

**Introduction**

You'll use a web-based Animation to explore some dramatic changes that happen every day – in fact, twice a day – in New York City (NYC) and its surrounding waters. We'll be focusing on the lower part of the Hudson River Estuary. An **estuary** is a place where fresh water and salt water mix. We'll use the word **salinity** to describe this mixture more precisely as a measure of the amount of dissolved salts in water. Salinity is measured in practical salinity units (psu) and usually written just as a number without "psu".

**Explore a satellite image of salinity in the Hudson River Estuary**

Open this site:

<http://hudson.dl.stevens-tech.edu/maritimeforecast/maincontrol.shtml>

In the blue box on the right side of the screen, enter the following:

**Region:** NY/NJ Harbor Estuary

**Parameter:** Surface Salinity

**Select Station:** Leave as is

**Units:** psu

**Date:** 2009 July 17

**Time:** 00:00

You'll see a satellite image of the New York-New Jersey-Long Island Sound area. Take a few minutes to orient yourself to familiar landmarks like Central Park (in the middle of Manhattan), Brooklyn and the Bronx. Then focus on the major bodies of water: the Atlantic Ocean, the Hudson River, and Long Island Sound. Only the western end of Long Island Sound is visible in the area shown on the Animation. Examine the map of Long Island Sound shown below. Notice that the Sound is an arm of the Atlantic Ocean and that its water flows through the East River into New York Harbor.



Source: [http://en.wikipedia.org/wiki/File:Long\\_Island\\_Road\\_Map.gif](http://en.wikipedia.org/wiki/File:Long_Island_Road_Map.gif)

**Don't start the Animation yet.** Notice the vertical colored salinity bar on the left, showing salinities from 15 (purple) to 30 (deep red). Complete Observations 1-3, below, on the Journal page now.

1. Describe the areas of highest salinity (26 – 30) on the satellite photo. You can refer to any place names you know or use place names from the blue map above.
2. Where are the areas of lowest salinity (15 – 18)?
3. Compare the surface salinities of the Atlantic Ocean and the small part of Long Island Sound visible on the satellite image. What are some possible reasons for any differences you notice?

### Start the Surface Salinity Animation

Click on the small red arrow in the blue box. Watch the animation for some time. You can stop the animation at any time by clicking on the red square button and can re-start it by clicking the arrow again.

Watch the pulsing colors changing over time. As the tide comes in from the Atlantic Ocean and from Long Island Sound, high salinity ocean water (red in the animation) moves towards NYC. As the tide goes out, that high salinity ocean water retreats. Each

day has two advancing tides and two retreating tides. Watch the animation for a few minutes and see if you can spot these tidal changes.

Focus on the Hudson River and watch the salinity of its surface waters change. Then do the same for the East River (on the opposite side of Manhattan). Record observations 4 and 5, below, in your Journal.

4. Describe the changes in surface salinity you saw in the Hudson River.
5. Describe the changes in surface salinity you saw in the East River (on the opposite side of Manhattan).

**Change the parameter from Surface Salinity to Bottom Salinity**, keep everything else the same but don't start the Animation yet. First record observations 6 and 7 in your Journal.

6. **Before starting the animation**, describe the bottom salinity of the Atlantic Ocean near New York Harbor. Compare your results with the answer to #3 above.
7. **Before starting the animation**, describe the bottom salinity of Long Island Sound where it enters NYC. Compare your results with the answer to #3 above.

**Now start the Animation** and observe it for several minutes. Then record observations 8 – 12 in your Journal.

8. Describe the bottom salinity changes you observe in NY Harbor
9. How do those changes compare with the surface salinities you examined earlier?
10. Focus on the Hudson River and describe the changes in bottom salinity you see.
11. How do those changes compare with the **surface** salinity changes in the Hudson River that you observed earlier?
12. How would you explain the differences you observed between surface salinity and bottom salinity in both places?