

### Journey down the Hudson

**Time:** 2 class periods

**National Benchmarks:** Benchmarks 5A: Diversity of Life; 5D Interdependence of Life; 5E: Flow of Matter and Energy; 9B:Symbolic Relationships; 9D:Uncertainty; 12B:Computation and Estimation; 12D:Communication Skills; 12E:Critical-Response Skills.

**National Science Content Standards:** *Science as Inquiry: A; Life Science: C:* Biological Evolution; The Interdependence of Organisms; Matter, Energy, and Organization in Living Systems; *Science and Technology: E:* Abilities of Technological Design; Understandings about Science and Technology; *Science in Personal and Social Perspectives: F:* Population Growth; Natural Resources: Environmental Quality; Natural and Human-induced Hazards; Science and Technology in Local, National, and Global Challenges

**New York State Standards:** 1, 2, 4, 5, 6, 7

**Objective:** Students will know the components of the Hudson River ecosystem and be able to revise their initial concept maps to create a more complete view of the ecosystem.

#### Lesson Outline:

1. Students draw the Hudson River ecosystem
2. Working in groups, students identify biotic vs abiotic objects
3. Students discuss what it means to be 'alive'
4. Students create a diagram of the Hudson River ecosystem, complete with biotic and abiotic factors, as a class
5. Students view a powerpoint of the Hudson River and add to their drawings
6. **Optional:** Is it alive? Lab activity, using either pond water or selected objects as specified in the accompanying worksheets.

#### Materials:

- For the class: Is it alive? Objects: yeast, an animal bone, a plant or insect, seeds, soil, rock, toy that squeaks (dog toy etc), paper
- Sticky notes
- Journey down the Hudson powerpoint (optional: worksheet)
- String (~10 feet long)

**Engage:** Ask students to get out a blank piece of paper, and imagine the Hudson River. Ask them to draw a map of all the things within that ecosystem, and all the things that contribute to that ecosystem's ability to function. These maps are to guide the teacher in understanding student preconceptions and will be used again during the lesson. The teacher should move around the room during this time to view the students' maps, in order to find out what students know and what type of information they are lacking.

**Explore:** Lay out a number of items at the front of the room that could be alive or not. You can vary these items depending on their availability; items such as Mexican jumping beans work well to pique a students' interest. Have students make a list of the things they think are alive, those that aren't, and those that were 'once alive'. Then, they should get into groups and debate the placement of the items on their lists, attempting to convince the other students to change their minds. When students have discussed for a few minutes, they should be encouraged to come up

with characteristics that can distinguish between something that is ‘alive’ and something that is not.

Bring the class back together and ask for their answers to the alive vs. not-alive question, and see if the class can come to a consensus on which items are alive and which are not. This works well if you ask students to vote in groups; it is easier to count their answers to the alive/not alive. It is also interesting to ask the students to arrange the items from alive to not alive, on a continuum.

**Explain:** Students should now have a sense of the complexity of life and of defining it! Encourage students to think about how things change when a flower is picked, or an animal hibernates, or a plant becomes dormant. Sometimes it is difficult to decide what is alive and what isn’t. Scientists have developed a few traits that all living things: have cells, require the use of energy (metabolize), reproduce, evolve and adapt, respond to stimuli, and maintain homeostasis (maintain stable internal environment). Sometimes educators include growth and development as a characteristic, but this can also be included in evolving and adapting and responding to stimuli. Now that students know what types of things are alive, they should be able to add to their ecosystem diagrams. Review the terms biotic and abiotic.

**Explore II:** Draw a cross-section of the Hudson River on the chalkboard. Pass out sticky notes to student pairs. Ask each student group to write down something that might be included in the Hudson River ecosystem on their sticky note, and come up to the board and place it in the appropriate area of the diagram (in the river, the air, the sediment, etc). Once all students have added their ecosystem components, remove the duplicates.

Now, use the “Journey down the Hudson” powerpoint to give students a visual perspective of the river. While viewing the powerpoint, you can ask students to answer questions on the worksheet and/or add to their personal drawings of the Hudson whenever they see something they missed.

At the beginning of the slide show are several slides that discuss the physical characteristics of the river. A good way to illustrate the differences between the upper and lower sections of the Hudson is to ask for three volunteers to come up to the front of the room. One volunteer will be Mt. Marcy, the start of the Hudson, a second will be in the middle at the Federal Dam at Troy, and the third will be the mouth of the Hudson in NYC. Ask ‘Mt.Marcy’ to hold the string up very high, as this is the highest point in New York State at 5,344 feet and also the start of the headwaters of Lake Tear of the Clouds, the origins of the Hudson River. Then, ask the New York City volunteer how high his/her end of the string should be; this may take the students a few minutes to realize that since New York City is at sea level, the string should be down on the ground. Then, ask the volunteer at Troy how high his/her string should be, since Troy is almost in the middle of the length of the Hudson. Generally, students think that Troy is about 2500 feet high, and they want the volunteer to hold the string in between the heights of ‘Mt Marcy’ and ‘NYC’. Reveal that the Troy dam is only about 4 feet above sea level. This should help students understand the large physical differences between the upper and lower parts of the river.

Finally, pass out another round of sticky notes to those students who would like to add items to the drawing on the board, and try to complete the diagram. Suggested inputs and outputs include: oxygen, sunlight, nitrogen, phosphorous, carbon, carbon dioxide, detritus, rain, plants, phyto/zooplankton, fish, birds, crustaceans, etc.

**Extend:** Ask students to pick another ecosystem and create a diagram showing all of the inputs and outputs. They should be given time to do some research to complete this task. You can also

extend this lesson by turning the ‘Alive vs not alive’ activity into a lab experience using one of the ‘Is it alive?’ labs.

**Evaluate:** Students should be able to use their initial ecosystem diagrams that they created and update them with the information they learned during class. These diagrams can be used throughout the unit as they learn more about the types of things that are important within an ecosystem.

**Comments:**

“Is it alive?” lab sheet version 1 was written by Lecia Zulak, science teacher, FDR High School, Hyde Park, NY.

“Is it alive?” lab sheet version 2 was written by Patricia Tomaseski, science teacher, Millbrook High School, Millbrook, NY.

**References:** Is it alive? activity modified from Straits and Wilke, Journal of College Science Teaching, Oct. 2006.

‘String’ activity showing the length and changes of the Hudson River courtesy of Chris Bowser, NYS DEC and HRNERR.