

Name _____

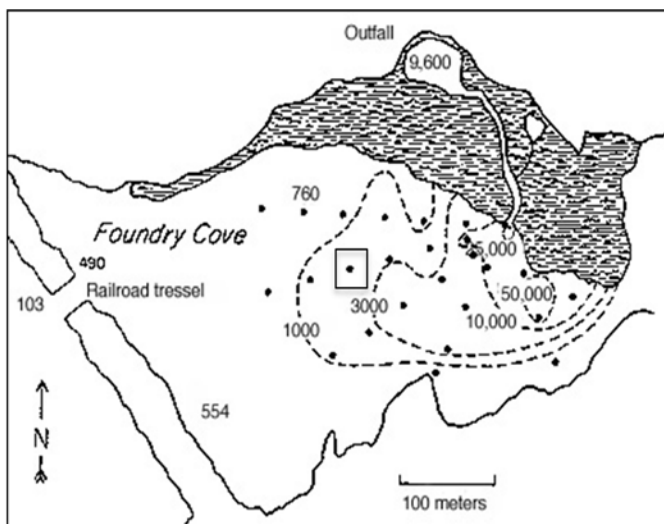
Date _____

Cadmium in the Cove: What happened to it?

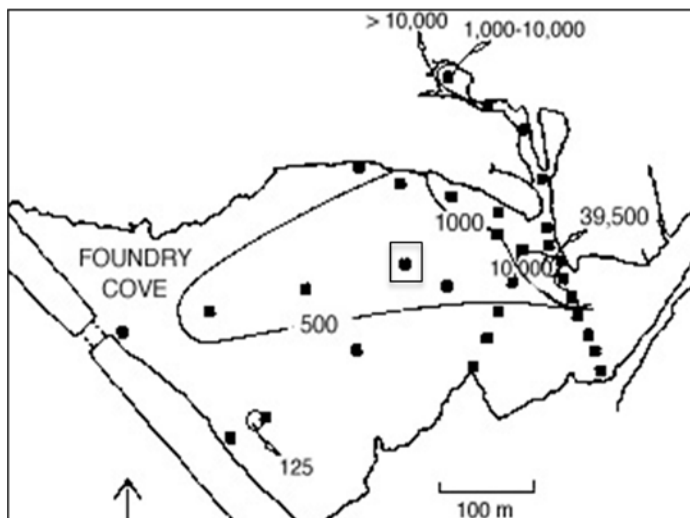
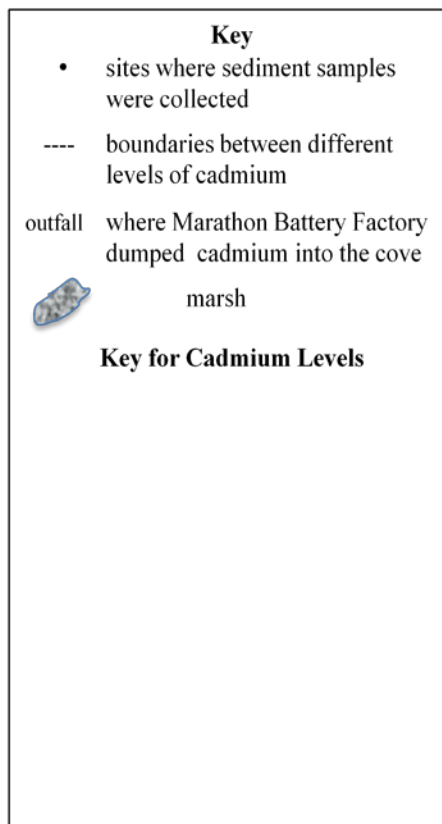
How could scientists find out where the cadmium went after it left the Marathon Battery outfall?

A. Cadmium in the Cove

Scientists collected and tested soil sediments from Foundry Cove in 1975 and 1983. They wanted to know the level and distribution of cadmium contamination in the cove and to learn how these changed over time. They measured cadmium in a unit called 'ppm' –parts per million. The 1975 and 1983 samples with squares around were measured to be 2000 ppm and 750 ppm, respectively.



1975, Foundry Cove
Distribution of cadmium in surface sediments



1983, Foundry Cove
Distribution of cadmium in surface sediments

The outfall site is shown on the 1975 map because the factory was operating and releasing contaminated wastewater at that time. The factory closed in 1979 so the outfall is not shown on the 1983 map.

1. Scientists often add visuals to data to make it easier to understand when you look at it. The above maps have numbers and lines, but they would be easier to read and compare at a glance if the contamination levels were color-coded.

Help the scientists by color-coding these two maps so that the changes in cadmium levels are easier to see. Notice that the ranges of cadmium levels are not the same on both maps – for example, there is a line at 500 ppm on the 1983 map but not on the 1974 map. Plan ahead! Then color the maps and use the box provided to make a key.

2. Use the maps to fill out the chart below.

	1975 cadmium level	1983 cadmium level
Where in the cove is the lowest level?	<i>Just north of the train trestle near the outlet to the Hudson River</i>	<i>South of the train trestle</i>
Lowest level in the cove in parts per million	<i>490 ppm (103 ppm in the Hudson River just outside the cove)</i>	<i>125 ppm</i>
Where in the cove is the highest level?	<i>Near the southern end of the marsh</i>	<i>In or near the southern end of the marsh</i>
Highest level in the cove in parts per million	<i>50,000 ppm</i>	<i>39,500 ppm</i>

3. How does the level of contamination in Foundry Cove in 1975 compare to that of 1983?
In most locations in the marsh and in cove, the levels of cadmium are lower in 1983. The “shape” of the cadmium levels in the cove has changed. In 1975, the cadmium was concentrated at southern end of the cove near the marsh. In 1983, the cadmium is spread out and seems to be moving towards the trestle.

B. Where did it go?

Look at the new information below and think about what might have caused the changes in cadmium levels that the scientists found.

Additional Information

- a. On the maps above, all cadmium levels shown are at the *surface of the mud* in the cove.
- b. Between 1975 and 1983, there were no cleanup projects at Foundry Cove.
- c. Batteries continued to be produced until 1979.
- d. Freshwater in the form of natural run-off, storm water, and snowmelt enters Foundry Cove from Foundry Cove Creek and other sources.
- e. Foundry Cove is a tidal cove so Hudson River water flows in and out, mostly under the train trestle, about twice a day.
- f. In 1983, scientists also sampled cadmium levels in the sediments *below the surface of the mud* in the cove, but these data are not shown on the maps.

g. In some locations in Foundry Cove, the highest cadmium levels were found 20 cm or more below the surface.

1. Why do you think the cadmium wasn't evenly spread out in the cove in either map? The highest cadmium concentrations are seen in or near the southern end of the marsh, so this may be where the waste water entered the cove or there may be consistent currents that cause the cadmium to settle out there. Tides and incoming freshwater from the land move water and carry sediments, so cadmium and sediments are deposited unevenly around the cove.

2. What might account for the lower levels of cadmium the scientists found in 1983? Cadmium was carried out of the cove (evidence: cadmium at 103 ppm in 1975). Cadmium could have been covered by incoming sediments carried by tides or freshwater runoff and snowmelt. Animals might eat or absorb cadmium. Since cadmium is an element, it can not "break down."

3. How do you think cadmium got into the Hudson River?

Possible answers: Abiotic--carried by tides, washed out during floods; Biotic--eaten by animals that eliminate wastes or die in the Hudson

4. How could you test one of your ideas about how cadmium got into the river? Various answers.