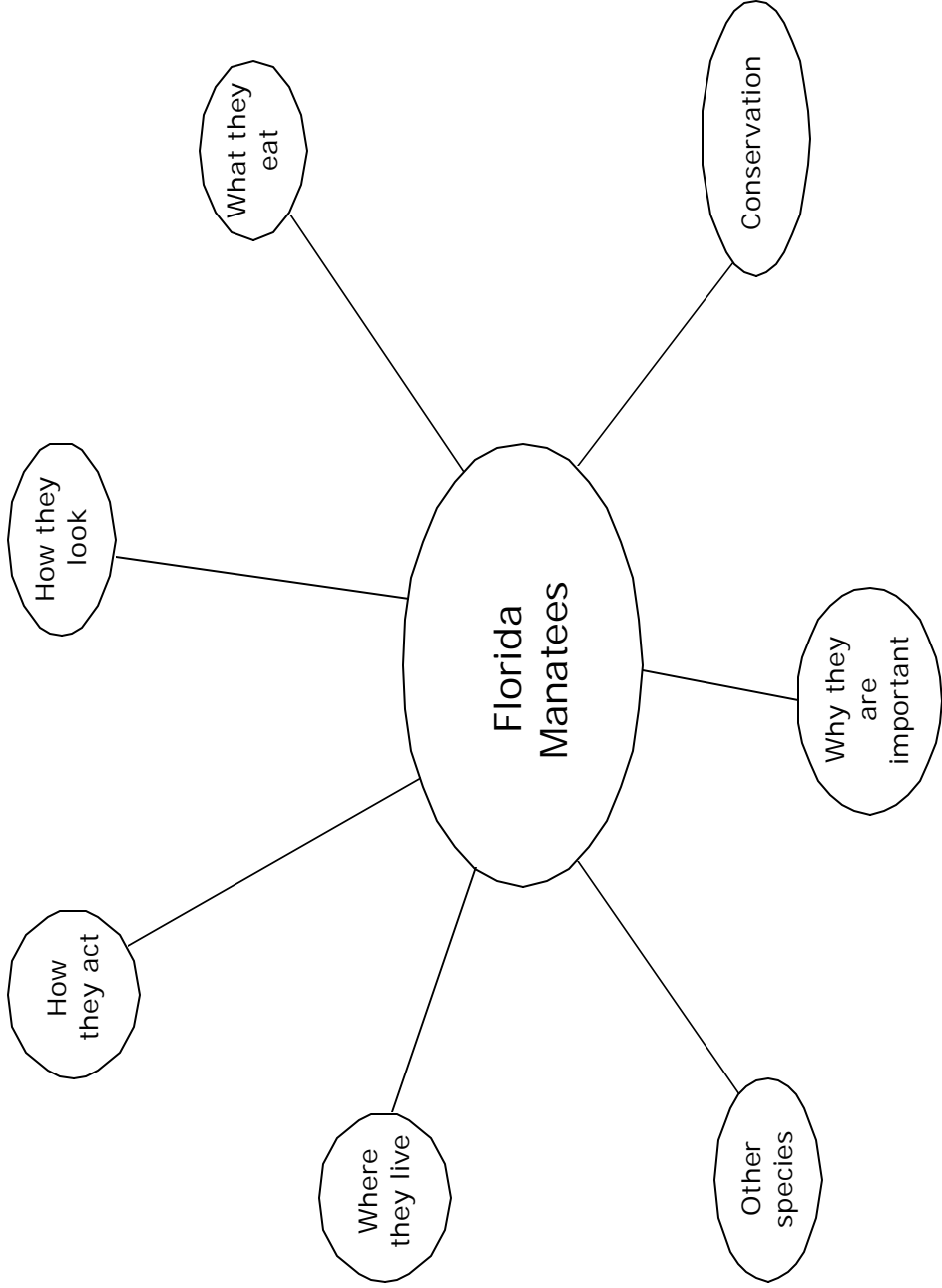
- **1/3** of all manatee deaths are from speedboats and crushing injuries!
- Watercraft-related mortality is the **leading cause of death** in adult manatees!



# Manatee Web

Name: \_\_\_\_\_

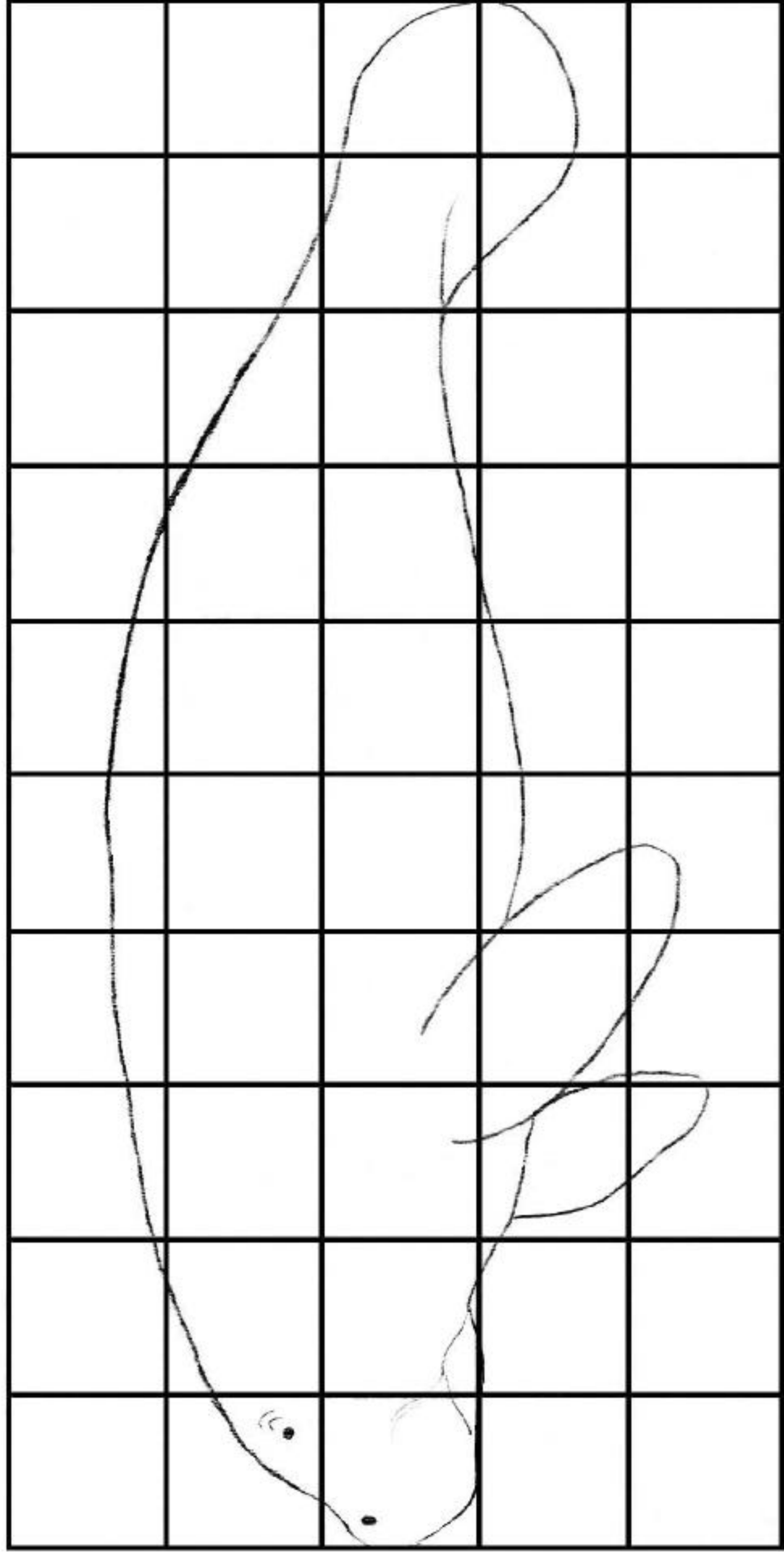
**Instructions:** Write in the information about Florida Manatees.



# Make a Life-Size Manatee!

**Directions:** Use the scale on this manatee to make a life-size manatee.

Scale (in inches) 1:12

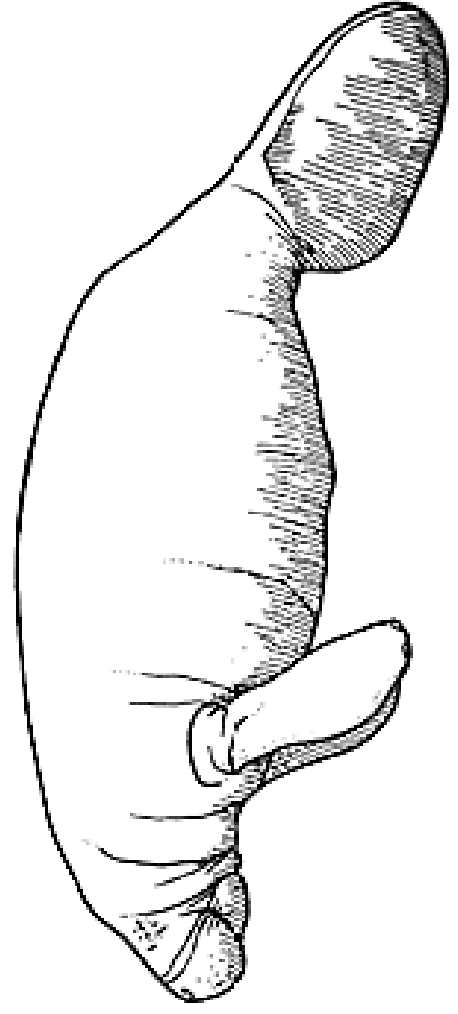


# Manatee Anatomy



Name: \_\_\_\_\_

**Instructions:** Label this manatee with the parts labeled on the life-size manatee.



# Manatee Fact Sheet

Other Sources: Sea World, Save the Manatee Club, Florida Marine Research Institute

## Classification

- Modern manatees have been in Florida for over one million years
- Fossils exist for more than a dozen sirenian species; only 5 species extant during the time of man; only 4 remain extant today
- Manatees are in the Order Sirenia and the Family Trichechidae
  - *Trichechus manatus*, the West Indian manatee. There are two subspecies of the West Indian manatee: the Florida manatee (*Trichechus manatus latirostris*) and the Antillean manatee (*Trichechus manatus manatus*). These subspecies are distinguished by certain cranial features and by their geographical distribution.
  - *Trichechus senegalensis*, the West African manatee. About the same size and shape as the West Indian manatee, the West African manatee differs in some important respects: its eyes, snout, and cranial bones are different.
  - *Trichechus inunguis*, the Amazonian manatee. The Amazonian manatee is the smallest of the manatees. Several physical characteristics distinguish it from the other two species.
- Studies using biochemical analysis of proteins show that the closest modern relatives of sirenians are elephants, aardvarks, and small mammals known as hyraxes.
- Even though the oldest known sirenian fossils were found in Jamaica, it's likely that sirenians originated in Eurasia or Africa. During the middle Eocene period (45 to 50 million years ago), the ancestors of manatees probably reached South America.

## Habitat and Distribution

- All species except the Amazonian manatee can live in salt, brackish, or fresh water
- Prefer water above 70 degrees, will risk hypothermia if in water less than 60 degrees
- May be found in any waterway 3.25 ft. or deeper, but usually close to land; usually not in water more than 15 ft. deep



West Indian Manatee



West African Manatee



Amazonian Manatee



## Anatomical/Physiological Characteristics

- Can remain submerged for 20 minutes
- Heart rate: 50-60 beats per minute
- No leg bones or pelvis— have a tiny L-shaped bone embedded in the muscle
- Averages: 10 feet, 1200 lbs. Record: 13.5 ft. pregnant female 3750 lbs.
- Marine mammals are able to stop bleeding in water due to a special clotting mechanism
- Body temp is 95.7 degrees
- Skin can be up to 2 inches thick and can not be pierced by arrows
- Bones are heavy and solid (no marrow); red blood cells are produced in the spinal column
- Have fingernails
- Only 6 cervical (neck) vertebrae; can't turn head
- Continue to grow throughout their lives
- Females are generally larger than males
- Digestive and respiratory systems are not connected
- The two small pectoral flippers on a manatee's upper body are used for steering or walking along the bottom, not swimming.
- Scientists think manatees do not have vocal cords
- Manatees do not have eyelashes
- Can move one side of its lip pads independently of the other side
- Barnacles can attach themselves to manatees in salt water, but they die and drop off when manatees return to fresh water
- Diaphragm pushes outward towards lungs, not upwards. Only mammal, as far as we know, in which the diaphragm doesn't touch the sternum; it's attached instead to a vertebra in the thorax
- Scientists determine a manatee's age by counting the growth rings in its ear bone

## Senses

- Possess the ability to have smell markers, using rub spots (message centers)
- Vibrissae (whiskers) are very sensitive; outer ones more so than inner ones
- Have same taste flavor sensors we do
- Can't smell underwater, but we think they can above water
- Skin is very sensitive and often manatees will touch each other
- Hairs are about an inch apart- don't provide warmth but they are used to detect changes in water currents
- Closes its eyes with a sphincter muscle
- Can see easily at a distance, but doesn't have good depth perception at short-range
- Studies on manatee food preferences at Blue Springs, Florida indicate that manatees avoid certain plants that contain toxins.



## Adaptations

- Gland next to the eyes produces a special oil to coat the eye and protect it from salt
- Have a low metabolism, one of the lowest of all mammals
- Manatees can fast (go long periods without eating)— Florida manatees for up to a month; Amazonian manatees for 6 months
- Being so big is a heat-saving adaptation
- 20% of their weight is fat
- Heart beats slower while diving (30 beats per minute during an 8- minute dive)
- Can dive up to 30 feet, but usually not more than 10 feet
- Can renew up to 90% of oxygen in lungs with each breath (humans renew only 10%)

## Behavior

- Some travel as fast as 30 miles a day
- Sometimes groan when they stretch
- They are endogenous (they don't keep a normal schedule of waking and sleeping)
- Usually solitary, but when they are together in the warm-water refuges they have constant body contact
- When in a herd, manatees will rise and breathe in unison
- Feed 6-8 hours per day
- Rest 2-12 hours per day

## Diet and Eating Habits

- Food takes about 7 days to move through digestive tract
- Chew two times a second
- Eat 4-15% of body weight daily in the wild
- Huge molars have no roots, but are held in place by ligaments
- One of two mammals that have an unending supply of teeth (shares distinction with a species of kangaroo)
- They crop overhanging branches, consume acorns, and haul themselves partially out of the water to eat bank vegetation
- Most digestion takes place in large intestine, as in elephants and horses
- Have 24 to 32 molars
- Feed on over 60 species of plants

## Reproduction

- Females are sexually mature at 7-8 years old and bear young the rest of their lives
- No fixed breeding season
- Males mature at 9-10 years old
- Breed year-round



## Birth and Care of Young

- 13 month pregnancy giving birth to 1-2 young; nurse for 2 years
- Newborn calves average 4 feet and 60-70 lbs.
- Calf teeth don't start moving forward until the calf begins eating plants
- Most Florida Manatees are born in spring and summer

## Communication

- Emit sounds when frightened, sexually aroused, or interacting with each other
- Mothers respond to their calves from over 200 ft away when the calf squeals

## Longevity and Causes of Death

- Manatees probably live 50-60 years, but no one knows for sure
- 1/3 of all deaths are from speedboats and crushing injuries
- Watercraft-related mortality is the leading cause of death in adult manatees.
- Natural causes of death include cold weather, diseases, and parasites
- Human-related causes of death— watercraft accidents, flood gates and navigation locks, poaching, harassment, accidental entanglement and pollution, and habitat destruction

## Conservation

- Recent research conducted at the Florida Marine Research Institute revealed that of the manatees whose carcasses had been recovered in the salvage program, few were living past the age of 30 and the majority of animals died between the age of 0 and 10 years, nowhere near their estimated life expectancy of 60 years.
- Biggest threat is the destruction of the sea-grass beds where they feed
- All species are protected by national or local laws & agreements
  - Marine Mammal Protection Act of 1972
  - Endangered Species Act of 1973
  - Florida Manatee Sanctuary Act of 1978
  - the Convention on International Trade of Endangered Species

## Wow! Facts

- Only marine mammal that eats plants
- Largest vegetarian creature in the sea
- Bigger than any land animal in the U.S.



# Lesson 2

## Manatee Adaptations

**Objective:** The student will research adaptations and then find real-world alternatives.

**Main Lesson Standard:** Diversity and Adaptations of Organisms  
(National Science Education Standards)

**Time Required:** 1 class period

**Materials:**

- Reference materials on manatees, including Internet sources (on “Manatee Websites” sheet) and print sources
- “Manatee Adaptations” sheet
- Paper and writing instruments

**Procedure:**

1. Go over the biological definition & concept of “adaptations” with your class—“An alteration or adjustment in structure or habits, often hereditary, by which a species or individual improves its condition in relationship to its environment.” (Dictionary.com)
2. Have the students get into groups of 3-4 students.
3. Have the students research the adaptations of a manatee.
4. The students should come up with ways to show at least five special adaptations manatees have by using everyday items that humans use (example: manatees use their paddles like humans use flippers on their feet when swimming). Unless you choose, the students do not have to collect the items and present them. You may also opt to limit the number of anatomical features listed to encourage the students to think of behavioral adaptations.
5. Have the students complete the “Manatee Adaptations” sheet with their five adaptations, listing the equivalencies next to each manatee adaptation.
6. Have the groups present their ideas to the class. Have the students listen and include on their sheet any adaptations that they don’t have on their list.
7. Have the students continue filling in the “Manatee Web” begun in Lesson 1.

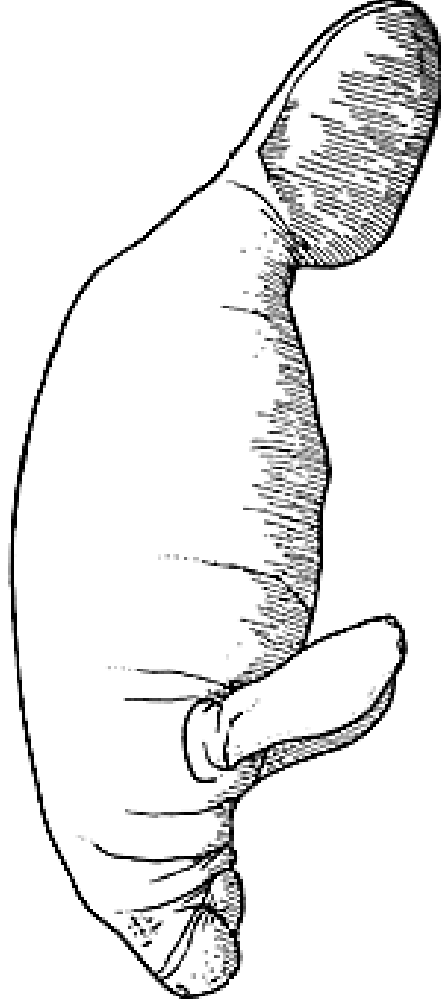


# Manatee Adaptations



Name: \_\_\_\_\_

**Instructions:** Find at least 5 adaptations that manatees have. Draw a line to where the adaptation is on the manatee.



# Lesson 3

## Manatees in Captivity

**Objective:** The student will understand some of the needs a manatee in captivity has.

**Main Lesson Standard:** Problem Solving (National Math Standards)

**Time Required:** 1 class period

**Materials:**

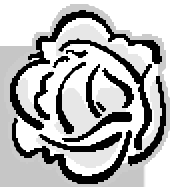
- “Two New Manatees!” sheet (1 per group)
- “Manatee Menu” sheet (1 per group)
- “Manatee Money” sheet (1 per group)
- “So What Do Manatees Do All Day?” sheet (1 per group)
- Calculator (1 per group)
- “Manatee Menu” Solution Sheet
- “Manatee Money” Solution Sheet

**Procedure:**

1. Have students break into 5-6 groups.
2. Handout the listed materials to each group.
3. Using information on the “Two New Manatees” sheet, have the students determine how much food and how much money it takes to feed two manatees each day on the “Manatee Menu” and “Manatee Money” sheets. The students should round their answers to the nearest tenth unless otherwise noted. Check answers using the Solution Sheets provided.
4. On the “So What Do Manatees Do All Day?” sheet, have the students compare the time they spend doing activities with how much time a manatee spends. Empty spaces are left for things students do that manatees do not.



SOLUTION SHEET



Manatee Menu

**Y**ou need to design a diet for Debi and Brandie. In captivity, manatees eat heads of lettuce, kale (another type of lettuce), apples, carrots, and, for treats, monkey biscuits. Most of their food should be lettuce and kale, given throughout the day. Apples, carrots, and monkey biscuits should only be given in small amounts.

In captivity if the manatee is very active, it should eat 8% of its body weight daily. If the manatee is moderately active, it should eat 6% of its body weight. If the manatee is not very active, it should eat only 4% of its body weight. Using Debi and Brandie's body weights and activity levels, make a diet for the trainers to feed to them daily.

Based on her activity level, what percent of body weight should she eat?

How many pounds of food should she eat (% x weight)?

If 84% of her food should be lettuce, how many pounds of lettuce should she eat?

If 12% of her food should be kale, how many pounds of kale should she eat?

If 2% of her food should be apples, how many pounds of apples should she eat?

If 1% of her food should be carrots, how many pounds of carrots should she eat?

If 1% of her food should be monkey biscuits, how many pounds of monkey biscuits should she eat?

	Debi	Brandie
Based on her activity level, what percent of body weight should she eat?	8%	6%
How many pounds of food should she eat (% x weight)?	110.5 pounds	63.2 pounds
If 84% of her food should be lettuce, how many pounds of lettuce should she eat?	92.8 pounds	53.1 pounds
If 12% of her food should be kale, how many pounds of kale should she eat?	13.3 pounds	7.6 pounds
If 2% of her food should be apples, how many pounds of apples should she eat?	2.2 pounds	1.3 pounds
If 1% of her food should be carrots, how many pounds of carrots should she eat?	1.1 pounds	0.6 pounds
If 1% of her food should be monkey biscuits, how many pounds of monkey biscuits should she eat?	1.1 pounds	0.6 pounds





# M

## SOLUTION SHEET

# Money



For both manatees, how much food will they need per day?

Lettuce: 145.9 lbs.

Kale: 20.8 lbs.

Apples: 3.5 lbs.

Carrots: 1.7 lbs.

Monkey biscuits: 1.7 lbs.

How much does it cost? (Round the pounds to the nearest pound.)

146 lbs. of lettuce x \$0.66/lb. = \$96.36

21 lbs. of kale x \$0.75/lb. = \$15.75

4 lbs. of apples x \$0.61/lb. = \$2.44

2 lbs. of carrots x \$0.98/lb. = \$1.96

2 lbs. of monkey biscuits x \$0.46/lb. = \$0.92

How much money will it take to feed both manatees:

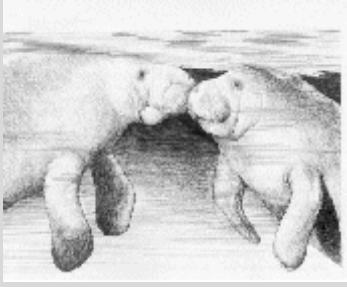
each day? \$117.43

each week? \$822.01

each month? \$3,288.04

each year? \$39,456.48



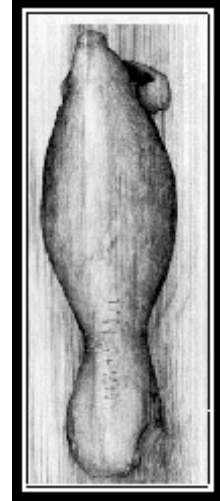


# Two New Manatees!

You are the curator of a well-known public aquarium. Your aquarium is receiving two new manatees named Debi and Brandie. Below are some facts about each of them.

## MANATEE TRANSPORTATION RECORD

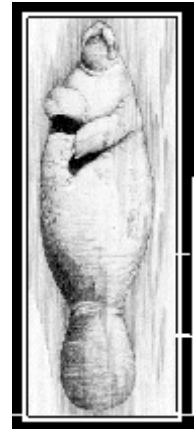
Name: Debi Sex: female  
Birthdate: unknown Birthplace: in the wild  
Length: 10 ft., 3 in. Weight: 1381 lbs.  
Activity level: very active  
Favorite food: monkey biscuits  
Identifying marks/behaviors:



Debi was brought into captivity because of a boat injury to her back. You can see many long healed gashes on her back near her paddle.

## MANATEE TRANSPORTATION RECORD

Name: Brandie Sex: female  
Birthdate: September 19, 1989 Birthplace: Birmingham Aquarium  
Length: 8 ft., 7 in. Weight: 1054 lbs.  
Activity level: moderately active  
Favorite food: apples  
Identifying marks/behaviors:



Brandie has a darker spot behind her left eye and often hangs out in the windows looking at the visitors.



# Manatee Menu

**Y**ou need to design a diet for Debi and Brandie. In captivity, manatees eat heads of lettuce, kale (another type of lettuce), apples, carrots, and, for treats, monkey biscuits. Most of their food should be lettuce and kale, given throughout the day. Apples, carrots, and monkey biscuits should only be given in small amounts.

In captivity if the manatee is very active, it should eat 8% of its body weight daily. If the manatee is moderately active, it should eat 6% of its body weight. If the manatee is not very active, it should eat only 4% of its body weight. Using Debi and Brandie's body weights and activity levels, make a diet for the trainers to feed to them daily.

**Debi**                      **Brandie**

Based on her activity level, what percent of body weight should she eat?

How many pounds of food should she eat ( $\% \times \text{weight}$ )?

If 84% of her food should be lettuce, how many pounds of lettuce should she eat?

If 12% of her food should be kale, how many pounds of kale should she eat?

If 2% of her food should be apples, how many pounds of apples should she eat?

If 1% of her food should be carrots, how many pounds of carrots should she eat?

If 1% of her food should be monkey biscuits, how many pounds of monkey biscuits should she eat?

	Debi	Brandie
Based on her activity level, what percent of body weight should she eat?		
How many pounds of food should she eat ( $\% \times \text{weight}$ )?		
If 84% of her food should be lettuce, how many pounds of lettuce should she eat?		
If 12% of her food should be kale, how many pounds of kale should she eat?		
If 2% of her food should be apples, how many pounds of apples should she eat?		
If 1% of her food should be carrots, how many pounds of carrots should she eat?		
If 1% of her food should be monkey biscuits, how many pounds of monkey biscuits should she eat?		





# Manatee Money

For both manatees, how much food will they need per day?

Lettuce: \_\_\_\_\_ lbs.

Kale: \_\_\_\_\_ lbs.

Apples: \_\_\_\_\_ lbs.

Carrots: \_\_\_\_\_ lbs.

Monkey biscuits: \_\_\_\_\_ lbs.

How much does it cost? (Round the pounds to the nearest pound.)

\_\_\_\_\_ lbs. of lettuce x \$0.66/lb. = \_\_\_\_\_

\_\_\_\_\_ lbs. of kale x \$0.75/lb. = \_\_\_\_\_

\_\_\_\_\_ lbs. of apples x \$0.61/lb. = \_\_\_\_\_

\_\_\_\_\_ lbs. of carrots x \$0.98/lb. = \_\_\_\_\_

\_\_\_\_\_ lbs. of monkey biscuits x \$0.46/lb. = \_\_\_\_\_

How much money will it take to feed both manatees:

each day? \_\_\_\_\_

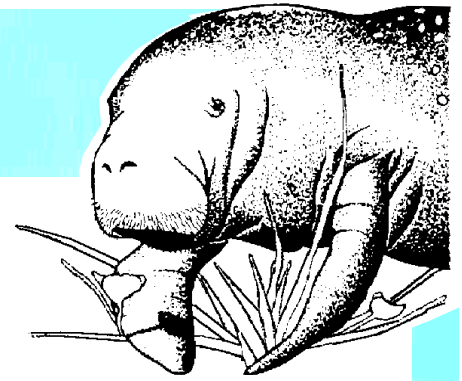
each week? \_\_\_\_\_

each month? \_\_\_\_\_

each year? \_\_\_\_\_

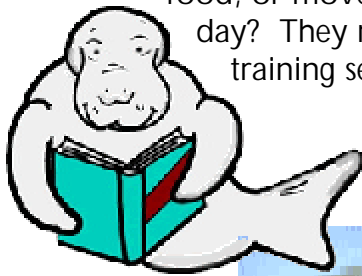


# So What Do Manatees Do All Day?



In the wild, manatees spend about 2-12 hours per day resting and about 6-8 hours per day feeding. The big difference in hours is because they need to travel different amounts of time throughout the year. They can travel up to 30 miles in a day, which takes many hours to complete. Therefore, they don't have as much time to rest or play.

In captivity, manatees don't have to migrate to warm water, find their own food, or move out of the way of boats. So, what do captive manatees do all day? They rest, eat, play with toys, swim, and learn new behaviors (through training sessions).



Let's compare what you do and what captive manatees do during a typical weekday:

Hours Spent		
Manatee		You
10.5	<b>Resting</b>	
4	<b>Eating</b>	
3.5	<b>Swimming/ Traveling</b>	
2	<b>Training/Learning</b>	
4	<b>Playing</b>	

What activities do you do more than a manatee: \_\_\_\_\_

What would you like to do as much as a manatee does? \_\_\_\_\_

# Lesson 4

## Videoconference

**Objective:** The student will learn how manatees are kept in captivity and conservation efforts being done now to save the manatees.

**Time Required:** 1 class period

**Main Lesson Standard:** Form and Function (National Science Education Standards)

**Materials:**

- Students' "Manatee Web" worksheets (from Lesson 1)

In the videoconference, Mote Marine Laboratory will present a 50-minute media-rich videoconference on manatees.

Topics in videoconference:

- Manatees in captivity
- Manatee training
- Environmental Enrichment Devices (EEDs)
- Conservation issues with manatees
- How the students can help manatee conservation



# Lesson 5

## Make a Manatee Toy

**Objective:** The student will design an environmental enrichment device (EED) that could be used with a manatee.

**Time Required:** 1-2 class periods

**Main Lesson Standard:** Nature of Science (National Science Education Standards)

**Materials:**

- Internet access
- Drawing paper
- Crayons, colored pencils, markers, etc.
- "Manatee Environmental Enrichment Device Idea Form" sheet (1 per student)

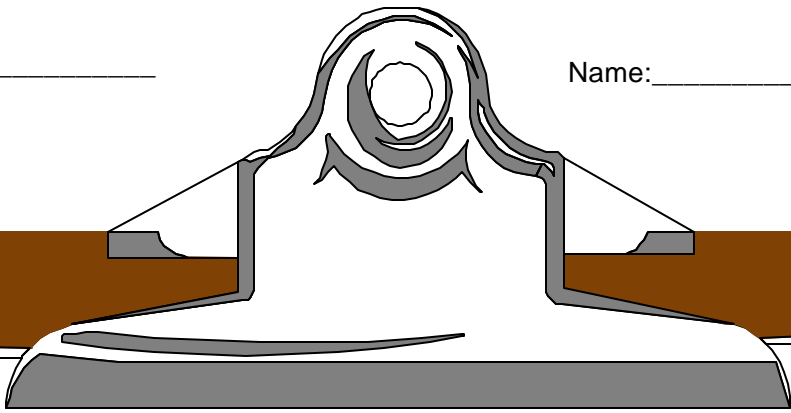
**Procedure:**

1. Ask the students what they remember about an environmental enrichment device, as was shown in the videoconference.
2. Have the students look at the following Mote Marine website to look at more EED's and the requirements for EED's:  
<http://www.mote.org/~hughbuffett/pages/Help/help3.eed.phtml>
3. Explain to the students that their assignment is to develop an EED for Mote's Manatees. Examples of current EED's can be seen by clicking on the words "Photo Gallery of Manatees and Their Toys."
4. Have the students describe and draw a picture of an EED of their own design. They should include a list of the things that are needed to make it (PVC pipe, etc.). They should complete the "Manatee Environmental Enrichment Device Idea Form".
5. Have the students present their designs to the class.
6. If the teacher would like, have the students vote on which one should be submitted to the Mote Marine Website ([www.mote.org/~hughbuffett/pages/formEED.html](http://www.mote.org/~hughbuffett/pages/formEED.html)) for consideration by Mote Marine scientists.



Date: \_\_\_\_\_

Name: \_\_\_\_\_



## Manatee Environmental Enrichment Device Idea Form



Please briefly describe your environmental enrichment device idea:

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Supplies needed: \_\_\_\_\_

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Building directions: \_\_\_\_\_

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Attach a drawing of your EED.



# National Standards

<b><u>National Science Education Standards</u></b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
<b>Unifying Concepts and Processes</b>					
Form and Function	X	X		X	X
<b>Life Science</b>					
Regulation and behavior		X		X	
Population and ecosystems				X	
Diversity and adaptation of organisms	X	X		X	
<b>Science in Personal and Social Perspective</b>					
Populations, resources and environments				X	
Natural hazards					
Science and technology in society				X	X
<b>History and Nature of Science</b>					
Nature of Science					X

<b><u>National Council of Teachers of Mathematics</u></b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
<b><u>Numbers and Operations Standard</u></b>					
Understand numbers, ways of representing numbers, relationships among numbers, and number systems			X		
Understand the place-value structure of the base-ten number system and be able to represent and compare whole numbers and decimals			X		
Compute fluently and make reasonable estimates			X		
Develop fluency in adding, subtracting, multiplying, and dividing whole numbers			X		
<b><u>Problem Solving Standard</u></b>					
Solve problems that arise in mathematics and in other contexts			X		X
Monitor and reflect on the process of mathematical problem solving			X		

<b><u>National Council of Teachers of English</u></b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Standard 1: Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.	X	X			
Standard 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.				X	X
Standard 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.					X

<b><u>National Educational Technology Standards</u></b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
<b><u>Basic operations and concepts</u></b>					
Students are proficient in the use of technology	X	X		X	X
Students practice responsible use of technology systems, information, and software	X	X		X	X
Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity	X	X		X	X
<b><u>Technology productivity tools</u></b>					
Students use technology tools to enhance learning, increase productivity, and promote creativity	X	X		X	X
<b><u>Technology communications tools</u></b>					
Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences				X	X
Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences				X	
<b><u>Technology research tools</u></b>					
Students use technology to locate, evaluate, and collect information from a variety of sources	X	X		X	X
Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks	X	X			
<b><u>Technology problem-solving and decision-making tools</u></b>					
Students use technology resources for solving problems and making informed decisions					X
Students employ technology in the development of strategies for solving problems in the real world					X

# Sunshine State Standards

<b>Science</b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
<b>Processes of Life</b>					
SC.F.1.2 The student describes patterns of structure and function in living things.	X	X	X		
SC.F.1.2.2- knows how all animals depend on plants			X		
SC.F.1.2.3- knows that living things are different but share similar structures	X	X			
<b>How Living Things Interact with Their Environment</b>					
SC.G.1.2 The student understands the competitive, interdependent, cyclic nature of living things in the environment.	X	X			
SC.G.1.2.1- knows ways that plants, animals, and protists interact					
SC.G.1.2.2- knows that living things compete in a climatic region with other living things and that the structural adaptations make them fit for an environment	X	X			
SC.G.2.2 The student understands the consequences of using limited natural resources.					
SC.G.2.2.3- understands that changes in the habitat of an organism may be beneficial or harmful					
<b>The Nature of Science</b>					
SC.H.1.2 The student uses the scientific processes and habits of mind to solve problems.					X
SC.H.1.2.2- knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results					X
SC.H.1.2.3- knows that to work collaboratively, all team members should be free to reach, explain, and justify their own individual conclusions					X
SC.H.1.2.5- knows that a model of something is different from the real thing, but can be used to learn something about the real thing					X
SC.H.3.2 The student understands that science, technology, and society are interwoven and interdependent.					X
SC.H.3.2.1- understands that people, alone or in groups, invent new tools to solve problems and do work that affects aspects of life outside of science					X
SC.H.3.2.4- knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas					X

<b>Language Arts</b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
<b>Listening, Viewing, and Speaking</b>					
LA.C.1.2 The student uses listening strategies effectively.				X	X
LA.C.1.2.1- listen and responds to a variety of oral presentations, such as stories, poems, skits, songs, personal accounts, and informational speeches				X	X
LA.C.1.2.4- listens attentively to the speaker, including making eye contact and facing the speaker				X	X
LA.C.1.2.5- responds to speakers by asking questions, making contributions, and paraphrasing				X	X
LA.C.3.2 The student uses speaking strategies effectively.				X	X
LA.C.3.2.1- speaks clearly at an understandable rate and uses appropriate volume				X	X
LA.C.3.2.3- speaks for specific occasions, audiences, and purposes, including conversations, discussions, projects, and informational or imaginative presentations				X	X
LA.C.3.2.4- uses eye contact and gestures that engage the audience					X

<b>Math</b>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
<b>Number Sense, Concepts, and Operations</b>					
MA.A.3.2 The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.			X		
MA.A.3.2.2- selects the appropriate operation to solve specific problems involving addition, subtraction, and multiplication of whole numbers, decimals and fractions, and division of whole numbers			X		
MA.A.3.2.3- adds, subtracts, and multiplies whole numbers, decimals, and fractions, including mixed numbers, and divides whole numbers to solve real-world problems, using appropriate methods of computing such as mental mathematics, paper and pencil, and calculator			X		
<b>Geometry and Spatial Sense</b>					
MA.C.1.2 The student describes, draws, identifies, and analyzes two- and three-dimensional shapes.	X				