

# STEM ACTIVITY OF THE WEEK



## Marine Ecology: Brackish Water Density

**Theme:** Hudson River Ecology; Density; Hudson River Geography

**Ages:** 5-12 years old

**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:

- Students learn about where the Hudson River Estuary gets its water from
- Students conduct an in-home 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.*

#### Sample Narrative to Teach:

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.

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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, 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!*

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.

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- 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.

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## 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