Effect of Water Temperature on Manatee Migration into Blue Spring State Park (Adaptations)

Grade Level: Elementary 4/5

Subject Area: Earth science, math, biology

Duration: 1 hr: instruction/background information, 30 minutes activity, 20 minutes discussion

Setting: Classroom

Sunshine State Standards: see Appendix A

Objectives:
- ✓ Students will understand that manatees are mammals and require warm water to survive.
- ✓ Students will understand that Blue Spring State Park keeps a constant water temperature of 72 degrees Fahrenheit year-round and because of this, manatees are attracted there during the colder months.
- ✓ Students will gather data and construct a graph to compare water temperatures outside of Blue Spring on specific winter days to the numbers of manatees in Blue Spring on those days.

Materials: Manatee count data, air and water temperature data from Blue Spring State Park, graph paper

Vocabulary:
adaptation, aquifer, data degree, estuary, endangered species, environment, Fahrenheit, freshwater, graph, habitat, herbivore, horizontal axis, hypothesis, interaction, investigation, mammal, manatee, marine, migrate, observation, percent, refuge, salt water, scientific method, spring, temperature, vertical axis, vulnerable, watershed

Background/ Preparation:

Introduction- The Florida (West Indian) manatee
Florida manatees are marine mammals, meaning they are warm-blooded, require oxygen from fresh air to breathe, have hair, and keep a high internal body temperature. They also give birth to live young and produce milk to nurse their babies. Maternal (mother-calf) care is very important in early development, and baby manatees must learn many things from their mothers. They are generally herbivores and depend on fresh water, which is obtained through the vegetation they eat, for survival. (Adult manatees are usually between 8 and 10 feet long and weigh around 1,000 lbs, but they can be larger) They eat plants that are equal in weight to 10 percent of their body weight every single day! 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 may get what is called "cold stress," and this makes them vulnerable to disease and death. Manatees are also an endangered species, meaning that unless certain actions are undertaken to protect 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.

Blue Spring State Park- Orange City, FL
Blue Spring is the largest spring that feeds into the St. Johns River. It is also a designated manatee refuge and the winter home (mid-November through March) to the St. Johns River manatee population. Blue Spring remains at a constant 72 degrees Fahrenheit all year. In winter when the spring is 72 degrees the river can be as cold as 59 degrees Fahrenheit. It is because the spring is warmer than the river that attracts the manatees to come into Blue Spring in the winter time.

Teach/Activity:

1.) Discuss the brief background of manatees with students, incorporating the significance of Blue Spring.

2.) Explain the provided manatee daily counts and corresponding water and air temperature. Make it apparent to students the importance of warm water (and how colder air temperature means colder water temperature in the St. Johns River, outside of Blue Spring) for manatees and why they migrate towards it.

3.) (5Th grade) Have students use the scientific method to address the subject of manatee migration. They should include the following steps: stating a problem, formulating a hypothesis, designing a simple experiment to test the hypothesis, conducting observations and collecting of data, creating appropriate graphs, analyzing data and drawing conclusions.

4.) Use the provided graphing paper to complete a bar graph.

5.) Explain how to complete the provided graph:
- Have students label the y-axis in multiples of 10, starting with 0 and ending with 120.This is for the number of manatees in the Blue Spring run for a particular day.
- Along the x-axis, have students label the day and temperature, starting with the earliest day of the year provided in the data.
- Have students mark the day, air temperature, and corresponding number of manatees in Blue Spring on the graph and fill in a bar for each of the days.

6.) For each day a manatee count was done, suggest a pattern that should start to appear with regards to more manatees being in the run on colder days.

7.) After students complete the graph, have them discuss reasons for higher numbers of manatees being in the run on particular days. Be sure to point out the corresponding air temperatures for those days.

8.) **Possible Discussion Questions**:
- Why are manatees attracted to the spring on colder days?
- What would happen if Blue Spring no longer had fresh, warmer water to provide the manatees?
- Why is it important for humans not to waste water?
- What affect would humans using more water have on places like Blue Spring?
- What do humans have in common with manatees? (May require more discussion on anatomy comparisons)

9) **Extension Activitiy**
> Field trip to Blue Spring State Park
> Collect water temp data

Background Information Sources

http://www.floridastateparks.org/bluespring/default.cfm
http://www.savethemanatee.org/manfcts.htm
www.homosassasprings.org
http://www.floridasprings.org/
http://echotourism.com/msc/fieldtrips
http://nerrs.noaa.gov/Education/LessonPlans.html

Date	High-Low Temps	River Temp	Run Temp	Manatees
15 Nov	27 to 12	21.5	22.5	1
2Dec	21 to 1	15.5	22.5	77
5 Jan	15 to 0	13.5	22.6	105
1 Feb	24 to 12	14.6	22.5	88
3 Mar	28 to 16	21.0	22.4	1

http://www.thewildones.org/manateebooks.html

Created by Janet Gray, adapted by Alexa Bracht and Georgia Zern

Vocabulary

adaptation: any alteration in the structure or function of an organism or any of its parts that results from natural selection and by which the organism becomes better fitted to survive and multiply in its environment.

aquifer: An aquifer is a geological formation conducting ground water that supplies the water for wells or springs.

data: individual facts, statistics, or items of information from which conclusions may be drawn

degree: a unit of measure, as of temperature or pressure, marked off on the scale of a measuring instrument.

estuary: A body of water, usually where a river meets the ocean. The part of the wide lower course of a river where its current is met by the tides, and salt and freshwater mixes.

endangered species: a species of plant or animal whose population is decreasing at an alarming rate. Without intervention, it's likely that an endangered species will become extinct.

environment: the air, water, minerals, organisms, and all other external factors surrounding and affecting a given organism at any time. The sum of conditions affecting an organism, including all living and nonliving things in an area, such as plants, animals, water, soil, weather, landforms, and air.

Fahrenheit: Of or relating to a temperature scale that registers the freezing point of water as 32° and the boiling point as 212° at one atmosphere of pressure.

freshwater: Of, relating to, living in, or consisting of water that is not salty.

graph: 1. A diagram that exhibits a relationship, between two sets of numbers and shown as a set of points having coordinates determined by the relationship. Also called *plot*. 2. A pictorial device, such as a pie chart or bar graph, used to show numerical relationships. Also called *chart*.

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.

horizontal axis: the horizontal line used in a rectangular graph or coordinate grid system, the "y" axis.

hypothesis: In science, a statement of a possible explanation for some natural occurrence. A hypothesis is tested by drawing conclusions from it; if observation and experimentation show a conclusion to be false, the hypothesis must be false.

interaction: the direct effect that one thing or organism has on another. Effect, influence.

investigation: a searching inquiry for determining facts; detailed or careful examination.

mammal: Any of various warm-blooded vertebrate animals of the class Mammalia, including humans, characterized by five traits. These are that they are warm blooded, have hair, give birth to live young, produce milk to nurse young, and breathe air.

manatee: herbivorous aquatic mammals, having paddlelike front flippers and a horizontally flattened tail. Found in warm coastal waters of Florida, northern South America, West Africa, and the Caribbean. All manatee species are protected.

marine: of or pertaining to the sea; existing in or produced by the sea.

migrate: seasonal movement of an animal from one region to another.

observation: 1.Noticing or perceiving. 2. Regarding attentively or watching. 3. Viewing or noting a fact or occurrence for some scientific or other special purpose. 4.The information or record secured by such an act. 5. Something that is learned in the course of observing things.

percent: Out of each hundred; per hundred.

refuge: a place of shelter, protection, or safety.

salt water: water containing a large amount of salt, usually referring to the ocean.

scientific method: The principles of discovery and demonstration considered necessary for scientific investigation, generally involving observation, the formulation of a hypothesis concerning the observation, experimentation to demonstrate the truth or falseness of the hypothesis, and a conclusion that validates or modifies the hypothesis.

spring: an issue of water from the earth, taking the form, on the surface, of a small stream or standing as a pool or small lake.

temperature: The degree of hotness or coldness of a body or environment.

vertical axis: the vertical number line used in a rectangular graph or coordinate grid system, the "x" axis.

vulnerable: Susceptible. Unprotected against attack; liable to be hurt or damaged
watershed: A ridge of high land dividing two areas that are drained by different river systems.

Appendix A

SC.D.1.1.2: The student knows that life occurs on or near the surface of the Earth in land, air, and water.

SC.D.1.1.3: The student recognizes patterns in weather.

SC.D.2.1.1: The student understands that people influence the quality of life of those around them.

SC.F.1.1.1: The student knows the basic needs of all living things

SC.F.1.1.4: The student understands that structures of living things are adapted to their function in specific environments.

SC.F.1.1.5: The student compares and describes the structural characteristics of plants and animals.

SC.F.2.1.1: The student knows that living things have offspring that resemble their parents.

SC.F.2.1.2: The student knows that there are many different kinds of living things that live in a variety of environments.

SC.G.2.1.1: The student knows that if living things do not get food, water, shelter, and space, they will die.

SC.A.1.2.1: The student determines that the properties of materials (e.g., density and volume) can be compared and measured (e.g., using rulers, balances, and thermometers)

SC.B.1.2.3: The student knows that most things that emit light also emit heat.

SC.B.1.2.6: The student knows ways that heat can move from one object to another

SC.B.2.2.1: The student knows that some source of energy is needed for organisms to stay alive and grow.

SC.D.1.2.2: The student knows that 75 percent of the surface of the Earth is covered by water.

SC.F.1.2.2: The student knows how all animals depend on plants.

SC.F.1.2.3: The student knows that living things are different but share similar structures.

SC.F.2.2.1: The student knows that many characteristics of an organism are inherited from the parents of the organism, but that other characteristics are learned from an individual's interactions with the environment.

SC.G.1.2.1: The student knows ways that plants, animals, and protists interact.

SC.G.1.2.2: The student knows that living things compete in a climatic region with other living things and that structural adaptations make them fit for an environment

SC.G.1.2.7: The student knows that variations in light, water, temperature, and soil content are largely responsible for the existence of different kinds of organisms and population densities in an ecosystem.

SC.G.2.2.1: The student knows that all living things must compete for Earth's limited resources; organisms best adapted to compete for the available resources will be successful and pass their adaptations (traits) to their offspring.

SC.G.2.2.3: The student understands that changes in the habitat of an organism may be beneficial or harmful.

SC.H.1.2.2: The student knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results.

SC.H.1.2.4: The student knows that to compare and contrast observations and results is an essential skill in science.

SC.H.1.2.5: The student knows that a model of something is different from the real thing, but can be used to learn something about the real thing.

SC.H.3.2.2: The student knows that data are collected and interpreted in order to explain an event or concept.

SC.H.3.2.4: The student knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas.

MA.B.1.2.1: The student uses concrete and graphic models to develop procedures for solving problems related to measurement including length, weight, time, temperature, perimeter, area, volume, and angle.

MA.B.1.2.2: The student solves real-world problems involving length, weight, perimeter, area, capacity, volume, time, temperature, and angles.

MA.B.3.2.1: The student solves real-world problems involving estimates of measurements, including length, time, weight, temperature, money, perimeter, area, and volume.

MA.D.1.2.1: The student describes a wide variety of patterns and relationships through models, such as manipulatives, tables, graphs, and rules using algebraic symbols.
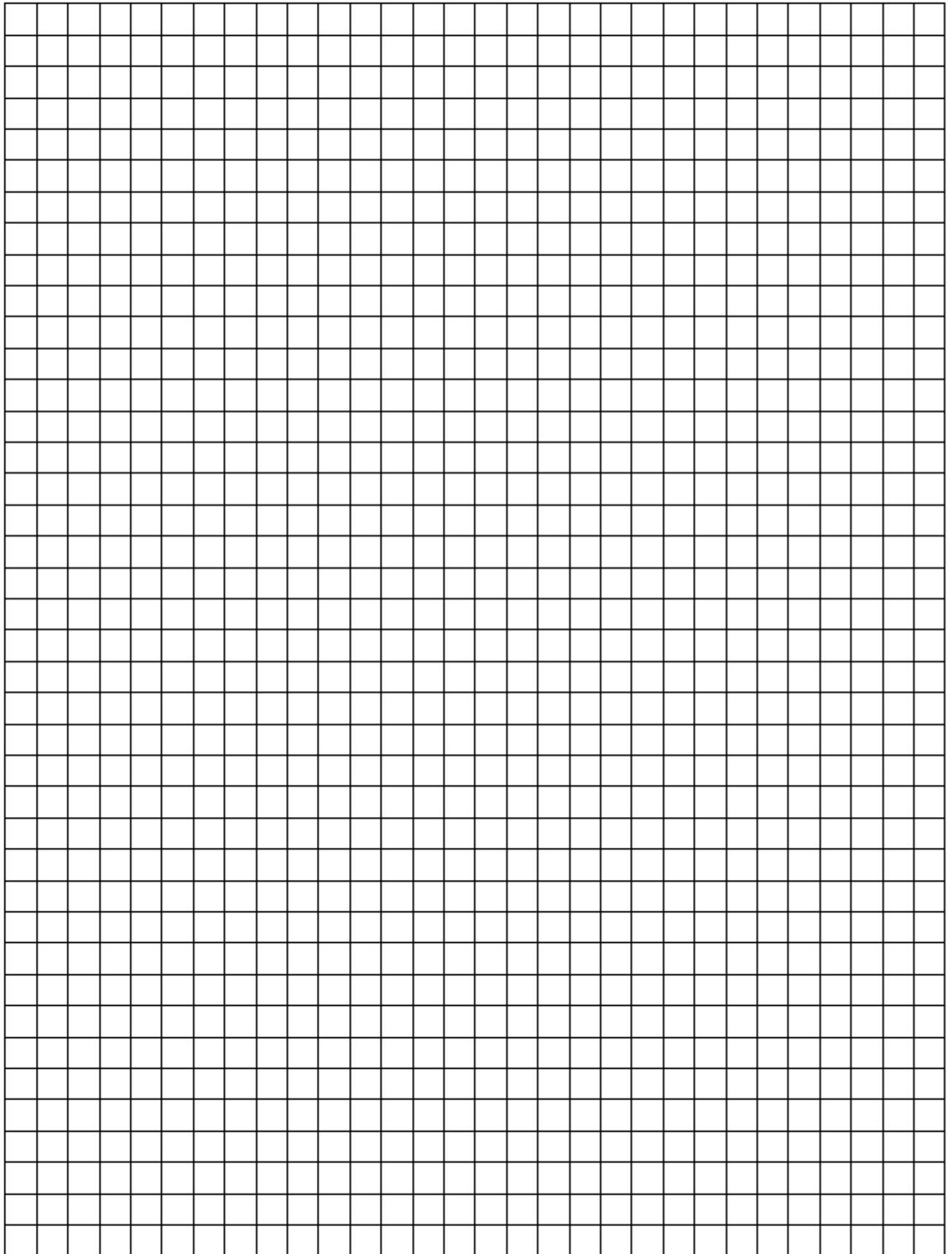
MA.E.1.2.1: The student solves problems by generating, collecting, organizing, displaying, and analyzing data using histograms, bar graphs, circle graphs, line graphs, pictographs, and charts.

MA.E.1.2.3: The student analyzes real-world data to recognize patterns and relationships of the measures of central tendency using tables, charts, histograms, bar graphs, line graphs, pictographs, and circle graphs generated by appropriate technology, including calculators

MA.E.3.2.2: The student uses statistical data about life situations to make predictions and justifies reasoning.

LA.A.1.2.2: The student selects from a variety of simple strategies, including the use of phonics, word structure, context clues, self-questioning, confirming simple predictions, retelling, and using visual cues to identify words and construct meaning

LA.B.2.2.2: The student organizes information using alphabetical and numerical systems.

Blue Spring State Park