

Virtual Summer Camp: River Rangers

Week 1—Introduction to the Hudson River Estuary

This Week:

Meet our educators live at Hudson River Park,
test with brackish water and create a wildlife puppet!

Friday-Monday: **Review & Prep!** Read through the packet and gather your materials.

Tuesday: **Tune in! Watch** our educators lead a live demonstration at 1pm.

Wednesday: **Experiment & Craft!** Follow the activity instructions in your packet.

Thursday: **Share Your Results!** Submit a photo of your results to education@hrpt.ny.gov to be featured on our website. Then, download next week's packet!

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Week 1—Introduction to the Hudson River Estuary

Materials Check List

Brackish Water Density Eggs-periment:

- ☐ [DEC Hudson River Watershed Map](#)
- ☐ Brackish Water Eggs-periment Worksheet
- ☐ Measuring cup
- ☐ Tap Water
- ☐ 2 clear cups/glasses
- ☐ Salt (~6 teaspoons)
- ☐ 1 egg

Wildlife Puppets:

- ☐ Small paper bowls or plates
- ☐ String, approx. 12 in
- ☐ Construction or scrap paper
- ☐ Streamers or toilet paper
- ☐ Markers or paint
- ☐ Dowel or chopstick
- ☐ Scissors
- ☐ Pencil
- ☐ Tape or glue
- ☐ Googly eyes (optional)

River Rangers Week 1

Marine Ecology: Brackish Water Density

Theme: Hudson River Ecology; Density; Hudson River Geography

Age: 5-14 years

Prep Time: 5 minutes

Activity Time: 20-30 minutes

Activity Summary:

Did you know that Hudson River Park's waters are an Estuarine Sanctuary? In fact, New York City is right in the middle of an environment we call the Hudson River Estuary. Estuaries are important aquatic environments, and many of them are close to cities like New York. In fact, out of the 32 biggest cities on the planet, including NYC, London and New Orleans, 22 of them (over 66%) are located on estuaries. Because so many people live near these environments, it is important to understand how they work so we can protect them from pollution, development and other human activities that can negatively affect the environment. In this lesson, we conduct an experiment to help us learn more about estuaries and the types of water we find in these environments.

Objectives:

- Learn about where the Hudson River Estuary gets its water from
- Conduct an experiment to explore the differences between fresh, salty and brackish water

Lesson Materials:

- [DEC Hudson River Watershed Map](#)
- Brackish Water Eggs-periment Worksheet

Experiment Materials:

- Measuring cup
- Tap Water
- 2 clear cups/glasses
- Salt (~6 teaspoons)
- 1 egg

Lesson Procedure: Brackish Water Density Eggs-periment

1 - Geography of the Hudson River Estuary

Educator Note: Refer to the Hudson River Watershed map to see where these bodies of water are in relation to NYC. While the Hudson River and Atlantic Ocean are clearly labeled, the boundaries of the Hudson River Estuary are not marked. Use information from the following paragraphs to figure out where the estuary is on this map.

You have probably heard of the Hudson River before, but have you ever heard of the Hudson River Estuary? The Hudson River Estuary is a special part of the river where fresh water of the Hudson River mixes with water from the Atlantic Ocean. If you look at the Hudson River from the shoreline of Manhattan you are seeing part of the Hudson River Estuary. But what is it that makes an estuary different from other parts of the river? While we might not know what kind of water we have in an estuary, we do know that the Hudson River Estuary gets its water from two different sources: the Hudson River and the Atlantic Ocean. These are two very different environments that have a meeting point in Hudson River Estuary.

Let's talk about the Atlantic Ocean. The Atlantic Ocean borders the eastern coast of the United States, including beach areas close to here like New Jersey, Long Island and the Rockaways. If have swallowed water while swimming at the beach,

River Rangers Week 1

you might have noticed that the water tasted a little funny compared to drinking water. This is because oceans are made up of **salt water**, meaning that ocean water has salt mixed into it, giving it that funny taste. Salt water moves into and out of the estuary with the help of **tides**. Tides are the daily movements of water due to gravitational pull. During a **high tide**, the water level is higher as salt water is pulled into the estuary, and during **low tide**, the salt water recedes and returns to the ocean. The Hudson River has two high tides and two low tides every day.

Next, let's move on to the type of water found in rivers, streams, ponds and most lakes which we call **fresh water**. Fresh water is any naturally occurring water that does not have salt in it. Our drinking water is included in this group, but not all fresh water is clean enough for people to drink. The Hudson River is the source of fresh water for the Hudson River Estuary. The Hudson River begins at Lake Tear of the Clouds, 315 miles north of NYC. Fresh water collects in this lake from rain and snow melt and eventually flows downstream until it reaches the Hudson Estuary.

Estuaries are bodies of water where salt and freshwater meet and mix together, with the help of tides, currents, waves and wind. This mixture of partly salty, partly fresh water that we find in estuaries is called **brackish water**. Brackish water is able to support a large number of different aquatic species and this makes estuaries especially good environments for juvenile fish. In fact, many species of fish like striped bass, blackfish and seahorses reproduce and hatch their offspring in estuaries.

2 - Density Eggs-periment

Educator Note: To understand these different types of water, we are going to create fresh, brackish and salt water with a density experiment. Use the Brackish Water Eggs-periment Worksheet to write predictions and observations!

Check out a video of this experiment on HRPK's Instagram [here](#).

1. Gather the experiment materials- measuring cup, 2 clear cups/glasses (make sure it is large enough to hold an egg AND a cup of water), salt (~6 teaspoons), teaspoon and one egg. See experiment setup below



2. Fill up each glass with one cup of water
3. We will begin with our **fresh water cup**. We do not need to mix in any salt for this cup. For this experiment, this cup will represent fresh water from the Hudson River.
4. Before you add your egg into the cup, make a prediction on your worksheet about what you think will happen when you place the egg in the cup. Record this prediction on your worksheet.

River Rangers Week 1

- Next, carefully lower an egg into the fresh water cup and observe what happens. Record your observations on your worksheet.
- Now we will prepare our **salt water cup**. Add 6-7 teaspoons of salt into your second cup. Make sure to mix it up really well so that the salt dissolves in the water. This cup will represent salt water from the Atlantic Ocean. See below for an example of the salt water cup, after it is mixed it should look cloudy.



- Make another prediction about what will happen to the egg when added to your salt water and record this on your experiment worksheet.
- Carefully lower an egg into your salt water cup (this can be the same egg as the freshwater cup) and observe what happens to your egg. Record your observations on your worksheet.
- Now that we know how the egg behaves in salt and fresh water, make a prediction of what you think will happen with an egg in brackish water, and record your prediction on your worksheet.
- With your egg still in the salt water cup, begin making the **brackish water cup** by slowly pouring fresh water into the salt water cup. (*Educator Note: Be careful not to add the water too quickly or it can interfere with your experiment results! As you slowly add the fresh water, the egg should start to float towards the center of your glass.*) As you slowly add freshwater, observe the egg for any changes and record observations. See below for a demonstration of how to create the brackish water cup.



- Observe what happens to the egg in your **brackish water cup** and record this final observation on the worksheet.

River Rangers Week 1

Post-Experiment Wrap Up and Questions

Over the course of this experiment, we created three different kinds of water and observed the impact it has on an egg. Below are the results you should expect to see during the experiment. The biggest change observed is that the position of the egg in the water differs based on what type of water the egg is floating in. In our experiment, we mixed these different types of water by changing the amount of salt in each cup of water. Saltiness of water, or **salinity**, is an important measurement for estuary scientists because salinity affects where species live as well as physical properties of the water like **buoyancy**, which we have actually seen during this experiment.

Buoyancy is the ability for objects to float in water and other fluids. Buoyancy is determined by the density of a liquid. In this experiment, we were changing the density of our water by adding salt to it. Because our egg stays the same weight, this allows us to see how changes in salinity affect where things may be floating in the water column.



Fresh Water Cup

Brackish Water Cup

Salt Water Cup

To wrap up this activity, using your observations and the images above, answer the following questions:

1. The cup with the highest salinity is the: Salt Water Cup / Fresh Water Cup/ Brackish Water Cup
How do you know this?
2. The cup with the highest buoyancy is the: Salt Water Cup / Fresh Water Cup / Brackish Water Cup
How do you know this?
3. In the Hudson River Estuary, you can find this type of water: Salt Water / Fresh Water / Brackish Water
Explain your answer

River Rangers Week 1

Brackish Water Eggs-periment Worksheet

<div data-bbox="332 499 579 705" data-label="Image"> </div> <p>Cup 1</p> <p>Type of Water?</p> <p>_____</p>	<p>Prediction:</p> <p>I predict the egg will</p> <p>_____</p> <p>_____in this cup.</p> <p>Observation:</p> <p>During the experiment, the egg</p> <p>_____</p> <p>_____in this cup.</p>
<div data-bbox="332 1014 579 1220" data-label="Image"> </div> <p>Cup 2</p> <p>Type of Water?</p> <p>_____</p>	<p>Prediction:</p> <p>I predict the egg will</p> <p>_____</p> <p>_____in this cup.</p> <p>Observation:</p> <p>During the experiment, the egg</p> <p>_____</p> <p>_____in this cup.</p>
<div data-bbox="332 1528 579 1734" data-label="Image"> </div> <p>Cup 3</p> <p>Type of Water?</p> <p>_____</p>	<p>Prediction:</p> <p>I predict the egg will</p> <p>_____</p> <p>_____in this cup.</p> <p>Observation:</p> <p>During the experiment, the egg</p> <p>_____</p> <p>_____in this cup.</p>

River Rangers Week 1

Wildlife Puppets

Activity Time: 20-30 minutes

Activity Summary:

The Hudson River Estuary is a biodiverse ecosystem that provides habitat for hundreds of species of aquatic wildlife. Comb jellies, mud crabs and diamondback terrapins are just a few of the many animals that live in the Hudson River. Create your own Wildlife Puppet and watch your critters come to life!

Recommended Materials:

- Small paper bowls or plates
- String, cut in approx. 12 inch segments
- Construction paper or scrap paper
- Streamers or toilet paper cut in narrow strips (for jellyfish)
- Markers or paint
- Googly eyes
- Dowel, chopstick or stick
- Scissors
- Pencil
- Tape or glue

Instructions:

1. Punch a hole in the center of the bowl using the pencil large enough to thread the string through.
2. Thread the string through the bottom of the bowl and tie a knot at the end so that the bowl hangs upside down.
3. While the bowl is upside down, decorate the hood of your animal with marker or paint. See the pictures below for examples of a crab, turtle and jellyfish puppet. Feel free to use your imagination!
4. Trace the animal's limbs, tail, head etc on construction paper, color and add details then, cut them out. For jellyfish, cut the streamers into 9-12 inch pieces.
5. Tape the pieces along the rim of the bowl as pictured below.
6. Glue on the googly eyes or draw them on.
7. Tie the string to the end of the dowel, adjusting the length to your preference.
8. Watch your puppet swing and sway!

