

Unit: Lowell and the Industrial Revolution

Author: Sheryl Kokkinos: Third Grade, Acton, MA

Lesson Topic: Human-Environment Interaction

Grade Level: Elementary

Class Time: 90-100 Minutes (two periods, two days apart)

Objectives:

- Students will be able to describe the importance of the Merrimack River in the Industrial Revolution.
- Students will be able to explain how the Industrial Revolution changed daily life.
- Students will be able to explain the environmental impact of the Industrial Revolution.
- Students will draw connections between individual actions and results in the community.

Prerequisite knowledge/Background Information:

We will have been studying change from farm to factory in this unit and have read the story ***A River Ran Wild*** about how the Nashua River changed over time. After reading ***The Lorax***, we will compare the book to the Lowell Mills then we will explore what happens with increased pollution in the water by doing a class experiment.

Materials:

- ***The Lorax*** by Dr. Seuss
- Picture of pollution on the river
- Containers of —pollution - 1 black plastic film canister per student (often available for free from film processing stores)
- canister labels (available at <http://www.populationeducation.org/media/upload/potomac7-04.pdf>)
- canister ingredients – (all ingredients are safe for students to handle and listed on above website)
- clear gallon jar/container of water
- graphic organizer
- interactive pollution story from Population Connection (adapted for the Merrimack River)

Procedure:

1. Students will review knowledge of the industrial revolution, what it was, and how industrial growth changed the economy in the United States.
2. We will read ***The Lorax*** and compare the story to industrial Lowell.

3. Students will observe the **Boott Mill** weaving machines in Lowell **via Youtube** to get a sense of what the factory was like and why it needed power.
4. Students will then listen to a story of how the Merrimack River was polluted by the Lowell Mills and as each part is read they will pour their pollution into the —river.
5. Students will observe pollution and discuss how it might be cleaned up.
6. The lesson will continue a few days later after the polluted river settles and we will try different methods of clean up.

Assessment

- Students will complete a graphic organizer comparing environmental results from *The Lorax* and the Industrial Revolution (from fiction vs. non-fiction)

Included Materials



Interactive Story: Who Polluted the Merrimack River? (Based on Who Polluted the Potomac)

For many thousands of years, people have lived on the banks of the Merrimack River. They hunted in the forests, harvested foods from wetlands, and caught fish in the river.

Imagine that the jar of water in front of you was taken from the Merrimack River by a Native American about 500 years ago.

How does it look to you?

Does this look like water that you might: drink? swim in? eat? fish from?

One of the first explorers to visit the river kept a journal of his discoveries. He wrote about the Native American villages, the tributaries of —sweet water, and seeing so many fish that he and his crew tried to scoop them out with a frying pan. Soon colonists began to arrive. They found fertile land for farming, forests teeming with wildlife, and a river that provided ample food and water. It was an outstanding environment for settlement, and the colonists prospered.

How do you think the colonists used the river?

(Possible answers might include: bathing, food, drinking and cooking water, transportation, etc.)

Do we use our rivers in the same way/s today?

What are the similarities and differences in the way we use the river?

(Students may immediately recognize direct similarities like transportation and food, but may not realize that the water they use everyday also may come from a local waterway to their tap.)

The river has changed a lot since it was first explored. This is the story of those changes. Listen for the name of the character printed on your canister. When you hear your character named, open the canister, and dump its contents into the river.

Years went by, and occasional storms drenched the area. High winds whipped through the **trees** and blew leaves into the water. Gradually, the city of Lowell, grew on the banks of the Merrimack. Developers cleared wetlands and forests to build houses and businesses. Rains washed loose soil from **construction sites** into the river.

Is this water safe to drink? (If the response is —no,I'd ask if the river had leaves or soil in it when explorers first drank from it).

Would you swim in it? Is it safe for wildlife?

At first, the city was small. Upstream, **farmers** planted crops to feed the city's growing population. Some of these crops grew right up against the banks of the river, and fertilizer washed off the land and into the water. Other farmers kept pigs and other animals in their **barnyards**. As rainwater drained out

of the barnyard, it carried some of the manure into a little creek behind the farm. The creek flows into the river.

Would you drink this water now? Would you swim in it? Go boating on it?
Is it safe for wildlife?

As the city grew, **textile mills**, dyes and debris from manufacturing invaded the canals and river. More and more people began to move to the nearby countryside. These rural houses are not connected to the city sewer system. Waste water from these houses flows into septic tanks under the ground. One **homeowner** has not maintained the septic tank and poorly treated sewage seeped into the river. To meet the electricity needs of the city, area officials decided that they would need to generate more power. Far upstream, a **coal mine** was dug. Rainwater drained down into the mine shaft and soaked the piles of wastes and scraps from mining. This made the rainwater become acidic—sort of like a strong vinegar. Then the acid water trickled off the banks and back out into the river.

To burn the coal, and produce the power, an electric **power plant** was built along the river. Gasses coming out of the smokestacks combine with moisture in the air to form acids. The pollution falls back to earth as acid rain or smog.

Would you drink this water now? Would you swim in it? Go boating?

How could we determine if this water was safe for wildlife? (**Possible answers might include: noticing evidence of dead animals, testing for pH levels with litmus paper or chemical testing, viewing water samples under a microscope, performing organism counts, etc.**)

Now, Lowell is one of the largest metropolitan areas in Massachusetts. Traffic congestion is a big problem for **commuters** who drive their cars to and from work. Car exhaust fumes (just like power plant fumes) cause acid rain. If a car is not kept in good repair it might also leak oil or other fluids, which will be washed off the pavement and into the river with the next rain.

And how do the residents of the city and its suburbs spend their time? In one neighborhood, lots of **gardeners** are out working in their yards. Many of them are using weed killers and insect sprays to keep the lawns pretty. The next rain will wash these poisons into a little creek nearby, and then into the river. One father is teaching his daughter how to change the **antifreeze** in their truck. They pour out the used antifreeze into the driveway. Antifreeze is sweet tasting and can poison animals that lick it. It can also get into the nearby creek and poison fish.

Nearby, a boy **washes the family car**. The soapy water rushes down the driveway into the storm drain; the storm drain empties into the river. The grease and grime on a car can contain asphalt from the roads, asbestos from the brakes, rubber particles from the tires, toxic metals, and rust. If the boy had gone to a local car wash, the water would have been treated before it returned to the river.

Next door, a family is cleaning out their garage. They find an old rusty can with a tattered skull and crossbones label still stuck on it. What could it be? It looks dangerous and they want to get rid of it before someone gets hurt. But how? Junior gets an idea: —Let's pour it down the drain out by the curb! So the **mysterious liquid** goes down the storm drain. The poison is out of sight – but is headed for the river.

On nice days, many people head down to the river. Some zoom up and down the river in **motorboats** and don't notice that a little engine oil leaks into the water. A group of friends have spread blankets on the shore for a **beach party**. Lots of families are **picnicking** in the parks, too. Some of these people have left trash on the shore. With the next storm, that trash will wash into the river. On the shore a **person fishing** snags a hook on a log, and breaks off the nylon fishing line.