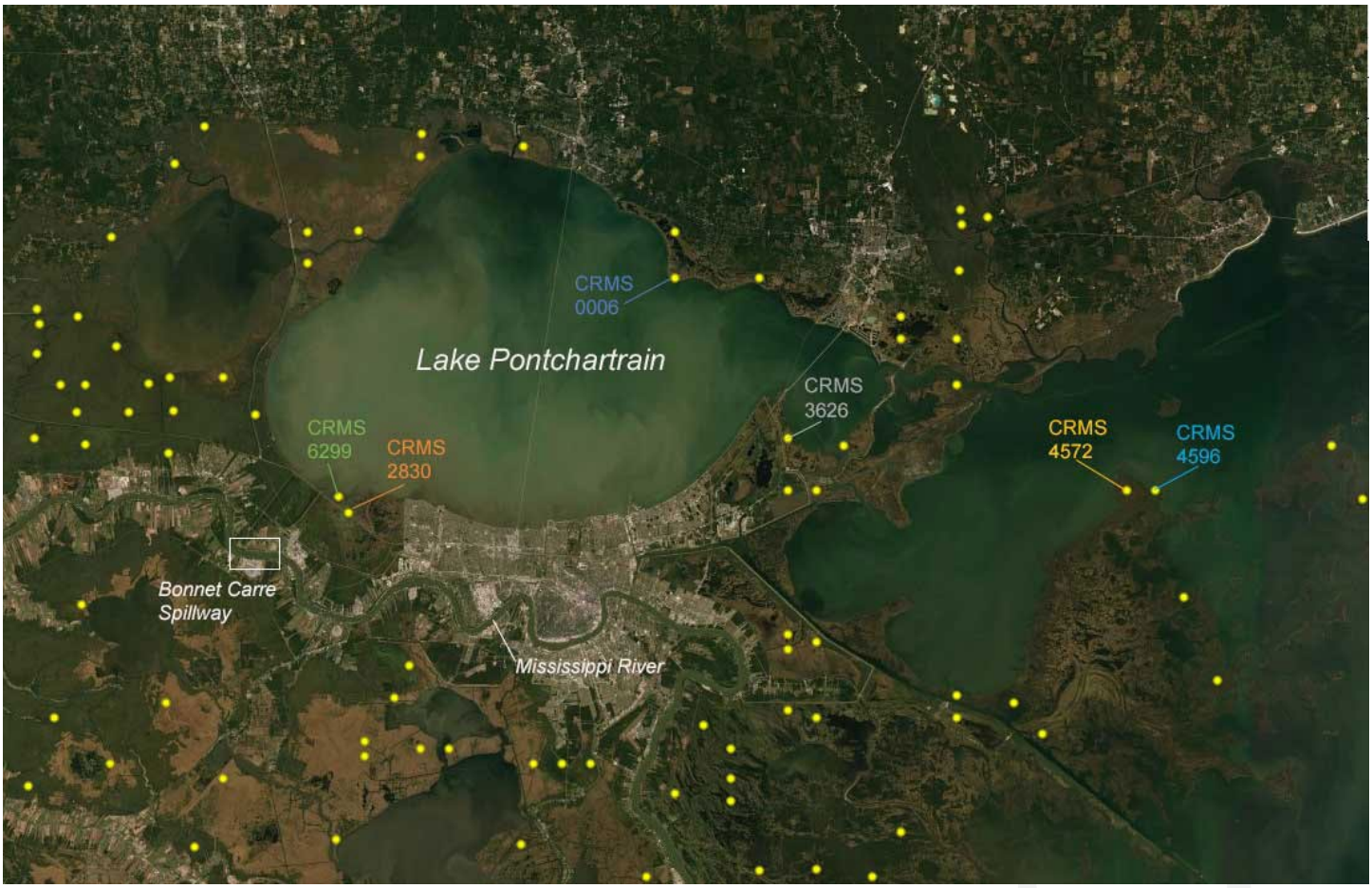
Names:

Brown Shrimp Investigation Student Sheet

Lesson 3 > Part 3 > Changing Ecosystems

Expert Group 3: Salinity in the Estuary

Use the map of Lake Pontchartrain, the NOAA Salinity in Oceans & Wetlands reading, and the Salinity Graphs on page 25 to answer the questions below.



This map shows Coastal Reference Monitoring Sites (CRMS) in the Lake Pontchartrain area. Each yellow dot marks the location of a CRMS site, where many different data points, including salinity data, are collected. Lake Pontchartrain opens up to the Gulf of Mexico on the right side of the image.

1. Look at the six labeled CRMS sites on the map of Lake Pontchartrain, predict which sites you would expect to have higher or lower salinity. Rank each site from lowest to highest salinity, label your rankings on the map.

NOAA: Salinity in Oceans & Estuaries

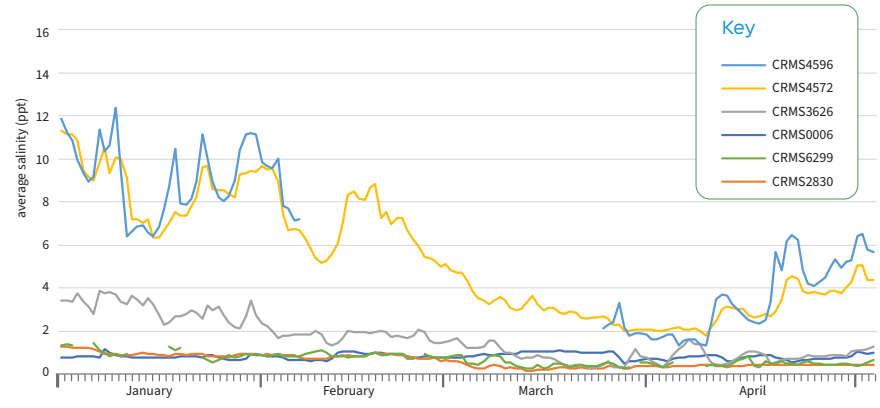
Under laboratory conditions, pure water contains only oxygen and hydrogen atoms, but in the real world, many substances are often dissolved in water, like salt. Salinity is the concentration of salt in water, usually measured in parts per thousand (ppt). The salinity of seawater in the open ocean is remarkably constant at about 35 ppt. Salinity in an estuary varies according to one's location in the estuary, the daily tides, and the volume of fresh water flowing into the estuary.

In estuaries, salinity levels are generally highest near the mouth of a river where the ocean water enters, and lowest upstream where freshwater flows in. Actual salinities vary throughout the tidal cycle, however. Salinity levels in estuaries typically decline in the spring when snowmelt and rain increase the freshwater flow from streams and groundwater. Salinity levels usually rise during the summer when higher temperatures increase levels of evaporation in the estuary.

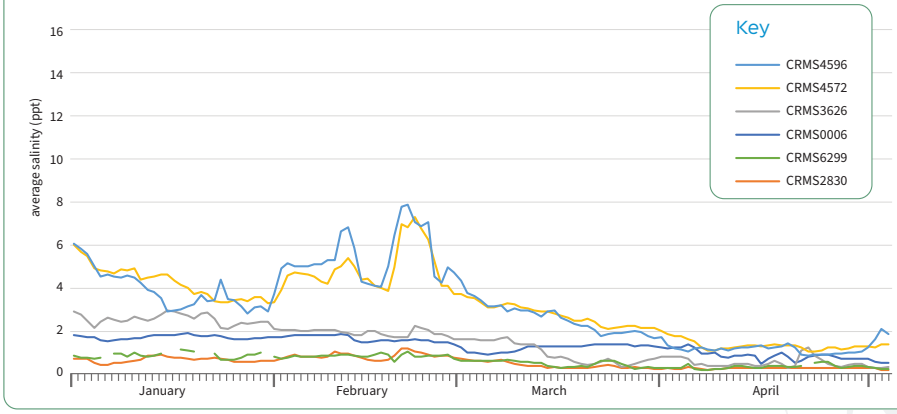
Estuarine organisms have different tolerances and responses to salinity changes. Many bottom-dwelling animals, like oysters and crabs, can tolerate some change in salinity, but salinities outside an acceptable range will negatively affect their growth and reproduction, and ultimately, their survival. Salinity also affects chemical conditions within the estuary, particularly levels of dissolved oxygen in the water. The amount of oxygen that can dissolve in water, or solubility, decreases as salinity increases. The solubility of oxygen in seawater is about 20 percent less than it is in fresh water at the same temperature.

Source: oceanservice.noaa.gov/education/tutorial_estuaries/media/supp_est10c_sal.html

Average Salinity at Six Locations from January 1 to May 3, 2018



Average Salinity at Six Locations from January 1 to May 3, 2019



2. Based on the NOAA Salinity reading, and the Salinity Graph for 2018, compare actual salinity to your predictions. Briefly explain why some areas are more or less saline, and how salinity might affect the ecosystem structure (i.e., the plants and animals that live there).

3. In 2019 the Bonnet Carre Spillway was opened from February - July, allowing millions of gallons of fresh water to flow into Lake Pontchartrain. Compare the 2018 and 2019 salinity data.
   - What patterns do you notice in the 2018 data? What might explain these patterns?
   - How is the 2019 data different?
   - How might the natural patterns have been disrupted by the opening of the spillway?

4. How does this information relate to the investigation question for today: *How are brown shrimp impacted by the changing coastal environment? How does this affect the people of Louisiana?*

5. **When you return to your home group,** compare information about the Brown Shrimp lifecycle from Group 2 to what you have learned about the salinity at each of the six CMRS sites to predict where in Lake Pontchartrain Brown Shrimp might be at different stages in their life cycle.