BROOKLYN BRIDGE PARK CONSERVANCY

PRE-TRIP LESSON

PLANKTON AND POLLUTION

LESSON OVERVIEW

OBJECTIVE

Students will become familiar with the geography of New York City waterways and the history of pollution in these areas.

RECOMMENDED GRADE LEVELS

4-8

DURATION

20 minutes

MATERIALS

- Student worksheets (provided)
- Projector or smartboard
- Computer with access to internet

TOPIC BACKGROUND

During your field trip to Brooklyn Bridge Park, students will be exploring and learning about the ecology and health of the East River estuary and intertidal zone.

An estuary is a special name given to a body of brackish water. Brackish water is a mix of saltwater and freshwater. The brackish water creates a very unique environment for a lot of different living organisms.

The intertidal zone is an area of the shoreline which gets covered in water at high tide. In the intertidal zone, a mix of living and nonliving things can be found, including crabs, snails, rocks, sand, shells, bricks, algae, and driftwood.

Historically, the East River, Hudson River and New York Harbor have been polluted by humans. Oil from ships, chemicals from factories, and plastic debris are a few examples of pollutants in the waterways. Since the early 1970's scientists and communities have worked together to clean these waterways. Overtime there has been an increase in species biodiversity (variety of species) and populations (number of species).

GETTING READY

1. Print out a copy for each student of the 2 worksheets provided. (Recommended to print double-sided)
2. Set up videos for second activity on projector or smartboard. (Links for videos can be found in the PROCEDURE section)

PROCEDURE

ACTIVITY 1: NEW YORK WATERWAYS GEOGRAPHY

1. Tell students that they will be taking a trip to Brooklyn Bridge Park to investigate the water quality and ecology of the East River and other local waterways.
2. Hand out the worksheet "New York City Waterways" and have students complete the mapping activity. Have students work in pairs if the activity seems challenging. Or have students use google maps to help determine the answers.
3. Explain to students that some water from the Hudson River actually reaches the East River and mixes with ocean water coming in with the tides. Our local waterways are very interconnected. Most rainwater and wastewater from our surrounding landscapes eventually enters the New York Harbor.

ACTIVITY 2: ECOLOGICAL HISTORY OF NY WATERWAYS

1. Hand out second worksheet to students (or have flip their worksheets to the second side). Tell students they will now watch a series of videos that introduce the Hudson River and New York Waterways and the ways in which people have impacted them.
2. Students should answer the questions on their worksheet as they are watching the videos.
3. Play the following videos to students in the order listed below:
    1) INTRO TO THE HUDSON RIVER (time length 3:26)
    https://youtu.be/T6ypsGlX8CQ
    2) PCB CONTAMINENTS (4:05)
    https://youtu.be/egKdpEA4_t8
    3) WATER QUALITY MONITORING (3:01)
    https://www.youtube.com/watch?v=A2ZWbFSVlyU

5. **Optional:** After showing the videos, consider collecting students' work as a graded assignment or have a class discussion to go over the answers to the worksheet questions, address other thoughts and inquires students may have from the videos, and most importantly, challenge students to think about ways our we can protect our waterways.

RECOMMENDED BOOKS

- *A Journey Into an Estuary (Biomes of N. America)* by Rebecca L. Johnson (Gr. 3 +)
- *The River of Dreams: Story of the Hudson River* by Hudson Talbott (Gr. 3+)
- *Make a Splash!: A Kid's Guide to Protecting Our Oceans, Lakes, Rivers, & Wetlands* by Cathryn Berger Kaye (Gr. 3-7)
- *Pollution and Waste: Environmental Facts and Experiments (Young Discoverers)* by Rosie Harlow (Gr. 4+)
- *The Hudson: A History* by Tom Lewis (Gr. 6+)

RECOMMENDED WEBSITES

Estuary Education
www8.nos.noaa.gov/estuaries101

NYSDEC: The Hudson Estuary
www.dec.ny.gov/lands/4923.html

NYSDEC: How is the Hudson Doing?
www.dec.ny.gov/lands/77105.html

NYSDEC: Teaching about the Hudson Estuary (Lesson Plans)
www.dec.ny.gov/lands/5102.html

Riverkeeper Alliance
www.riverkeeper.org

USGS: Water Quality
https://water.usgs.gov/edu/waterquality.html

What is dissolved oxygen? (video for students)
https://www.youtube.com/watch?v=oVW5LAzd7Ec

What is the pH scale? (video)
https://www.youtube.com/watch?v=ckbsHM2igT0

TEACHER NOTES:

VOCABULARY

Acid: Being or containing an acid; of a solution having an excess of hydrogen atoms (having a pH of less than 7).

Basic: Of or containing alkali. Basic liquids can have a pH from 8-14.

Bivalve: an aquatic mollusk that has a soft body enclosed within a hinged shell, such as oysters, clams, mussels, and scallops. In other words, an animal with two shells.

Brackish: Slightly salty water, due to the mixture of freshwater from rivers and streams and seawater.

Combined sewage overflow (CSO): Overflow that occurs when heavy rain overloads the waste water treatment plant's capacity; the plant intake closes and raw sewage is released into the receiving waters.

Driftwood: pieces of wood or tree debris that are floating on the water or have been washed ashore.

Dissolved oxygen: Oxygen from the atmosphere as well as that produced as a by-product of photosynthesis that is present in water for organisms that need it for respiration and decomposition.

Ecosystem: community together with its environment, functioning as a unit.

Estuary: A semi-enclosed body of water containing both fresh and salt water.

Intertidal zone: the area that is above water at low tide and under water at high tide. Also know as the seashore or shoreline and sometimes referred to as the littoral zone.

Non-point source pollution: pollution that comes from multiple vectors.

pH: A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The pH scale commonly in use ranges from 0 to 14.

Pollution: The introduction of pollutants (whether chemical substances, or energy (noise, heat, light, etc.) into the environment which result in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems, and impair or interfere with amenities and other legitimate uses of the environment.

Salinity: measure of the content of salts in soil or water .

Tidal Strait: A channel that connects two saltwater bodies. The East River is technically a tidal strait because it connects the New York Bay to the Long Island Sound.

Watershed: An area of land over which water drains into a river or other body of water.

STANDARDS

COMMON CORE ELA

- Speaking and Listening
- Literacy in Technical Subjects
- Literacy in Science
- Writing Standards

COMMON CORE MATH

- Counting and Cardinality
- Measurement and Data
- Quantities

NYC K-8 SCIENCE & SOCIAL STUDIES SCOPE & SEQUENCE

6. Human Impact on Earth's Climate

7. Minimizing Human Impact Through Engineering Design

NEXT GENERATION SCIENCE STANDARDS

5. Earth's Systems

3-5. Engineering Design

MS. Human Impacts

Name:_____

New York City Waterways

There are several different waterways in New York City which connect to each other. These bodies of water are ecologically important as well as used by humans for transportation and recreation. Use the map below to answer the following questions.

1. Place a star near the location of your school.

2. Using the word bank below, label the following points on the map

Hudson River	Long Island Sound	New York Harbor
East River	Bronx River	Atlantic Ocean

A. _____

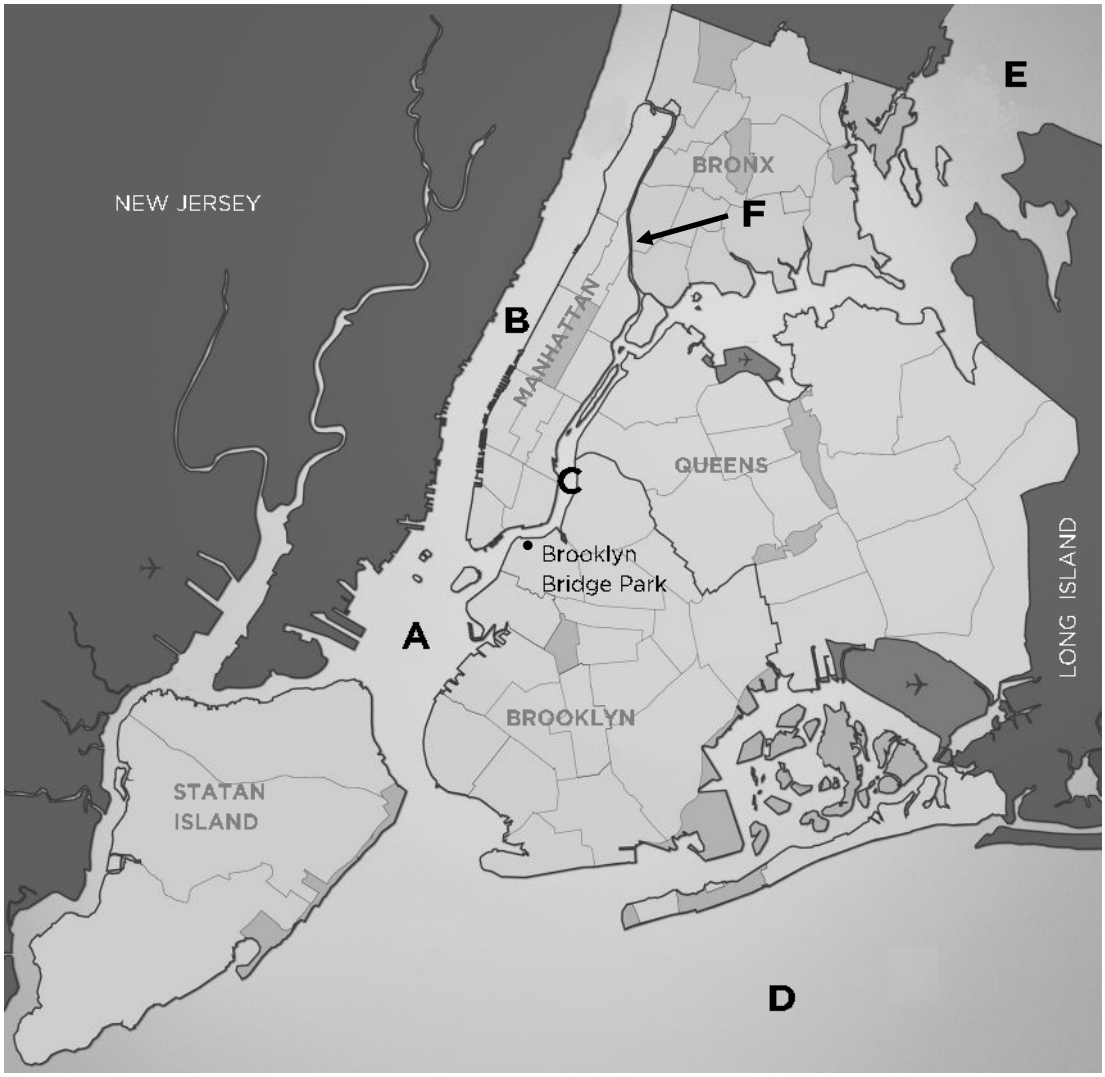
B. _____

C. _____

D. _____

E. _____

F. _____



3. Is Manhattan a peninsula or an island? Explain.

Name:_____

History of the Hudson River and Health of New York Harbor

1. Where does the Hudson River begin (the headwaters)?

2. How long is the entire Hudson River?

3. What is the term used to describe the portion of the Lower Hudson River from Albany down to New York Harbor?
What makes this area of water different from the Upper Hudson?

4. What are PCBs? Why are they bad for waterways?

5. What is the term used to describe the removal of contaminated sediments from the bottom of the river?

6. Name 3 water quality tests scientists routinely conduct in the New York Harbor.

ANSWER KEY

New York City Waterways

There are several different waterways in New York City which connect to each other. These bodies of water are ecologically important as well as used by humans for transportation and recreation. Use the map below to answer the following questions.

1. Place a star near the location of your school. Answers vary

2. Using the word back below, label the following points on the map

A. New York Harbor

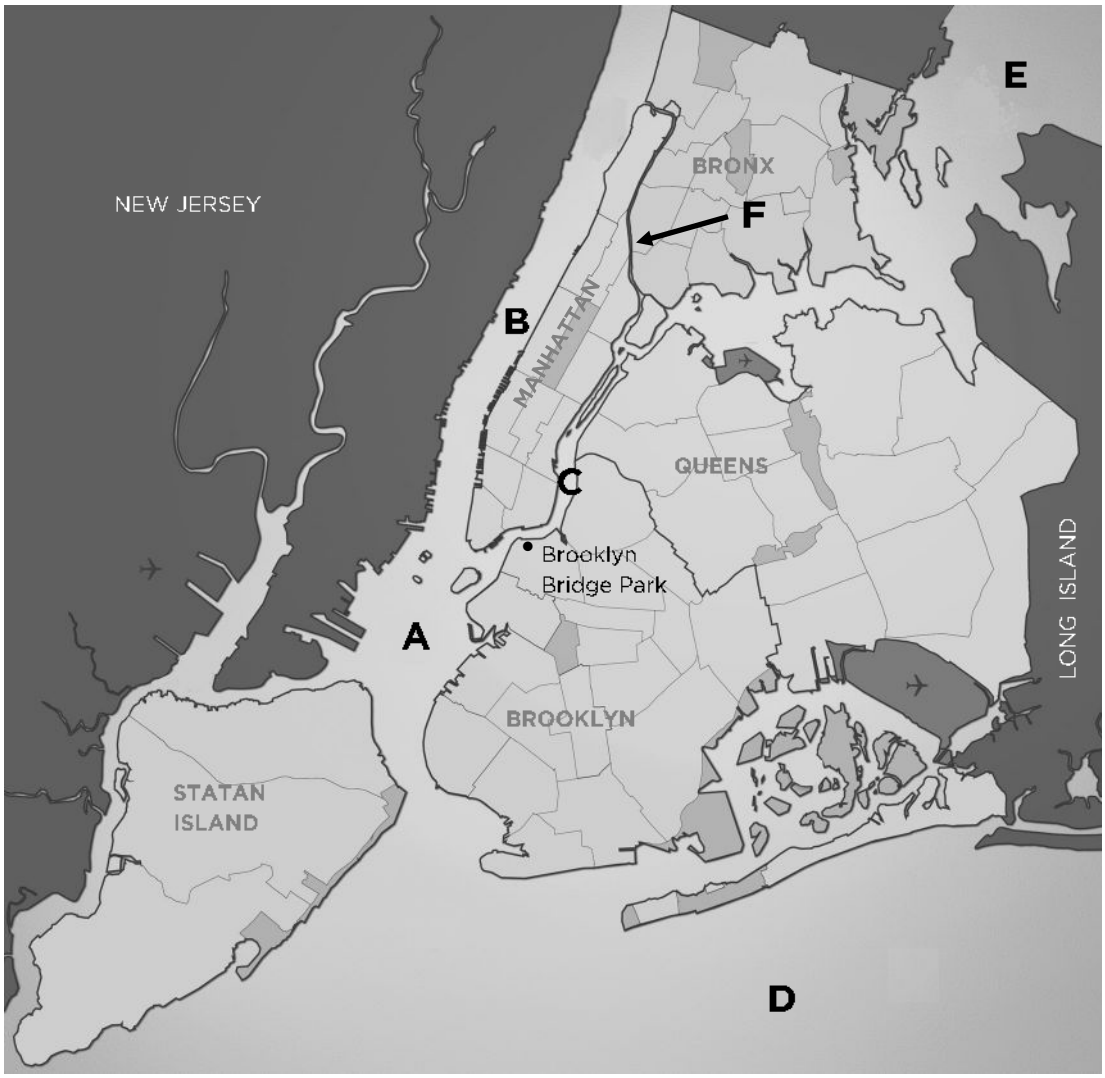
B. Hudson River

C. East River

D. Atlantic Ocean

E. Long Island Sound

F. Bronx River



3. . Is Manhattan a peninsula or an island? Explain.

Manhattan is a considered a an island because it is completely surrounded by water in all directions. A peninsula is surrounded by water in only three directions and typically are a part of a larger landmass. For example, Florida and Cape Cod can both be considered peninsulas.

ANSWER KEY

History of the Hudson River and Health of New York Harbor

1. Where does the Hudson River begin (the headwaters)?

In the Adirondack Mountains, a small body of water called Lake Tear of the Clouds atop Mount Marcy.

2. How long is the entire Hudson River? **315 miles**

3. What is the term used to describe the portion of the Lower Hudson River from Albany down to New York Harbor? **Estuary**
What makes this area of water different from the Upper Hudson? **Estuaries are slightly salty bodies of water due to the tides pushing in water from the ocean.**

4. What are PCBs? Why are they bad for waterways?

PCB stands for polychlorinated biphenyl, a type of chemical once used by factories along the Hudson River. PCBs were discovered to be harmful to the environment as well as human health. In addition to making fish and other organisms sick, people who ingest these foods can become sick as well.

5. What is the term used to describe the removal of contaminated sediments from the bottom of the river? **Dredging**

6. Name 3 water quality tests scientists routinely conduct in the New York Harbor.

pH, oxygen level (dissolved oxygen), salinity, bacteria levels, temperature, chlorophyll, water clarity (turbidity)