GO FURTHER!

Follow the Manatees

Manatees are large aquatic mammals, related to elephants. They can weigh up to 1800 pounds and grow to 13 feet. They are aquatic grazers. Their herbivory has a significant effect on the habitats in the shallow rivers, bays and estuaries where they live.

Like elephants, manatees display many social behaviors that are vital to their survival. They communicate under water with squeals when they are stressed or afraid.

Because of their size, they don't have any natural predators as adults. But human interference in their ecosystems, especially the damage done by human machines like motorboats, can cause them significant damage.

Florida manatees are endangered; only about 7000 remain in the state's rivers and estuaries.

Consider the physical characteristics of this gentle giant. Watch the video and check out the image below. For each of these descriptions, hypothesize what advantage they might provide for the manatee in its environment.

Rough skin often covered with algae and barnacles _____

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Large front flippers _____

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Flat tail _____

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_____

Small eyes _____

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_____

No outer ears _____

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_____

Greyish brown color _____

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_____

Molars but no incisor teeth _____

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_____

Sensitive whiskers called vibrissae _____

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For the past 30 years, USFWS researchers have taken aerial counts of Manatees in 13 areas in West Florida: Kings Bay, Crystal River, Upper and Lower Homosassa, Salt River, Crystal River, Waccasassa Bay, Withlacoochie River, Barge Canal, Suwannee River and Estuary, Chassahowitzka River and Weeki Wachi River. (You can find these areas on a map. *(http://soundwaves.usgs.gov/2009/03/fieldwork2.html)*

RESULTS:

The numbers below are samples from the data—totals from one of the first counts taken each month. Use a highlighter to identify the highest three manatee counts for each year.

	2010	2011	2012	2013	2014
January	651	465	657	313	639
February	430	423	321	428	461
March	419	48	87	377	151
April	55	68	86	42	58
May	73	127	128	74	89
June	73	91	52	87	51
July	82	54	38	20	48
August	55	59	51	24	41
September	19	63	58	35	14
October	47	55	45	103	36
November	293	181	318	168	212
December	615	244	224	382	308

The National Oceanographic and Atmospheric Administration keeps long term records on temperatures for these areas. This chart shows the average temperature (°F) in West Florida during the period when the count was taken. Take your highlighter again, and identify the coldest periods.

Month	2010	2011	2012	2013	2014
January	60	73	60	74	70
February	68	74	74	71	74
March	90	81	78	64	80
April	80	84	82	82	80
May	86	87	86	75	85
June	87	90	85	80	85
July	88	90	90	88	90
August	90	90	91	88	89
September	89	87	87	87	88
October	85	85	85	86	86
November	81	80	77	80	77
December	72	80	74	75	75

Is there a link between cold temperatures and high manatee counts? _____

Now graph the temperatures and counts for the beginning of January for each year.

Temperature	2010	2011	2012	2013	2014	Manatees
74						650
72						600
70						550
68						500
66						450
64						400
62						350
60						300
58						250
56						200

Formulate a hypothesis about why manatee numbers change.

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THINK!

1. What physical characteristics of the rivers and estuaries help manatees survive?

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2. Manatees are grazers. They live in areas of Florida where there are often long dry periods. How would their herbivory (plant eating) help other organisms in the shallow waters when the rivers are low?

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3. Florida has many visitors in the winter, who love to kayak and boat in the same rivers and estuaries where manatees live. What impact does this have on the behaviors and survival of these mammals?

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4. Imagine you are an employee of a conservation organization in this area of Florida. What regulations would you recommend for boaters and fishermen in areas where manatees live?

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GO FURTHER

When you examined the data, not every count matched the temperature pattern. Think of other conditions that might affect the counts.

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Teacher Page

Because this activity represents only a small portion of the data, the emphasis should be on asking questions and developing hypotheses rather than coming to firm conclusions—"practicing science."

Manatees are extremely sensitive to variations in temperature. Their tube-like bodies are good for maintaining heat but they have no blubber like other marine mammals and have a very low metabolism. Because they move slowly, the result of movement due to unexpected cold days might be seen some time later.

Possible Answers:

Characteristics: Wrinkled skin and algae symbionts help maintain moisture and screen against sun, flippers help move through both water and along shallow river beds, helping them steer (along with the tail). Small eyes and ears are less susceptible to damage but the animals are generally thought to see and hear quite well. They have grinding teeth characteristic of herbivores, which must continue to be replaced. Vibrissae are sensitive like human fingers.

Think!

1. What physical characteristics of the rivers and estuaries help manatees survive? The water remains warm, and isolated areas support social behaviors which help the animals stay warm.

2. Manatees are grazers. They live in areas of Florida where there are often long dry periods. How would their herbivory (plant eating) help other organisms in the shallow waters when the rivers are low? Manatees are crucial in keeping aquatic plants from totally blocking water flow. They eat 5-6 hours a day. Like horses that eat rough grass, manatees eat plants that often have sand on their leaves. So their molars wear away and new molars push up from the back.

3. Florida has many visitors in the winter, who love to kayak and boat in the same rivers and estuaries that where manatees live. What impact does this have on the behaviors and survival of these mammals? Besides physical injuries from boats, manatees can be damaged when the areas where they congregate are diverted or used for recreation.

4. Imagine you are an employee of a conservation organization in this area of Florida. What regulations would you recommend for boaters and fishers in areas where manatees live? While answers will vary, students should realize that manatees need safe spaces for their survival. Cleaning up trash and especially plastic and nylon lines is another key step.

Go Further:

The data presented here represent only a small portion of the counts available. In some situations heavy fog or other weather conditions prevented the count from being taken when planned. Sometimes a few very cold days the week before the count affected social behavior even when the actual day of the count was warmer. Other disruptions like construction or human activity can also affect the distribution of manatees.

For longer term data on rainfall and temperature in the area, go to http://www.srh.noaa.gov/mfl/?n=apf_cliplot

Integrate!

Integrating literature with math and science lessons enhances academic achievement in all areas. The National Science Teachers Association (NSTA) Recommends review team identifies great books to use, and provides a searchable database for K-12 educators. The system includes Outstanding Science Trade Books. Educators may choose these or other related materials to supplement the episodes to deepen the learning experience for students. Learn more about wildlife species and habitats using keyword searches in the NSTA Recommends database, which has more than 10,000 reviews, at http://www.nsta. org/recommends/. Use the key word "Manatee" in the "word in title" to find content that relates to this educational resource.

Common Core Language Arts

CCSS.ELA-Literacy.RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Next Generation Science Standards Students who demonstrate understanding can:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Common Core Mathematics

CCSS.Math.Content.7.SP.A.1

Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.