



★ *the* CHILDREN'S MUSEUM OF NEW HAMPSHIRE

RIVERS: Bringing New Hampshire To Life  
Natural Science & New Hampshire History Curriculum

Created with generous support from the  
Roger R. and Theresa S. Thompson Endowment Fund





An Introduction to  
*Rivers: Bringing New Hampshire To Life*



If the rivers of New Hampshire could talk, what stories they would tell. They would tell about their own journeys, about the life teeming within them and along their shores, and their important role in sustaining the state's natural resources.

Rivers could tell us about their relationship with humans, from Native Americans paddling their waterways in birch bark canoes, to European explorers and early settlers navigating their lengths in search of natural resources such as timber, granite, furs and fish to sell or trade.

Rivers could tell us how the power of their rushing waters was harnessed to run machinery in saw mills, grist mills, tanneries and other manufacturing mills as early as the 1700s. Rivers were key players in the Industrial Revolution. They not only provided the power to run huge mills, particularly cotton textile mills throughout the state, the rivers also served as highways, supplying the mills with a way to efficiently transport raw materials and finished goods to and from the mills.

If New Hampshire rivers could talk, they would tell us about the people who worked in those mills along their shores: children working to support their families, young women seeking financial independence and equality, and immigrants seeking a better life in a new country.

Since rivers cannot talk, this curriculum aims to tell part of New Hampshire's historical and natural story, using lives along the river as a unifying theme.

*Rivers: Bringing New Hampshire To Life* would not be possible without the generous support from the **Roger R. and Theresa S. Thompson Endowment Fund.**

We appreciate the Foundation's dedication to improving the lives of children in New Hampshire, as well as the educational mission of The Children's Museum of New Hampshire.



Dear Educators,

At the Children’s Museum of New Hampshire, we are focused on providing unique, interactive learning experiences for children of all ages through educational exhibits and programs. One exhibit in particular, *Cohecosystem: Lives Built on the River*, weaves together the ways that both animals and humans have constructed their lives around the energy and the resources of the Coheco River system. In looking closely at this single river and the complex and dynamic web of life it supports, visitors learn much about the essential role that rivers play throughout New Hampshire, New England, and beyond. The museum offers focused group visits as a way for school groups to extend their learning beyond the exhibit itself.

The lessons you will find included in *Rivers: Bringing New Hampshire To Life* were created to provide teachers with new paths to follow, new “tributaries” to explore in the study of the natural and historic aspects of New Hampshire rivers. They complement a visit to our Cohecosystem exhibit, but can also be used as a stand-alone resource. The first section focuses on nature’s relationship with the state’s rivers, and the second half is dedicated to humans’ relationship with these rivers. Included with the publication are printable activities, historical photographs, interviews and memoirs of mill workers and supplemental learning activities for students in grades kindergarten through second grade.

Lesson plans were developed for students in third through fifth grade, although the concepts and ideas for implementation can certainly be modified to serve both younger and older students. You may find that some lesson plans contain more information than you are looking for, or seem either below or above your students’ academic level. When designing this curriculum, we approached the task much like we do when creating a new exhibit or program. We strive to provide children with as many entry points and as many ways of approaching the subject as possible. This curriculum is designed to help students construct meaning in a way that works best for them.

Much like the meandering path of a river, the themes and subject matter took an organic flow during the development phase of this project. And as with rivers, we followed a natural path where it led us. We didn’t turn over every rock, follow every stream, or explore every wetland. Although we regret any omissions to the tale of New Hampshire’s people and rivers, we welcome your feedback and thank you for sharing the journey with your students.

Regards,

A handwritten signature in cursive script that reads "Jane Bard".

Jane Bard, M. Ed., Education Director  
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The Children’s Museum of New Hampshire  
[www.childrens-museum.org](http://www.childrens-museum.org)



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Rivers: Bringing New Hampshire To Life

# River Life & Ecosystems





## How Rivers Form and Flow

### *Big Ideas:*

- Students will explore how a river forms and learn how its course can change over time.
- By creating a river system model, students will gain a greater understanding of the parts of a river and how they connect.
- Students will examine the rivers of New Hampshire and trace their origins and the path in which they flow.

### *Standards:*

- Representing and understanding results of investigations.
- Represent and interpret information and observations in many ways.
- Compile and display data in a variety of formats.

### *What You'll Need:*

- Topographical map of New Hampshire, focusing on an area near you. You may wish to project this for students to look at together or make copies for students to look at on their own, or perhaps both. You may find that satellite images found on the internet at Google Maps work well for this activity.
- Copies of "How A River Forms and Flows – Words to Know" found at the end of this lesson
- Drawing paper
- Markers/drawing materials
- Science journals or writing paper
- Large piece of cardboard (a clean pizza box works well)
- Mixing bowl
- Measuring cups
- Paints and brushes
- Salt
- Flour
- Water

### *A Little Background:*

#### How do rivers form naturally?

A **watershed** is the term used to describe an area that has a set of streams and waterways that drain into a larger body of water. Watersheds can be small or large. Watersheds are usually divided by high points of land, such as mountains and are named by the body of water or river that the water drains into. Smaller watersheds usually flow into larger watersheds. For example, the Mississippi watershed flows into the Gulf of Mexico.

Small streams flow together to form small rivers; small rivers flow together to form medium rivers; medium rivers flow together to form large rivers, which flow into oceans. A **tributary** is formed when a small river flows into a larger one. **Headwaters** are the tributaries that come together to form a river, and usually are found in mountain areas, but can form in lowland meadows and desert springs. Watershed boundaries are located at the tops of hills and mountains because water flows downward, draining toward another body of water.

The rain and snow that falls to Earth and is not absorbed by plants flows off the land and into rivers, streams and lakes, and eventually into the oceans. This is called **run-off**. Not all water becomes run-off. Some water soaks into the ground, where it is filtered through layers of soil and rocks and becomes **groundwater**. This groundwater can also enter into rivers, streams and ponds through a process called **infiltration**. Areas that are dry during periods of dry weather can fill and flow with water when there is **precipitation**. Ditches and small brooks also contribute to rivers. Rivers can be thought of as a system by which extra water is transported to oceans.

River water also originates from snowcap and glacial melting. This water flows downhill with gravity. In steep mountainous areas, a river can run quickly, forming strong rapids. In flatland areas, streams are slower and **meander**, or curve.

Where a river flows into an ocean is called the **mouth of the river**. Where river water flows in together with the salty ocean water, an **estuary** is formed.

### **Does the course of a river change over time? If so, how does that happen?**

The course a river takes can change over time. These changes are caused by two forces, nature and creatures who live along the river.

Because all living things depend on water for life, rivers are teeming with life. Many plants, animals and humans build their lives along rivers and use rivers as a resource. People use rivers for food, transportation and power. People also build dams and **levees** that disrupt the natural flow of rivers. People try to control rivers to prevent flooding and also to harness the power of the flow of rivers to create and use **hydropower**.

People are not the only dam-builders. Beavers also build dams to form ponds in which to build their lodges. Both humans and animals such as the beaver can change the course of a river by building along the river and changing the natural flow of water.

**Erosion** and **flooding** are examples of river flow changes caused by nature. Erosion typically happens slowly over long periods of time as the river rushes against the land at the rivers' edge. Soil from the riverbank washes into the river, washing away nutrients for river plant life and disturbing the balance of the plant and animal life of the river ecosystem. Building and paving surfaces close to rivers causes erosion because rainwater and snowmelt do not penetrate these hard surfaces, and runoff runs directly into the river, often causing flooding which can increase erosion.

### **The watersheds of New Hampshire:**

New Hampshire has five main watersheds. These include:

- Connecticut
- Merrimack
- Androscoggin
- Piscataqua
- Saco

All New Hampshire watersheds empty into the Atlantic Ocean.

Running along the boarder of New Hampshire and Vermont, the **Connecticut River** is the largest in New England, with a watershed that drains approximately 1/3 of the New Hampshire. It has 38 tributaries and flows through four states before draining into Long Island Sound.

The **Merrimack River** flows as the Pemigewasset River from Profile Lake in the White Mountains, traveling through the state toward Newburyport, Massachusetts where it flows into the Atlantic Ocean. The Merrimack River watershed drains approximately 40 percent of New Hampshire and contains most of the state's lakes and ponds.

The **Androscoggin River** flows from Lake Umbagog in Maine, into several Northeast communities in New Hampshire before crossing back into Maine and toward the Atlantic Ocean. The Androscoggin River was once used as a means of transportation for the logging and paper industry.

The **Piscataqua**, or coastal watershed, includes the Piscataqua River and other direct tributaries to the Atlantic Ocean. The Piscataqua River, which flows through Portsmouth toward the ocean, begins at the merging of the Cocheco River and Salmon Falls near Dover, NH and Eliot, Maine. The Piscataqua is a tidal river and its ecosystem is unique to this coastal part of the state. The coastal watershed includes Great Bay estuary.

The **Saco River** watershed flows through the White Mountain National Forest, and drains into forested and mostly undeveloped land in eight New Hampshire communities before crossing into Maine and flowing toward the Atlantic Ocean. It provides a habitat to a large number of wildlife.

You can find more information on the watershed of your community online at the United States Government Environmental Protection Agency website:  
<http://cfpub.epa.gov/surf/locate/index.cfm>

and the US Geological Survey website:  
<http://waterdata.usgs.gov/nh/nwis/current/?type=flow>

A list of New Hampshire rivers, as well as the tributaries that flow into each river can be found at:  
[http://www.absoluteastronomy.com/topics/List\\_of\\_New\\_Hampshire\\_rivers](http://www.absoluteastronomy.com/topics/List_of_New_Hampshire_rivers)

The following link provides some great resources for student research, including illustrated field guides and information on river ecology, as well as fact sheets containing specific river maps, history, wildlife, fish and plant information:  
<http://des.nh.gov/organization/divisions/water/wmb/vrap/categories/publications.htm>

## **What To Do:**

Talk about rivers:

### **What You'll Need:**

- Topographical map of New Hampshire, focusing on an area near you. You may wish to project this for students to look at together or make copies for students to look at on their own, or perhaps both. You may find that satellite images found on the internet at Google Maps work well for this activity.
- Copies of "How A River Forms and Flows – Words to Know" found at the end of this lesson.

Ask students for their ideas about how rivers form. Discuss where a river originates, where the water comes from and how it flows. Introduce the concepts of a watershed and talk about tributaries.

Explain that rivers naturally flow toward the ocean, but that the path a river forms can change over time. Discuss the ways in which a river course can be altered.

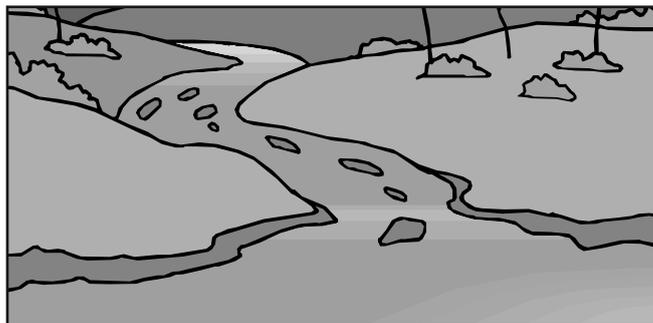
Look at your topographical map, noticing the features that are illustrated. Review the legend and help students recognize the symbols represented on the map. Find a nearby river and ask students to trace its path, starting at a point of origin and following its path to a major river or ocean. Notice other streams and tributaries that it meets. Talk about the river as part of a local watershed. (At the end of this lesson you will find a map of New Hampshire detailing the state's rivers and lakes that you can share with students.)

Visit a river:

### **What You'll Need:**

- Topographical map of New Hampshire, focusing on an area near you. You may wish to project this for students to look at together or make copies for students to look at on their own, or perhaps both. You may find that satellite images found on the internet at Google Maps work well for this activity.
- Copies of "How A River Forms and Flows – Words to Know" found at the end of this lesson.

Go on a river walk to observe a nearby stream, river, or estuary. Talk about how this waterway would be characterized, and how it relates to the larger watershed. Is this waterway a tributary to a larger river? Or is this a river that flows to the ocean? Perhaps it is an estuary where a river meets the salt water of a bay? Discuss the flow of the water, does it meander or flow rapidly downhill? Is there any visible erosion? Is there evidence of human or animal impact on this waterway? Look at this waterway on a map that shows its origins as well as where it flows downstream from where students are so that they can visualize this waterway in the larger context of a watershed.





### Create a river model:

#### **What You'll Need:**

- Drawing paper
- Markers/drawing materials
- Science journals or writing paper
- Large piece of cardboard (a clean pizza box works well)
- Mixing bowl
- Measuring cups
- Paints and brushes
- Salt
- Flour
- Water

Have students create a topographical map of a river. If the class has gone on the river walk, the map may be of the river they observed. If the class has not gone on the river walk, they may create a map of a nearby river they have seen and observed on a real map. They might do some research to learn more about the watershed that their river is in, looking up the tributaries, headwaters and outlets. Their drawing should represent a river's origin and map its path as it flows toward the ocean. Students should create a key to the symbols used to represent the topographical features, including elevation (mountains, hills), vegetation (trees, shrubs), and bodies of water (waterways, lakes, river, ocean).

As a class, in small groups, pairs or as individuals construct a salt relief model of the watershed using salt, water and flour. Expect that this project will take several days because the salt-flour-water mixture needs to dry completely before it is painted. Before mixing the ingredients, map out the shape and area for your model on the cardboard base. Then mix the ingredients using this recipe:

#### **Recipe salt relief map:**

- 1 cup water
- 2 cups all purpose flour
- 1 cup salt

Mix all ingredients, adding more flour, salt or water as needed until a thick cookie-dough consistency is reached.

Spread the dough mixture over the mapped out area, creating the base. (Depending on the size of the river model you map out, you may need to double this recipe). Next, use more dough and hands to shape mountains and hills. A plastic knife, narrow ruler, the handle of a fork or clay tool can be used to carve the river, tributaries and/or to form ponds or estuaries. Allow the mixture to dry completely before painting. Starting the project on a Friday and allowing the mixture to dry over the weekend is ideal. After the dough has dried, it can be painted. Students can use toothpicks to label the parts of their river map, using the "How A River Forms and Flows – Words to Know" as a reference. Other environmental details, such as trees and rocks, can be included as well.

#### **What Did You Discover?**

To reinforce their understanding, have students rotate around the room looking at their fellow classmates' models, or have students share their models with students from another class or grade level. Have students identify different features of their river model and the way in which they are connected and part of the watershed. Keep copies of the "Words to Know" handy and encourage students to use those words when referring to parts of their models and the workings of a watershed.

### ***More On The Subject:***

Learn more about **erosion**, the wearing away of soil and land. Talk about what erosion is and why it can be harmful to a river ecosystem. Erosion typically happens slowly over long periods of time as the river rushes against the land at the rivers' edge. Soil from the riverbank washes into the river, washing away nutrients for river plant life and disturbs the balance of the plant and animal life of the river ecosystem. The more energy a river has, the more erosive it can be. Water moving over land that has a great slope will move more quickly and therefore be more erosive. Building and paving surfaces close to rivers causes erosion because rainwater and snowmelt does not penetrate these hard surfaces, and runoff runs directly into the river, often causing flooding which can increase erosion.

### **Make A Riverbed Project:**

#### ***What You'll Need:***

- A quart-sized cardboard milk container
- Soil
- Pencil and scissors
- Watering can and access to a sink
- A plastic tub for catching the runoff and two clear containers of equal size

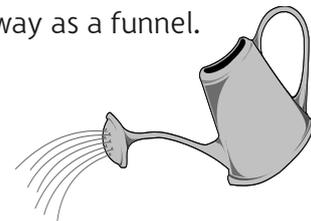
#### **What To Do:**

Create a riverbed using a milk carton and soil to simulate a river course and experiment with different river "currents" to observe how erosion takes place.

Cut a quart sized milk carton in half lengthwise, opening the spout partway as a funnel.

Fill the carton with dry soil, leaving 1/3 of an inch of space at the top.

Now create a groove in the soil the length of the carton using a pencil.



With a plastic tub at the bottom, tip the carton slightly. Using a watering can of water to simulate rain, pour water onto the soil at the top of the slope, from three feet above the soil, for approximately 30 seconds. A river will flow down the slope, out the spout and into the plastic tub.

After the water stops flowing, pour the water from the plastic tub into a clear container using a funnel. Be sure to collect all the mud from the container. Wait for the sediment to settle to the bottom of the clear container and measure the soil at the bottom. This is a measure of "erosion."

Now repeat the entire activity, emptying and putting fresh soil in the carton. This time create a steeper slope with the carton, which will result in a more rapid "current." Collect the muddy water in the plastic tub and as before, transfer into a second clear container and measure the soil in the second container.

Compare the amounts of "erosion" in each experiment. In which experiment was there more erosion? Did the speed and flow of the water have anything to do with the amount of erosion?

Ask students to consider factors that increase river currents, and therefore erosion. Knowing what they do about rivers and run off from the land, what might cause rivers to fill and flow faster? What can be done to slow this down?

Ask students to think about what happens when it rains. Where does the water flow? Have they noticed natural ways the water moves? Are there human-designed ways to move the water? Ask students to notice and observe what happens the next time it rains.



## How Rivers Form and Flow

### Words To Know

**Erosion** – the group of natural processes, including weathering, dissolution, abrasion and corrosion by which soil and rock is worn away from the earth’s surface.

**Estuary** – the area of a river mouth which is affected by sea tides or the part of the wide lower course of a river where its current is met by the tides; where river water is mixed with seawater.

**Groundwater** – water beneath the earth’s surface, often between saturated soil and rock, that supplies wells and springs.

**Headwaters** – the source and upstream waters of a stream or lake.

**Hydropower** – power that comes from the weight or motion of water, used as a force to drive machinery.

**Infiltration** – the process of water entering the soil, the slower the infiltration rate, the more run-off.

**Levee** – a raised bank of sediment deposited by flowing water on the sides of a river; the bank is built up when the river deposits sediment during flooding.

**Mouth of river** – the lowest point of a river’s flow; where a river flows into an ocean, sea, estuary, lake, reservoir, or another river.

**Precipitation** - water that falls to the ground in all forms, including rain, snow, sleet or hail.

**Run-off** – the movement of rain water over ground; run-off occurs when the rainfall is very heavy and when the rocks and soil can’t absorb any more water.

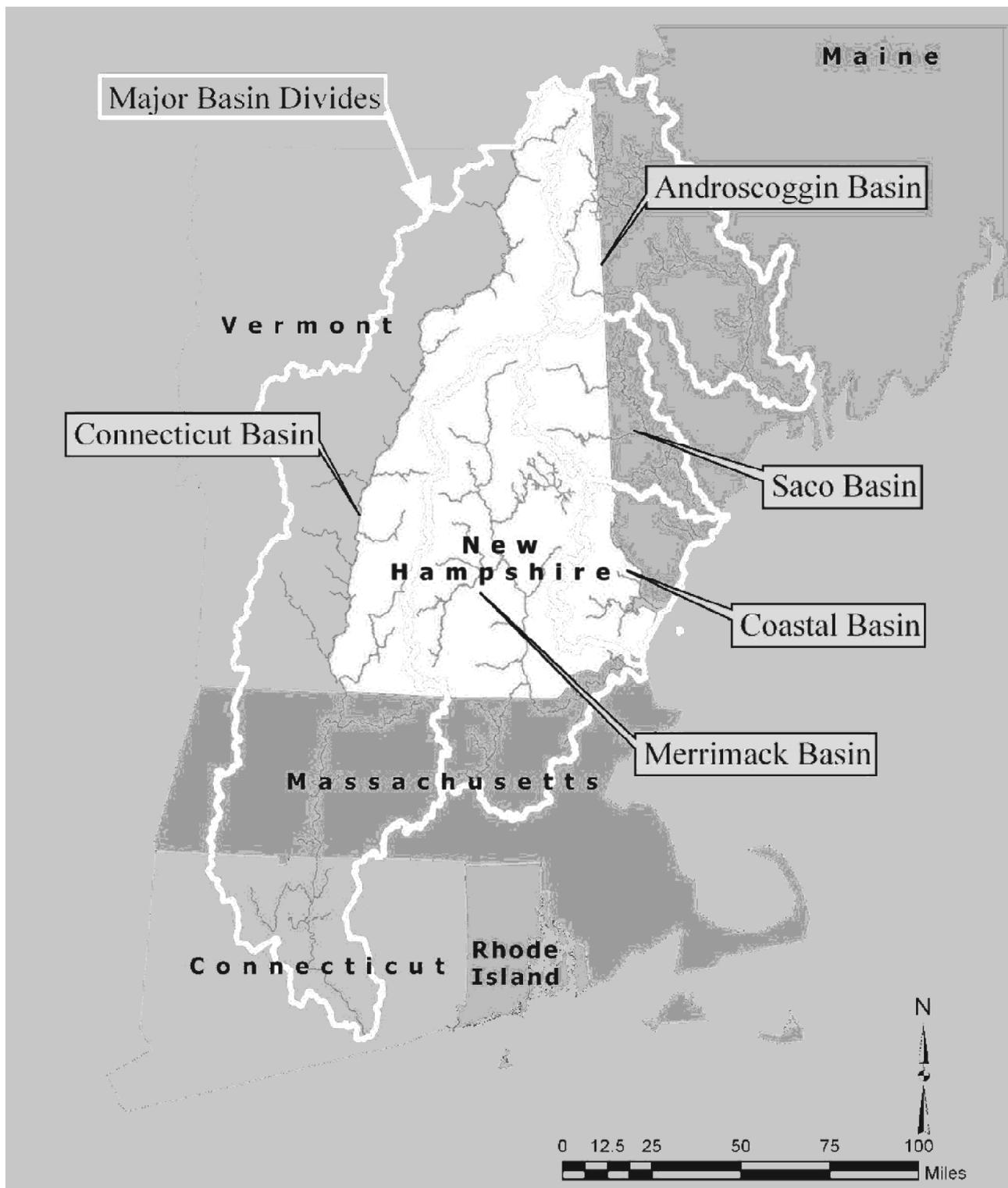
**Tributary** – a stream that flows into a larger stream or other body of water.

**Watershed** – a watershed carries water “shed” from the land after rain falls and snow melts, drop by drop, water is channeled into soil, groundwater, creeks and streams, making its way to larger rivers and eventually the sea; a watershed is the whole region which contributes to the supply of a river or lake.

### Map of New Hampshire's Major Rivers and Lakes



References and Resources for *How Rivers Form and Flow* Lesson



## It's Alive!...Or Is It?

### What's living (and non-living) along the river?

#### **Big Ideas:**

- Students will identify characteristics that determine if something is living or nonliving and use those characteristics to classify things as living or non-living.
- They will learn that several criteria have to be met in order to classify an object as living.
- Students will learn that living things develop and grow, and have needs such as food and water.
- Students will also find out that things that were once living and are now dead are still classified as living objects.

#### **Standards:**

##### Classification:

- Differentiate between living and nonliving things.
- Recognize plants and animals as living things.
- Identify basic needs of living things.

##### Reproduction:

- Recognize that living things have a life cycle.

#### **What You'll Need:**

- White board, blackboard, or chart paper
- A section of a log
- A flower seed and a dead flower
- Living v. Non-living handout
- Extension materials such as shells, yeast, a piece of paper or dried coral
- Science journals for students to record their ideas or living/non-living things

#### **A Little Background:**

Young students often have misconceptions about what determines if an object is living or non-living. Very young students are likely to classify something as living if it has a face or moves. For example a first grader is likely to think that a river is alive because of its flow and movement.

Students may use their understanding of the life cycle to describe living things as objects that grow. They may explain that a tree is a living thing because it grows. However they might also reason that a river "grows" (i.e. gets higher) when it rains, thus it is alive. Another misconception that students have is to confuse the concept of "non-living" with that of "not living." In other words, they will classify a dead worm as "non-living" when in fact scientists classify it a living object because it was alive at one time. Scientists classify "living" as anything that is or has been alive, and "non-living" as anything that is not nor will ever be alive. Scientists use several criteria to



classify living objects including the following that you can share with your students:

- living things have the capacity to grow and develop
- living things have needs like food and water
- and living things can reproduce



### ***What To Do:***

For this lesson, you will have a discussion with students to first uncover their misconceptions about living and non-living things and then help them discover some scientific characteristics for classifying objects as living or non-living. Following the discussion, students will head outdoors on a hunt for objects that they themselves will then classify as living or non-living on a chart. Coming together as a class to discuss their findings, their understanding of living and non-living will be reinforced.

### ***What You'll Need:***

- White board, blackboard, or chart paper
- A section of a log
- A flower seed and a dead flower
- Living v. Non-living handout
- Extension materials such as shells, yeast, a piece of paper or dried coral
- Science journals for students to record their ideas or living/non-living things

### **Discussion:**

To start the discussion, ask students how they would explain what a living thing is to someone who has never heard the word “living” before. Record their answers on a white board, blackboard or chart paper for all the class to see. Ask students to explain what “non-living” means. Write down all ideas, whether they are correct or not.

Next, ask students to consider a fallen log. (If you have access to a fallen log or branch, bring it in as a visual aid.) Is it a living thing or a non-living thing? Ask students to work independently or in small groups to record their answers on paper or in a journal. Encourage students to give reasons for their answer. Younger students may use drawings, while older students can give a written response as well.

When they have finished their initial responses about the fallen log, ask them to classify a flower seed, a dead flower and a river as living or non-living and to give reasons for their answers. When students are done, have them share their ideas with the class.

After sharing students’ ideas as a class, explain that scientists have developed a list of criteria that they use to classify an object as a living thing or non-living thing. Point out that several of the criteria that scientists use are also things that students mentioned in their discussion. Highlight these ideas, explaining that living things need air, food and water, grow and develop, and reproduce. Explain that scientists also define a living thing as something that is or was once alive; and that non-living things are not, were never nor will ever be alive. Explain that this means that a dead worm was once alive and is therefore considered a living thing.

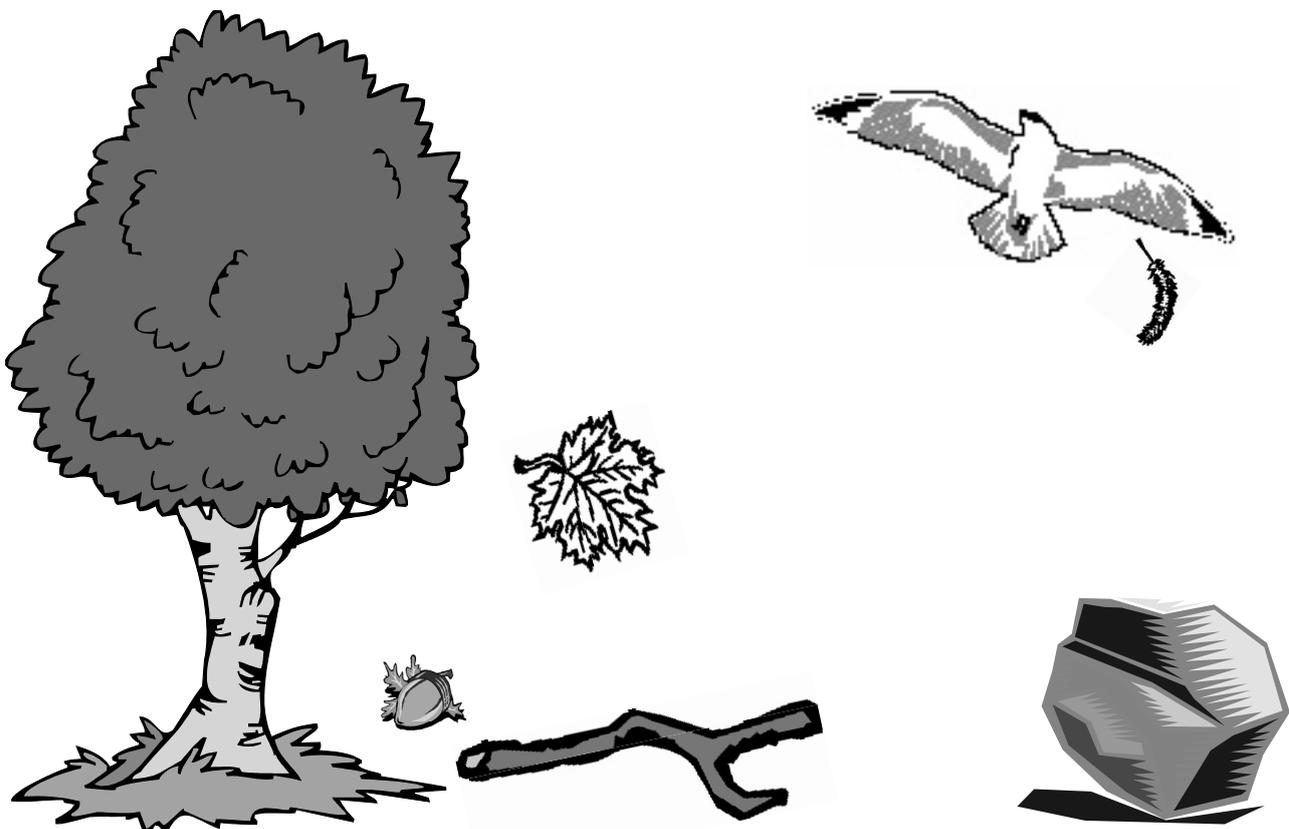
### ***What Did You Discover?***

- Ask students to again consider the log, flower (seed), dead flower and river and using what they know about the scientific concepts of living and non-living, reclassify these items.
- How did students make their classifications? What questions did they ask themselves about the items to know if it was living or non-living?

### ***More On The Subject:***

As a way to extend this lesson, take students on a scavenger hunt to collect living and non-living things from a wetland area, riverbank, wooded area or any outdoor area outside their school. Use one of the reproducible Living v. Non-living pages following this lesson plan to have students classify their found objects as living or non-living. As a class, have students share their findings, reviewing and reinforcing the scientific criteria to define living and non-living.

Challenge students to find things that they find difficult to classify upon first glance, or bring in objects that encourage discussion or “stump” the group such as sea shells, a package of yeast, a piece of paper, yogurt, or dried piece of coral. As you discuss each object, ask students to explain the reasoning behind whether they think each object is living or non-living. Remind students of the criteria used by scientists, including that if something was once alive at one time, it is considered “living.”





Name \_\_\_\_\_ Date \_\_\_\_\_

Directions: Write the name of the object under "Object". Then answer the questions with yes or no for each object to decide if it is (or was) a living or non-living thing.

Object	Do/did I need food or water?	Do/did I reproduce?	Do/did I grow?	Am I or was I a living thing?





## Home, Wet, Home: A River Habitat

### **Big Ideas:**

- Students will learn what comprises a habitat, specifically a river habitat.
- Learning that living organisms have basic needs, students will understand plants and animals living along the river rely on the resources of the river to provide food, water and shelter.
- Students will explore a river habitat, observing the various microhabitats within a river, including: water surface, river floor, pools and ponds, and river rocks. They will also discover that a river habitat includes the area immediately surrounding the river, including the plant and animal life that lives along the riverbanks.

### **Standards:**

- Classification: Identify the basic needs of plants and animals.
- Environment: Recognize that animals interact with their surroundings.
- Flow of Energy: Identify the resources plants and animals need for growth and energy, and describe how their habitat provides these basic needs.

### **What You'll Need:**

- Illustrated Parts of a River for distribution
- Science journals
- A river or stream
- Field guides to identify trees, insects, plants or animals

### **A Little Background:**

#### **What is a habitat?**

A habitat is a place where organisms live, grow and reproduce. A habitat provides for the basic needs of its organisms, supplying food, water and shelter. A river habitat includes the life in and around the river. Fish, insects, microorganisms, trees, plants, birds and animals living in the water and along the land of the river bed make up the habitat of a river.

#### **How does the river habitat support life?**

The river habitat has several “micro-habitats,” areas within the river habitat in which certain plants and animals live. These areas provide conditions that support specific life forms and meet their needs.

Some of the river’s micro-habitats include:

- ponds and pools
- river rapids
- the river bottom or river bed
- the riparian forest



For example, the waters of **ponds** and **pools** that are created in rivers by dams (both human-made and those made by beavers) are different from those of other parts of the river. The temperature, clarity, and current of ponds are hospitable to certain species of plants and animals. The water of pools and ponds are calm and dark compared to faster moving streams. Plants, animals and aquatic insects that prefer calmer waters make their homes in ponds. Beavers create dams to form pools and ponds in which they build their lodges. Fish such as salmon, trout, alewife and herring spawn and lay their eggs in pools. The calm water here is a hospitable environment for their young offspring who can't yet swim the strong currents of a river. River plant-life usually grows in the less turbulent waters of ponds. Cattails prefer the brackish waters of river ponds.

Some creatures prefer the faster moving waters of the **river rapids**. Water that is in motion tends to have more oxygen and is clearer, allowing sunlight to permeate the waters, encouraging plant growth.

Another micro-habitat is the **river bottom** or **river bed**. Caddis flies build their cases and live along the bottom of rivers and river pools. The fast current of the river can carry a caddis fly down stream, so caddis flies prefer areas of the river where the stream is slower as well as rocky areas of the river where they can attach and secure their cases to rocks. The cases of the caddis fly also blend and camouflage with the mud, silt and stones of the river bottom, providing protection from predators.

The **riparian forest**, or trees and plant-life around the river, is another example of a microhabitat. Because an osprey's diet consists mainly of fish, the trees near rivers make an ideal place for nesting. Osprey tend to make their nest atop high perches near swampy, shallow waters where fish can be easily spotted and caught. Trees also provide shade, as well as leaf matter for nesting, and fruit for food. Trees are often the nesting site of insects and other creatures that serve as food source for animals higher on the food chain. Plant roots bind the riverbanks together and help prevent erosion. Trees provide shade for creatures to hide from predators and keep the water cool.

### ***What To Do:***

#### **Introduction:**

For this lesson, introduce students to the concept of a habitat. Gather their ideas of what a habitat is and how it supports the living things that are found there. Explain that they will be thinking about a river habitat today. Identify the various parts of a river and ask students to think about how they provide different types of living environments. Be sure to mention that the riverbank and land around the water is also considered part of the river habitat.

Following the discussion listed below, take students on a walk to a river or stream where they can observe a river habitat and identify at least one micro-habitat. After the river walk ask students to reflect on the way in which the parts of the river support the animals and plants that make their home there.



## Discussion:

### ***What You'll Need:***

- Illustrated Parts of a River for distribution

Introduce the term “habitat” to students, first gathering their ideas and then explaining that scientists define a habitat as a place where living things feed, grow and reproduce. Ask students to think about the needs of living things and how a habitat supports those needs. Under a heading of “habitat,” list students’ ideas, such as food, water, oxygen, nesting, shelter and protection.

Tell students that today they are going to be exploring a river habitat. Explain that there are many “micro-habitats” that are part of the overall river habitat. Ask students if they have heard of the word “micro” and if they know what that means. Then ask them to think about what a “micro-habitat” might be. Discuss the various micro-habitats that exist in a river habitat, including the river bank, the plants and trees around the river, ponds or pools near a stream, the river bottom and the river water itself. Explain that these micro-habitats are suitable for certain types of creatures and living things.

Share the Illustrated Parts of a River handout found at the end of this lesson. Identify the part of the river that they will be visiting and ask students to identify any micro-habitats that they think they will observe.

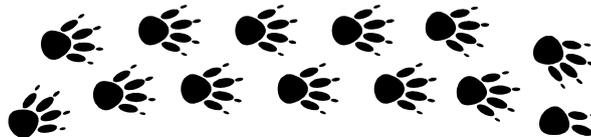
## River Walk:

### ***What You'll Need:***

- Science journals
- A river or stream
- Field guides to identify trees, insects, plants or animals

Explain that they will be going on a river walk to observe a river habitat and to think about the ways in which this river supports the life found there. Working in small groups or alone, help students focus their observations by asking questions such as:

- What does the river look like?
- Is it straight or meandering?
- How fast is the water moving?
- How deep is the water?
- Is the water clear? If not, why?
- What is on the bottom of the river?
- What is along the riverbanks and the land around the river?
- What kinds of plants and animals do you see?
- Are there any signs of animal life, such as tracks, scat, nests or feathers?



If possible, have students sketch the river habitat as they observe it and label what they find. Use field guides to identify trees, plants, insects and animals. Ask students to record their observations in their science journal or on paper.



### ***What Did You Discover?***

Ask students to share their observations about the river. Ask students to reflect on what they observed and how the features of the river habitat support life they observed. Some questions to ask are:

- What life forms did you see in the river?
- How does the river support these?
- What did you notice about the bottom of the river? What makes the bottom a supportive environment for some types of life?
- What evidence of life forms did you notice around the riverbanks or on the land near the stream?
- How do the plants that grow around the river support the life nearby?
- How does the river support the growth of plants and trees nearby?

### ***More On The Subject:***

If a river walk is not feasible, you might instead read a book about the life on a river or pond. Here is a list of suggested readings:

[Let's Explore a River](#), by Jane McCauley

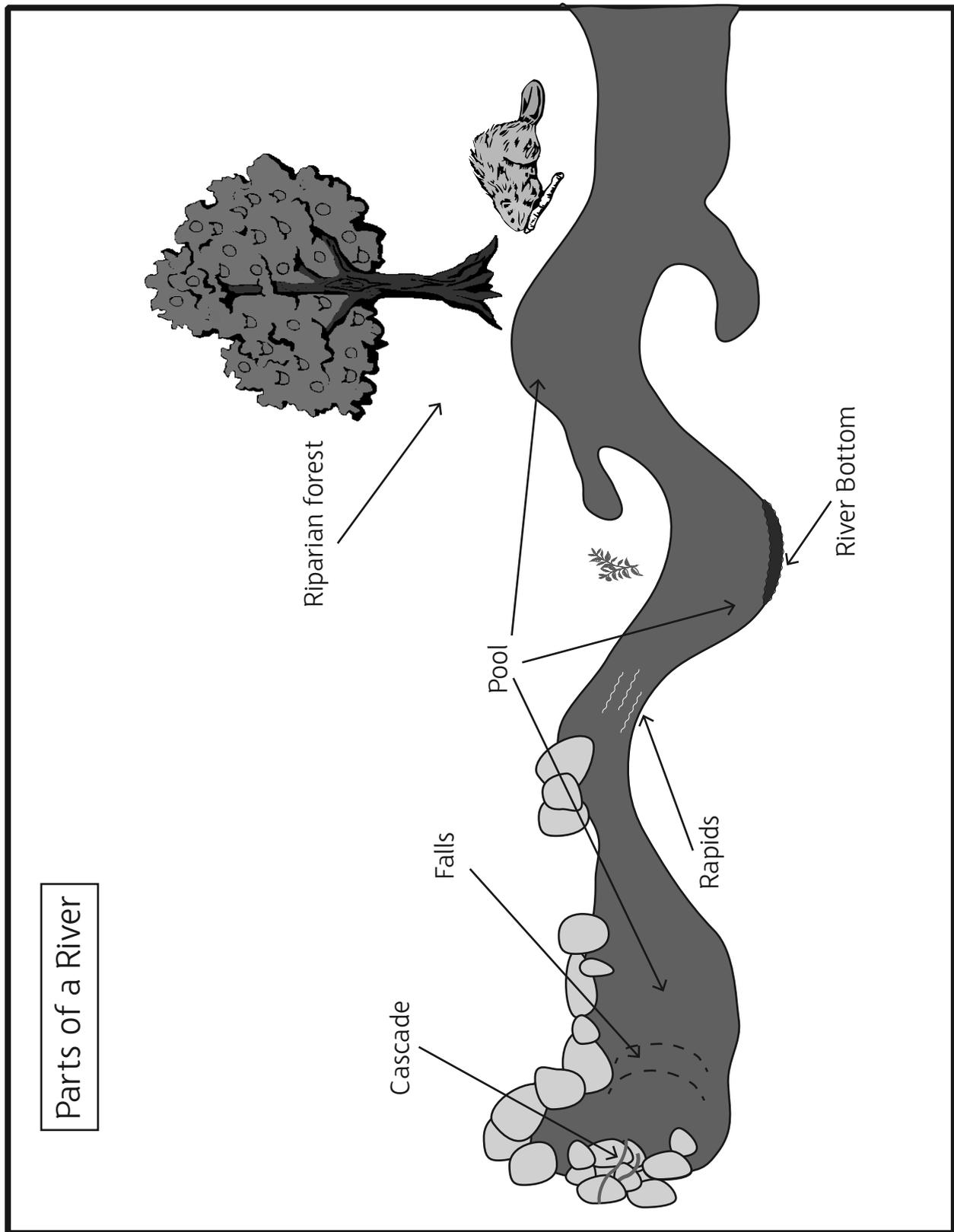
[Ponds and Streams](#), by John Stidworthy

[Animals of Rivers, Lakes and Ponds](#), by Sandra Donovan

[Life in a Stream](#), by Carol Lindeen

[Puddles and Ponds](#), by Rose Wyler

<http://chamisa.freeshell.org/habitat.htm>



Parts of a River





## What's On The Menu?

### Food Chain Interactions In A River Ecosystem

#### **Big Ideas:**

- Students will explore the interdependence of plants and animals within an ecosystem, and how they depend on each other for food.
- They will learn about the flow of energy in an ecosystem.
- Students will recognize the resources plants and animals need for growth and energy and describe how their habitat provides these basic needs.
- Students will identify producers, consumers and decomposers in a river habitat and learn about the roles of producers, consumers and decomposers in a river ecosystem.

#### **Standards:**

- Classification: Identify the basic needs of plants and animals.
- Environment: Identify and describe the factors that influence the number and kinds of organisms an ecosystem can support, including the resources that are available, the differences in temperature, the composition of the soil, any disease, the threat of predators, and competition from other organisms. (Gr 5+)
- Flow of Energy: Identify the resources plants and animals need for growth and energy, and describe how their habitat provides these basic needs.
- Recycling of Materials: Recognize that plants and animals interact with one another in various ways besides providing food, such as seed dispersal or pollination. (Gr 3+)
- Recycling of Materials: Describe ways plants and animals depend on each other (shelter, nesting, food). (Gr 5+)
- Recycling of Materials: Define a population as all individuals of a species living together at a given time; and explain that all populations living together in a community, along with the physical factors with which they interact, compose an ecosystem. (Gr 5+)

#### **What You'll Need:**

- Handout illustrating a New Hampshire river habitat
- Printable River Food Web Cards
- Dominoes

#### **A Little Background:**

An **ecosystem** is the interaction of living things and the physical surroundings they share. In a river habitat, the ecosystem includes the river, the riverbank, the land surrounding the river, the trees and plants, as well as the animals and people that use the river as their habitat. The interaction between the living things and the river is not linear like a straight line, rather it is a complex interaction that can be thought of as a web. This includes the way in which the habitat provides resources for food, shelter, protection and reproduction.

Most often ecosystems are talked about in terms of food and energy and the way in which those are produced and consumed within the habitat. All living things need energy in order to live. Food is a source of energy and life in an ecosystem, and because most living things eat other plants and animals, a **food chain** can be illustrated, showing the way in which energy is transferred from



one group of living things to others. Because the ecosystem is complex and connected on different levels, the transfer of energy within the ecosystem is thought of as a **food web**. Much like a spider's web, if there is a disturbance on one part of the web, the ripple effect can disturb all living things that are part of that web.

Scientists classify the living things in an ecosystem as either **producers, consumers** or **decomposers**. Producers make their own energy from the sun, while consumers take and use energy by eating producers or other consumers. Decomposers break down dead matter into nutrients that get recycled back into the food web. Some examples of decomposers are microbes such as bacteria, fungi and earthworms. Students often have difficulty thinking about the role of decomposers in a food web because they are not visible, as in the case of microbes, and their effects are not obvious or not easily observable, as in the recycling of nutrients.

### ***What To Do:***

#### **Discussion:**

##### **What is an ecosystem?**

Introduce the term ecosystem and how an ecosystem is the relationship between living things in a habitat. Ask students to think about the river habitat they have been studying. Ask them to think and share the different ways plants and animals interact with one another. Record student's ideas. Concepts that students share might include food, nesting, seed dispersal, shelter and protection.

##### **What is a food web?**

Tell students that today they are going to be thinking about the way in which living things use and provide food and energy in a river ecosystem. Explain that all living things need food and energy to live. As they already know, the living things within an ecosystem both *provide* and *use* energy from their habitat to live. This relationship is described as a *food web*. Ask students to think about what a web is and what the term "food web" means. It might be helpful to have an image of a web or drawing a web for students to see as they think about this concept.

##### **Who are the different "players" in a food web?**

Ask students to share their ideas about where the food and energy in an ecosystem comes from. After students share their ideas, explain that when talking about ecosystems and food webs, the living things can be labeled producers, consumers and decomposers. Ask students to think about those terms. What does the word "produce" mean? Consume? Decompose?

**Be sure that students understand that producers make their own food or energy from the sun, water or carbon dioxide, while consumers take and use energy by eating producers or other consumers.** Now ask students to hypothesize, or make an educated guess, about where decomposers might get their energy. What does it mean to be a decomposer? Students may be less familiar with the term decompose or decomposer. Help them to think about who decomposers are, and why their role in an ecosystem is important. Talk about the recycling of nutrients from dead plant matter back into the soil.

After talking about the definition of each "player" in the food web, ask students to give some examples of all three. Who are the producers in a river habitat? Record students' answers. Next, ask students to think about consumers. Who are the consumers in a river habitat? Ask students to think of some decomposers they might find in and around a river.



### Identify the roles in a river food web:

#### ***What You'll Need:***

- Handout illustrating a New Hampshire river habitat

Hand out the illustration of a New Hampshire river habitat. Ask students to identify the living things in the picture. Have students label the living things in the picture as producers, consumers, and/or decomposers. Students can work alone or in small groups. Review individual ideas as a class.

### Make connections in a river food web:

#### ***What You'll Need:***

- Handout illustrating a New Hampshire river habitat
- Printable River Food Web Cards

After reviewing the role of each living thing, draw the connections showing the food web relationships between the groups using arrows to show “what gives energy to what.” Help students understand that the direction of the arrow shows “what gives energy to what,” and not always “what eats what,” which is a natural way for students to think about these relationships. For example, plants don’t “eat” the sun, but the sun gives plants the energy they need to live. This can be a small group or a whole class activity, or older students may work on this alone.

Using the River Food Web Cards, ask students to create food chains by putting the cards in the order of “who gives energy to whom.” Each food chain should start with the sun because without the sun, producers cannot produce energy or food. Encourage students to create chains with multiple links. Have students record these food chains in their science journals or on paper. Using the *decomposer cards* (found in the River Food Web Cards), students can create food webs, showing how energy is recycled back into the ecosystem.

### Domino food chain game:

#### ***What You'll Need:***

- Dominoes

Using the River Food Web Cards, create food web dominoes for a Domino Food Chain game. As they did with the food web cards, ask students to line up the dominoes to create food chains. Students can demonstrate the transfer of energy by knocking down the first domino, which will knock into the next and so forth.

To help students understand the interconnectedness of the ecosystem, ask them to think about what would happen if there were no producers? If all the green plants disappeared, what would happen to the rest of the animals in the river habitat? Remind students that we are talking about *groups* of plants and animals. For example, when talking about cattails and beavers in our river ecosystem we mean all cattails and beavers in the habitat, not an individual cattail or an individual beaver. Ask students to once again create food chains using the food chain dominoes. Instruct students to remove a plants or animal domino and observe the reaction. Student should create



several food chains and experiment with removing different producers and consumers to see the result. Have students record these food chains and reactions in their science journals or on paper.

### ***What Did You Discover?***

After making several food chains with the dominoes ask students to reflect on the following questions and discuss as a group:

- Why are producers important for a food web?
- What happens to the food web if certain parts of it disappear?
- What happens if the animals at the end of the food chain disappear? What parts of the food web does this effect?

### ***More On The Subject:***

Students often have difficulty thinking about the complete cycle of the flow of energy in a food web. This is because the role of decomposers is not obvious. Some decomposers, like microbes are not visible and the recycling of nutrients is not an obvious or observable process. There are some activities that can help students to think about decomposition and it's importance in a food web. They include:

#### **Worm tank**

Set up an experiment to compare the rate of decomposition in a compost pail with earthworms and without. Students will learn that earthworms are known as "nature's recyclers" and that they benefit plants by making the soil they grow in more nutrient-rich.

#### **Role of nutrients in plant growth**

To explore the importance of nutrients in the soil and nutrient recycling, conduct an experiment with plants grown in soil with nutrients added and no nutrients added. Observe the difference in plant growth.

#### **Web of Life game**

If your class is not planning a focused group visit on Food Webs at the Children's Museum of New Hampshire, play the web of life game using river ecosystem organisms.

#### ***Materials and directions:***

- River Food Web Cards
- Ball of yarn

Use the printable River Food Web Cards included in this lesson. Fold each card so the image is on one side, and information about where each plant or animal gets its energy from is on the other side of the card. For plants, the answer is the sun. For other creatures the answer will depend on whether it is an **herbivore**, **carnivore**, **omnivore** or **decomposer**.

Have students stand in a large circle and give each student a prepared index card. Explain that they will be creating a food web today and will see how the living things in a river habitat are interconnected. This might be a good time to discuss the concept of a food web and what



interconnected means. Then begin playing the web of life game by having the person representing the sun begin by holding a ball of yarn. The sun then passes the ball of yarn to something that it gives energy to, which will be one of the plants or trees. Then the plant or tree passes the ball to something that it gives energy to. The play continues with the yarn being passed between organisms that take energy from or give energy to each other. Play until the yarn has been passed to each organism at least once. When the play has ended the yarn will resemble a web pattern.

Ask students questions about the connections, such as:

- Who is holding the most yarn?
- What would happen if all the green plants disappeared?
- What would happen to the animals that eat green plants if there were no plants?
- What would happen to the animals that eat those animals?

It might be helpful to act out these questions by having students who are the green plants drop the yarn they are holding. The organisms that are connected to the green plants should then drop their yarn and so forth. This will illustrate for students the way in which the food web is connected, relying on green plants and the sun as its foundation.

Some additional reading on related ecosystem and food web topics:

[River of Life](#), by Debbie S. Miller

[What River Animals Eat](#), by Joanne Mattern



## What's On The Menu? Food Chain Interactions in a River Ecosystem

### Words To Know

**Carnivore** – any animal that gets most if not all of its energy and food by eating animals.

**Consumers** – animals that cannot make their own food, they get their energy from (eating) other plants and animals.

**Decomposers** – organisms, insects and animals that cannot make their own food, they get their energy by breaking down waste products and dead organisms for their food; these broken down materials then return to the soil as nutrients for other plants.

**Ecosystem** – a complex relationship between the natural resources, habitat, and all living creatures in a particular area; it includes plants, animals, birds, fish, insects, soil, water and humans. All parts of an ecosystem function as one unit and depend on each other.

**Food chain** – the single path followed as one animal eats another animal; food chains just follow one path of energy as animals find food.

**Food web** – shows how plants and animals are interconnected in different paths as they transfer energy back and forth by eating or being eaten.

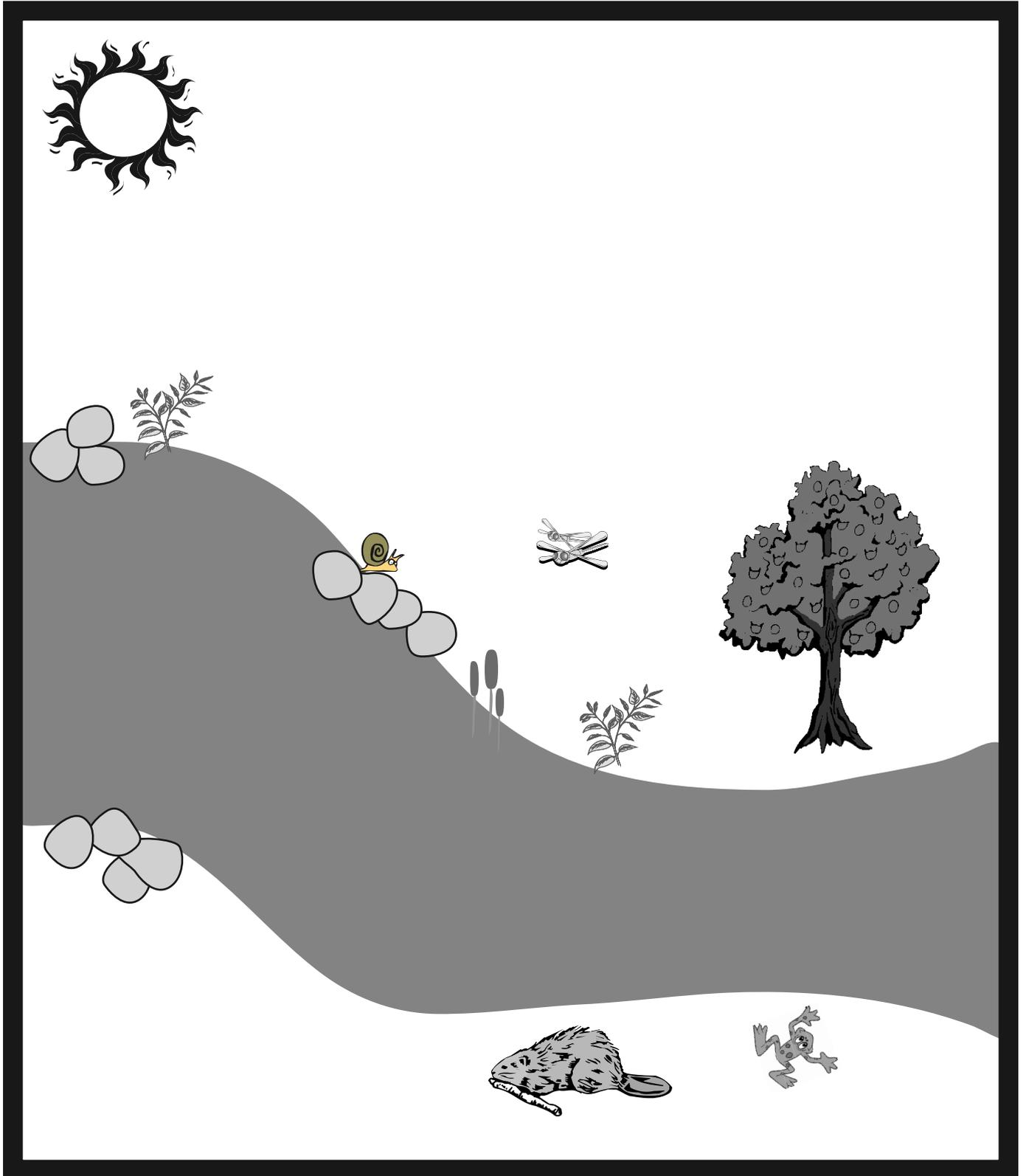
**Herbivore** – any animal that gets its energy by eating only plants.

**Omnivore** – any animal that gets its energy by eating both meat and plants.

**Producers** – green plants that make their own food using the energy from the sun in a process called photosynthesis, as well as other compounds like water and carbon dioxide.

New Hampshire River Habitat

What other species can be found inside this River habitat? Draw them in!

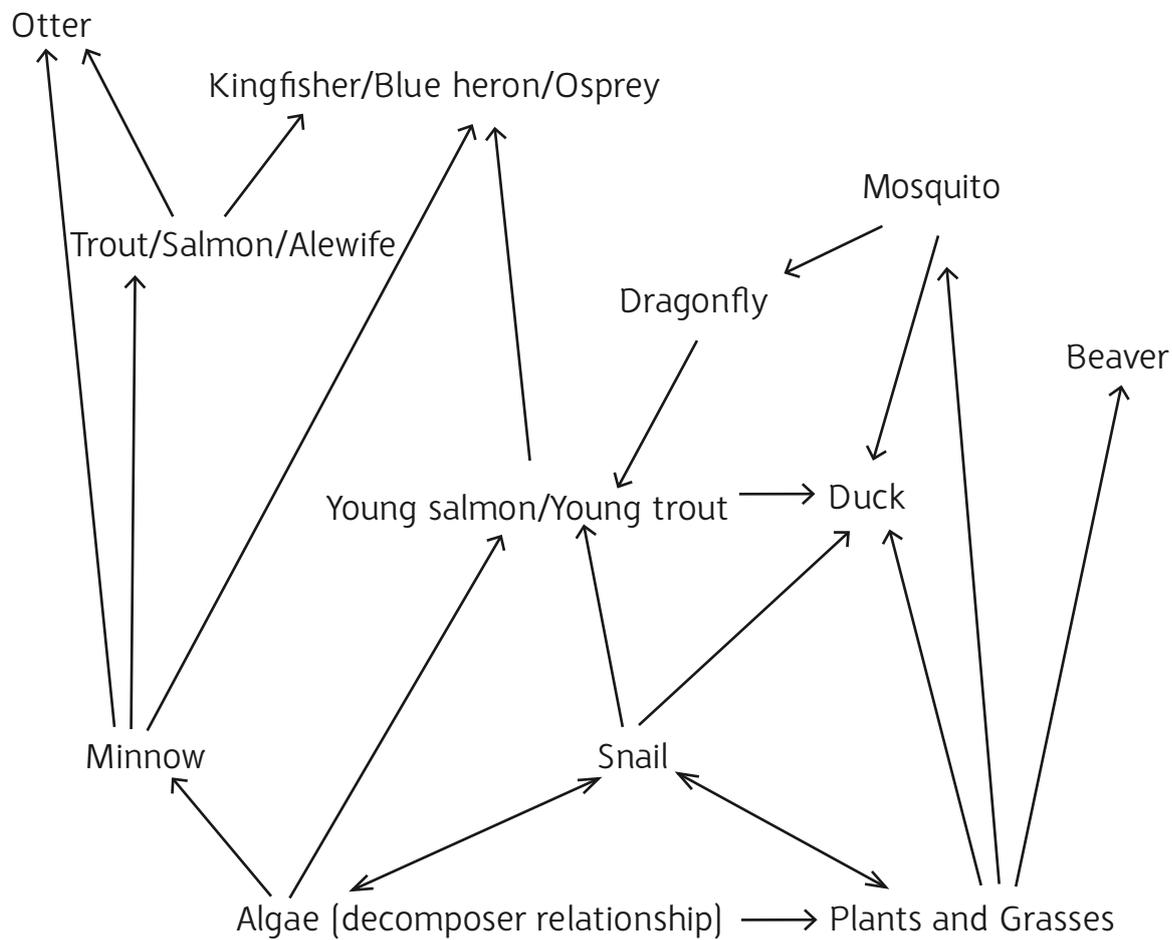


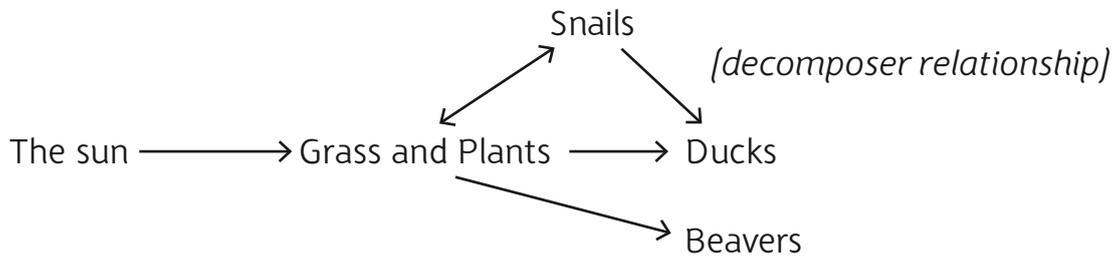
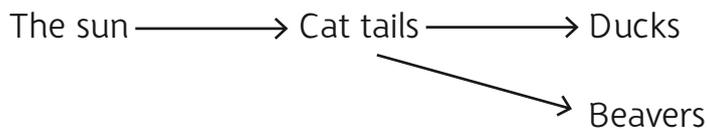
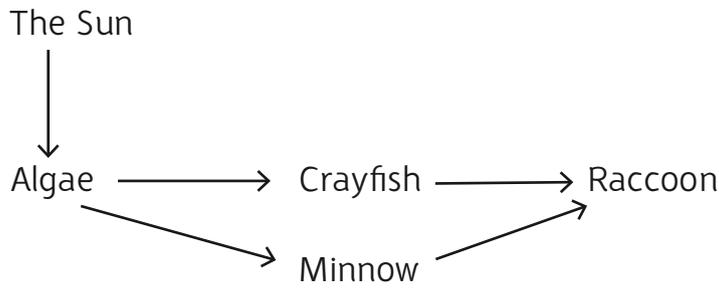
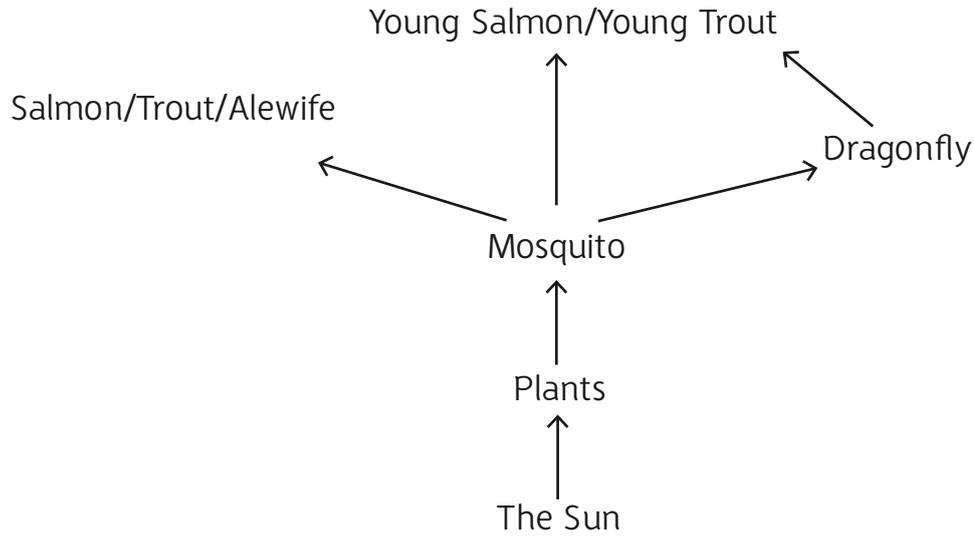


### Food Web Connections in a River Ecosystem

A river ecosystem can be described as a vast and complex community of living things that include nearby trees, plant life, insects, fish, birds and small and large animals. These living things depend upon each other in various ways, including the transfer of energy through food chains and webs. Some connections are simple and linear; others are complex with various levels. All food webs start with the sun. The sun gives energy to plants and trees, which in turn give energy to other living things, either directly or indirectly. For example, snails, an insect decomposer, feed off algae and decaying plant matter in rivers and streams. Snails help to break down the decaying plant matter into nutrients that enrich the soil for new plant growth. Snails also give energy to a number of animals in a river ecosystem.

Here are some examples of the types of food web connections students might make, both complex and simple. The organisms included here are just some examples of who lives in a river ecosystem and the relationship within a river food web. The arrows point in the direction to indicate who gives energy to whom. Arrows that point in both directions indicate a decomposer relationship where energy is transferred in both directions.







Printable River Food Web Cards: Photocopy each set of cards, cut along solid lines, fold along dotted line and staple, tape or glue description to reverse side of image.



**MALLARD DUCK:**  
*consumer*  
The mallard duck gets its energy by eating underwater plants, small fish, insects, worms, seeds and grains.



**OSPREY:**  
*consumer*  
The osprey gets its energy by diving into the water to eat fish 5-16 inches in size, and only when fish are not available they will eat small mammals, birds and reptiles.



**KING FISHER:**  
*consumer*  
The king fisher gets its energy by diving into the water to eat small fish, crustaceans, small reptiles, amphibians and aquatic insects.



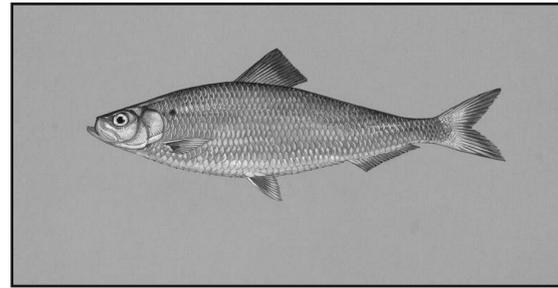
**BLUE HERON:**  
*consumer*  
The blue heron gets its energy by eating small fish, frogs, salamander, snakes, crustaceans and aquatic insects.



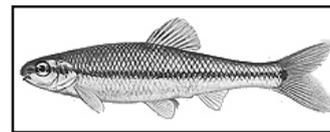
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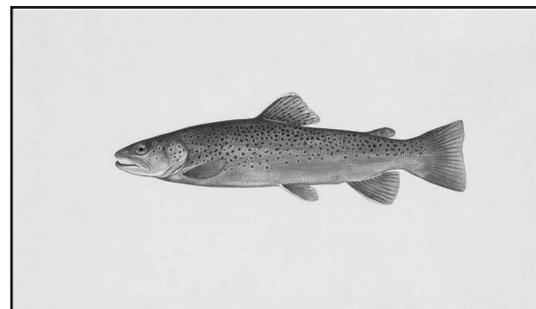
**SALMON:**  
*consumer*  
Salmon get its energy by eating smaller fish, the larvae of aquatic insects and plankton.



**ALEWIFE:**  
*consumer*  
The alewife gets its energy by eating aquatic insects, plankton and some plant material like algae.



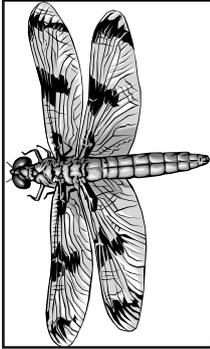
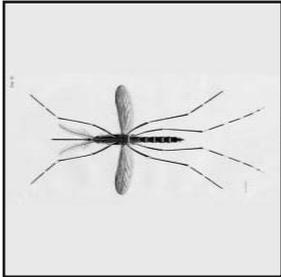
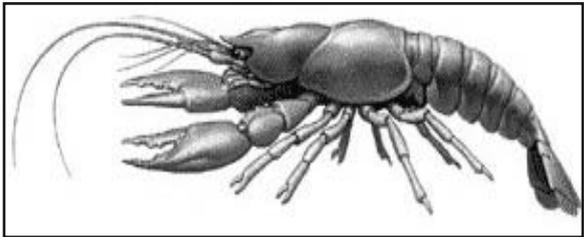
**MINNOW:**  
*consumer*  
The minnow gets its energy by eating fish eggs and young fish.



**TROUT:**  
*consumer*  
The trout gets its energy by eating smaller trout, aquatic insects like mayflies, land insects like grasshoppers, ants and worms, as well as shrimp, fish and fish eggs.



Printable River Food Web Cards: Photocopy each set of cards, cut along solid lines, fold along dotted line and staple, tape or glue description to reverse side of image.

<p><b>DRAGONFLY</b> <i>consumer</i> The dragonfly gets its energy by eating aquatic insects, flying insects like mosquitoes, tadpoles and small fish.</p>	
<p><b>MOSQUITO:</b> <i>consumer</i> The female mosquito gets its energy by eating blood to give her the nutrients she needs to lay eggs, both female and male mosquitoes eat plant nectar.</p>	
<p><b>SNAIL:</b> <i>decomposer</i> The snail gets its energy by eating plankton, algae, plants and microscopic organisms.</p>	
<p><b>CRAYFISH:</b> <i>consumer</i> The crayfish gets its energy by eating aquatic insects, snails and small plants.</p>	



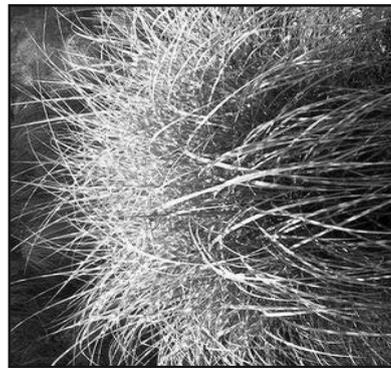
Printable River Food Web Cards: Photocopy each set of cards, cut along solid lines, fold along dotted line and staple, tape or glue description to reverse side of image.



**CATTAILS:**  
*producer*  
Cattails are plants. Plants get their energy from the sun and make their own food using photosynthesis, water and carbon dioxide.



**ALGAE:**  
*producer*  
Algae is a tiny plant. Plants get their energy from the sun and make their own food using photosynthesis, water and carbon dioxide.



**GRASS AND PLANTS:**  
*producers*  
Grass and plants get their energy from the sun and make their own food using photosynthesis, water and carbon dioxide.



**RIVER OTTER:**  
*consumer*  
River otters get their energy by eating fish, but have also been known to eat birds, reptiles, amphibians, crustaceans and insects.



Printable River Food Web Cards: Photocopy each set of cards, cut along solid lines, fold along dotted line and staple, tape or glue description to reverse side of image.



**BEAVER:**  
*consumer*  
The beaver gets its energy by eating plants. During the growing season beavers eat aquatic plants, leaves and small twigs from a variety of trees. During the winter it eats the inner bark of trees.



**SUN:**  
The sun gives energy to all plants.



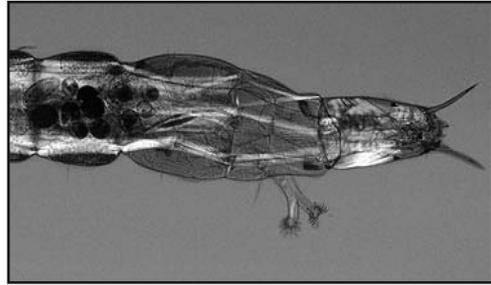
**CADDIS FLY:**  
*consumer*  
The caddis fly gets its energy as larvae by eating small aquatic plants and leaf litter.



**EARTHWORM:**  
*decomposer*  
The earthworm gets its energy by eating dirt, decomposing plants and organic material, which then returns to bring nutrients to the soil.



Printable River Food Web Cards: Photocopy each set of cards, cut along solid lines, fold along dotted line and staple, tape or glue description to reverse side of image.



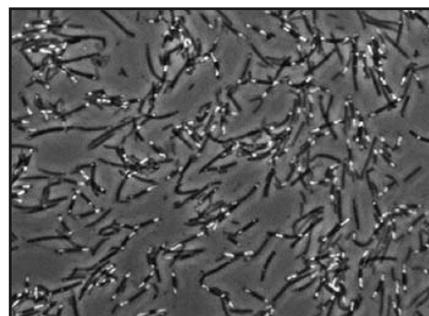
**INSECT LARVAE:**  
*consumer*  
Insect larvae get their energy by eating algae and micro-organisms too small to see with the bare eye.



**HUMAN:**  
*consumer*  
Humans get their energy by eating plants, animals and animal products.



**FROG:**  
*consumer*  
Frogs are carnivores and get their energy by eating insects, worms, snails, and small fish. Large frogs can even eat small mice and lizards.



**BACTERIA:**  
*producer and consumer*  
Some bacteria get their energy from the sun, others break down chemicals in the environment, while other bacteria consume substances like milk, meat and decaying materials.





## Populations, We're All Connected: How Changes Effect Balance in a River Ecosystem

### **Big Ideas:**

- Students will think about the organisms of the river habitat in terms of “populations.”
- Students will learn how populations depend on each other in an ecosystem and discover how changes in one species’ population affect the populations of others in their food web.
- Students will follow the *direct* effects of change on one river species and its *indirect* effects on the rest of the river ecosystem.

### **Standards:**

- Environment: Identify and describe the factors that influence the number and kinds of organisms an ecosystem can support, including the resources that are available, the differences in temperature, composition of the soil, any disease, the threat of predators, and competition from other organisms.
- Recycling of materials: Define a population as all individuals of a species living together at a given time; and explain that all populations living together in a community, along with physical factors with which they interact, compose an ecosystem.
- Recycling of materials: Using food webs, identify and describe the ways in which organisms interact and depend on one another in an ecosystem.
- Representing and understanding results of an investigation: Identify and suggest possible explanations for patterns.

### **What You'll Need:**

- Handout illustrating a New Hampshire river habitat and River Food Web Cards (from the lesson: What's On The Menu? Food Chain Interactions In A River Ecosystem)
- Ecosystem Event Cards
- White board or chart paper
- The Day They Parachuted Cats on Borneo (this book is out of print but can be found at libraries; an on-line, page by page version of the story that can be viewed from your computer can be found at:  
<http://www2.visalia.k12.ca.us/eldiamante/science/biology/powerpoints/Borneo.pdf>)
- DDT Osprey picture time line
- Science journals or writing paper for story writing

### **A Little Background:**

#### **What is a population?**

When thinking about river ecosystems and habitats, we are thinking about the populations that live there, their interactions with each other and their physical environment. A population can be described as the entire group of a particular species that lives in the same habitat. For instance when talking about alewife in a river food web, we are talking about the entire populations of



alewives or all the alewives living in the river.

### **How do different populations depend on each other?**

Because an ecosystem consists of many different populations sharing the same habitat, the members of an ecosystem are connected in a complex series of relationships, often called the “web of life.” Populations in the web of life depend on each other in many ways. These include:

- providing food and energy to each other, as illustrated in food chains and webs. Every population eats something, and many in turn are eaten.
- helping each other reproduce, such as how bees help plants by spreading their pollen and plants help bees by providing nectar.
- producing materials for nesting and protection, such as how plants provide matter that is used by insects and animals in creating nests and cocoon-like structures for protection.

### **How does an increase or decrease in one population affect others?**

The web of life is dynamic, meaning that changes to one population affect other populations as well. Thinking about predator-prey relationships within the food chain, an increase in a prey population will result in an increase in a predator population over time. This is because there is an increase in the food resources for the predator, resulting in increased reproduction and survival. For instance, if the alewife population of a river were to increase, the osprey population would benefit and increase over time because they have plenty of alewife to eat. Likewise, when there is a decrease in the prey populations, there is a resulting decrease in the predator population because of limited food supply.

### **But... it's not that simple.**

In a true ecosystem, populations adapt to changes and often have more than one food source. Do you eat only one kind of food every day? Imagine eating just fruits and vegetables, or only grains. If you eat fruit, but none is available, you would eat something else. Many animal populations adapt what they eat to what is available as well. So in the case of the osprey and the alewife, if the alewife population were to decrease due to over-fishing, osprey would likely shift their food source to another fish such as trout. In this way, fluctuations occur in ecosystems without catastrophic effects. However there are instances where the effects are profound.

### **A real life example from the island of Borneo:**

The effects of changes and fluctuations in an ecosystem are not always direct. Often the effects of changes ripple through the web of life in a branching domino-like effect, impacting more than one population in indirect ways. The story of malaria, DDT, and cats on the island of Borneo illustrates this. This true story explains the way in which the use of DDT in the 1950's to kill mosquitoes that were transmitting malaria, actually brought down roofs and caused the spread of the plague, causing the World Health Organization to parachute cats onto the island to solve the unintended problems the use of DDT had on the populations there. The DDT killed the mosquitoes, but it also affected other animals that ate the poisoned insects, including lizards and cats. When the cat



population decreased, rats flourished on the island, spreading the plague. Another unexpected effect the DDT had on the island was the collapsing of roofs. This resulted because the predators of the thatch-eating caterpillars decreased, causing the thatch-eating caterpillar population to increase. To help get the ecosystem of Borneo into balance once again, cats were parachuted onto the island to eat the plague-spreading rats.

### Another example affecting osprey in the USA:

A similar effect was seen on osprey populations around rivers in the United States during the 1950 and 60's. DDT that was used as an insecticide in farming made its way into the food chain of river habitats by washing from the soil into the water. Osprey then ate fish that were poisoned with DDT, causing the shells of osprey eggs to weaken. The eggshells were so weak that they would break when an adult osprey would sit on them to incubate them. This greatly reduced the populations of osprey during that time. And although DDT was made illegal in the 1970's, it has taken time for osprey populations to begin to increase once again. Humans have tried to facilitate their repopulation by building nesting platforms in popular nesting areas. Keeping the waters clean means a healthy and plentiful fish population that is also beneficial for the osprey population.

### What To Do:

#### What You'll Need:

- Handout illustrating a New Hampshire river habitat and River Food Web Cards (from the lesson: What's On The Menu? Food Chain Interactions In A River Ecosystem)
- Ecosystem Event Cards
- White board or chart paper
- [The Day They Parachuted Cats on Borneo](#) (this book is out of print but can be found at libraries; an on-line, page by page version of the story that can be viewed from your computer can be found at: <http://www2.visalia.k12.ca.us/eldiamante/science/biology/powerpoints/Borneo.pdf>)
- DDT Osprey picture time line
- Science journals or writing paper for story writing

### Talk about increases and decreases in populations:

Review the handout illustrating a New Hampshire river habitat and the connections within a food web, from one level to the next. Next discuss how each living thing in a food web represents all of that species in that particular ecosystem. Help students think about how each organism in the river food web is representing the entire **population** of that organism in that particular ecosystem. We are not talking about one osprey, but about the entire group of osprey that live along the river.

Ask students to think about the ways in which a population living in a habitat might change, such as increasing or decreasing in size. Brainstorm and record students' ideas for how or why these changes might occur. Students might share what they know about how a habitat supports its inhabitants. Some ideas to discuss are food supply, an increase or decrease in the number of predators, environmental changes such as weather, pollution, and the human effects on the physical environment.





### ***More On The Subject:***

**Play the Populations Card Game:** make multiple copies of the printable River Food Web cards from the lesson **What's On The Menu? Food Chain Interactions In A River Ecosystem** and use the ecosystem events cards to have students make food chains that are affected by events that cause fluctuations in an ecosystem. Students shuffle and deal 7 cards, using the rest as a draw pile. Taking turns, students attempt to build a food web using their cards. If they have multiple cards of the same organism, they can build up their population.

**Play "Oh Deer"** an interactive game that allows students to see the way in which populations fluctuate depending on factors such as habitat, space and food. The directions to this popular game can be found online and in instructional guides such as Project Wild (1983, Western Regional Environmental Education Council). Online reference to directions for this game:  
<http://www.eduref.org/Virtual/Lessons/Science/Ecology/ECL0043.html>

**Experiment with increases and decreases of species in a pond food web.** Online computer programs allow students to increase and decrease the populations of different species and watched the effects on a food web.

Earth Systems Digital Lab:

<http://www.eduweb.com/portfolio/earthsystems/food/foodweb4.html>

Explore A Pond:

<http://www.uen.org/utahlink/pond/virtpond2.cgi>

**Research other plants and animals in NH that have been endangered, or whose populations have experienced fluctuations.** Ask students to find out what was the cause that precipitated the change and what other populations in their ecosystem are affected. What, if anything, is being done to restore balance in the ecosystem? Some suggestions of organisms to research: bats, purple loose strife, milfoil and the bald eagle.

A great online resource and collection of activities on invasive species can be found at:

[http://www.apms.org/activity\\_book.pdf](http://www.apms.org/activity_book.pdf)

A good reference for purple loosestrife in NH:

<http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-45.pdf>

A good reference for milfoil in NH:

<http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-1.pdf>

An online version of the story of the day they parachuted cats on Borneo:

The Day They Parachuted Cats on Borneo: A Drama of Ecology. Charlotte Pomerantz, (1969) Young Scott Books.

<http://www2.visalia.k12.ca.us/eldiamante/science/biology/powerpoints/Borneo.pdf>





Ecosystem Event Cards -- photocopy and cut along dashed lines.

<p>A dam is built downstream; fewer fish spawn upstream.</p>	<p>A fish ladder is created to help fish migrate past a dam downstream.</p>	<p>Fishermen catch a huge amount of salmon to sell at market; salmon counts are down.</p>
<p>A rainy spring causes the mosquito population to soar.</p>	<p>Beavers have moved in and built a dam, a new pond forms.</p>	<p>The earthworm population increases; soil is rich with nutrients.</p>
<p>Towns along the river spray pesticides for mosquito control.</p>	<p>Lots of rain causes algae and bacteria levels to rise in ponds.</p>	<p>A beaver dam is removed and a pond dries up. The frog population decreases.</p>





Ecosystem Event Cards -- photocopy and cut along dashed lines.

<p>The crayfish population is on the rise.</p>	<p>A highway is built along the river upstream. Oil, gasoline and road salt finds its way into the river and into the plant life growing along the river banks.</p>	<p>There has been plentiful sunshine and enough rain this spring and summer, plants are growing like crazy!</p>
<p>The river floods and many insects and their larvae are washed downstream.</p>	<p>A hot, dry spell leaves water levels low; plants are wilting and dying.</p>	<p>Pesticides from nearby farms make their way into the stream. Small fish and insects are affected.</p>
<p>Nesting platforms are built for osprey along the river and a new family of osprey move in.</p>	<p>A large group of adult alewife are traveling upriver to spawn, providing cover for young salmon who are traveling in the opposite direction to go out to sea.</p>	



The Cats of Borneo Illustration

The use of DDT in the 1950's on the island of Borneo is an excellent example of how the effects of changes and fluctuations in an ecosystem are not always direct.



DDT was used to kill mosquitoes that were transmitting malaria.



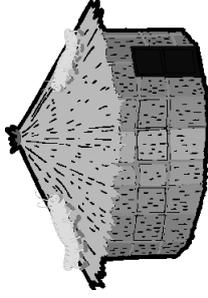
Cats and lizards ate the poisoned mosquitoes and died.



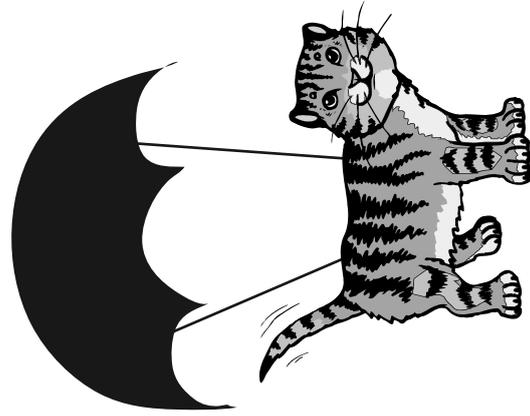
With no cats to eat them, the rat population increased and rats began to spread the plaque.



With no lizards to eat the caterpillars, caterpillars were everywhere and people's roofs were collapsing!



What is Borneo to do?



Cats were parachuted in to eat the rats to balance the ecosystem.



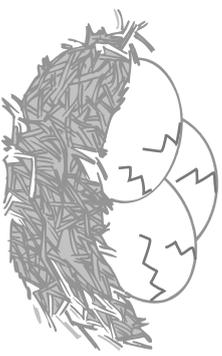
In the 1950's and 60's, DDT was used as an insecticide in farming. Trace the ways DDT made its way into the food chain of river habitats.

# DDT

DDT was used as an insecticide in farming. DDT washed from the crops and soil into nearby rivers and streams.



Fish and other living organisms in the rivers were then polluted with DDT.



Osprey then ate the fish that were poisoned with DDT, causing the shells of osprey eggs to weaken.

The eggshells were so weak that they would break when an adult osprey would sit on them to incubate them. This greatly reduced the populations of osprey during that time. Although DDT was made illegal in the 1970's, it has taken time for osprey populations to begin to increase once again. Humans have tried to facilitate their repopulation by building nesting platforms in popular nesting areas. Keeping the waters clean provides with a plentiful fish population that is also beneficial for the osprey population.

## Plant Life: Helping Rivers

### **Big Ideas:**

- Students will explore the role of plants in a river ecosystem.
- They will learn that other than a food source, plants play an important role in the health of a river.
- Students will find out that plants filter sediment and contaminants from run-off, plants shade rivers and keep water temperature cool, plants support the habitat of river wildlife, and plants absorb floodwaters and help to prevent erosion.

### **Standards:**

#### Flow of Energy:

- Identify the resources plants and animals need for growth and energy, and describe how their habitat provides these basic needs.

#### Recycling of materials:

- Recognize that plants and animals interact with one another in various ways besides providing food, such as seed dispersal or pollination.
- Describe ways plants and animals depend on each other.

#### Making observations and asking questions:

- Make observations and explore materials using all of the senses and simple tools.

### **What You'll Need:**

- Potted plant (ideally one that is mature enough to have a strong root base)
- Celery stalks
- Glass jar(s)
- Food coloring
- Water

### **A Little Background:**

The wooded area around a river is called a **riparian forest**. It is important to the river ecosystem because it provides food and habitat for animals. The plants and trees along the banks of a river shade the waters, keeping them cool and temperate for fish and other creatures that live in the river waters. Leaves of these plants and trees fall into the river and become the base of the food web of a river ecosystem. The roots of plants along the river create an overhanging that serves as a protective habitat for fish and other river creatures.

Plants and trees in the riparian zone act as a filter for the river, purifying its waters by filtering out sediment and harmful chemicals like fertilizers and pesticides. Riparian vegetation also helps during flood times by acting like a sponge and absorbing water, reducing the speed at which it spreads to floodplains. The roots of plants, shrubs and trees help to prevent erosion by holding the soil along the river banks in place and preventing it from washing away. Vegetation growing in and along the waters helps rivers to meander instead of cutting a straight path that could cause rivers to run too fast and increase erosion. Plants and trees absorb heavy rains that could also wash away soil along the riverbanks.

The riverbank also benefits the plant life there. It is a sustainable habitat for plants, helping with seed dispersal and reproduction. The riverbanks and nearby floodplains are moist, fertile ground



for young vegetation. In the spring when streams and rivers often overflow with snowmelt, many riparian plants drop their seeds into the waters that carry the seeds to fertile ground.

**New Hampshire river vegetation:**

There are many different types of plants and vegetation that grow near, along and in the rivers of New Hampshire. Some common plants include cat tails, wild strawberries, pussy willows, milk weed, Joe-Pye weed, water lilies, ferns, willow trees and red and silver maples.

***What To Do:***

**Explore the role of plants in the river ecosystem with students:**

Ask students to share their ideas about the role plants play in the river ecosystem, reminding students that plant life includes trees, shrubs and all plants. Record students ideas. Remind them to think about what they know about habitats and the river food web. Students might mention that plants are a food source for animals and insects, shelter for animals, birds and insects, and that they provide materials for nesting. Encourage students to think of some non-obvious benefits of plants along the river. Plants provide shade, which in turn keeps the temperature of the water cooler, which is beneficial to fish and other creatures that live in the river waters.

Now ask students to think about why the river is a suitable, or good, habitat for plants. Help them to think about what a plant needs for survival. Explain that plants that live near the water are the type of plants that need a lot of moisture. Ask students to think about how plants reproduce (seeds) and why living near a stream or river might help with their reproduction.

Ask students to think about (or draw) the parts of plants, trees and vegetation. Have them brainstorm the parts of plants: leaves, seeds and fruits, branches, trunks. Because they are not visible to students above the ground, roots might not be obvious to young students. Talk briefly about the roots of plants and what they do. Show students a potted plant. Ask them to think about how the potted plant is like the plant-life that lives along the riverbanks. Students should see several connections, including that it lives in soil, needs water and has roots. Now take the plant out of the pot, with the roots and soil still intact. Ask students to share what they notice. Students should observe that the roots hold the soil together. Help students understand that this is what the vegetation along the river does, holding the soil and helping to prevent it from washing away during periods of high, fast-moving waters. Flooding can pose a problem for rivers because the high, fast moving water can cause erosion and the roots of plants and trees such as willows, birch and cedars, help to prevent erosion.

Explain that there is another benefit that plants provide rivers. With runoff from land, pollutants such as fertilizers and pesticides can enter the river. Ask students to think about how plants might help with these problems. Tell them that to observe how this happens, they are going to conduct an experiment.

**The experiment:**

***What You'll Need:***

- Potted plant (ideally one that is mature enough to have a strong root base)
- Celery stalks
- Glass jar(s)
- Food coloring
- Water

This experiment can be done as a class or in small groups. Fill a glass jar with water. Add food coloring to the water. (This will make the water absorbed by the celery visible). Cut the ends of the celery stalk and place the cut side down into the colored water. Ask students what they predict will happen. Have students record their procedure and predictions in their science journal or on paper. Leave the celery in the water over night and return to it the following day. Ask students to remove the celery from the water and again cut the end off. What did they observe? Have students record their observations in their journals or on paper.

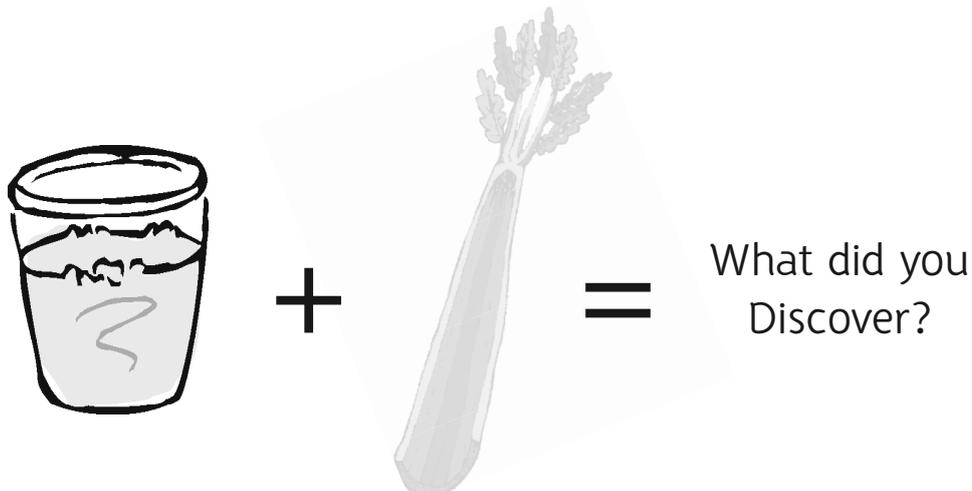
***What Did You Discover?***

Ask students to explain what happened to the celery in the colored water. Why did this occur? How is the celery like the plants along the river? In what way do the plants absorb water along and near the river? How does this help the river? In addition to filtering out sediment, contaminants and pollutants, students should also think about how roots help to absorb floodwaters.

***More On The Subject:***

Go on a riparian forest walk. Use a field guide to identify plants along the riverbank and in the water. Ask students to notice the types of trees and vegetation along the riverbank. Are roots visible? Do they create any overhanging areas above the river surface? Are plants growing in the waters? What wildlife is observed and how does the vegetation support the animals, birds and insects? Have students record their observations and answers to these questions in their science journals or on paper.

A great on-line field guide to New Hampshire Riparian Vegetation can be found at:  
<http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-06-34.pdf>





## Images of River Vegetation

Cattails



Fern



Images of River Vegetation

Joe Pye Weed



Pussy willow



Wild strawberry plant



Red maple tree





## Images of River Vegetation

Willow tree



Milkweed





## It's All About Survival: Adaptations of The Beaver

### **Big Ideas:**

- Students will learn about the physical characteristics and survival techniques of beavers.
- Students will learn that animals have physical and behavioral adaptations that help them to survive in their habitat.
- Using the beaver as an example, students will learn about animal adaptations.

### **Standards:**

- Classification: Identify the basic needs of plants and animals in order to stay alive.

### **What You'll Need:**

- Materials for creating "new river animals"
- Human props to compare to beaver adaptations: flippers, rain slicker, goggles, chisel
- Writing paper
- Beaver images found at the end of this lesson

### **A Little Background:**

**Adaptation** can be described as the way an animal's body and its actions help it survive, or live, in its environment. In this lesson, we will focus on the beaver and the way it is adapted to live in a river habitat.

**Physical adaptations** can be described as the characteristics a plant or animal is born with that helps it survive in its environment.

**Behavioral adaptations** can be described as something a plant or animal does to survive in its environment.

### **All You've Ever Wanted To Know About Beavers:**

Beavers are the largest rodent in North America. Female beavers are larger than males, weighing between 40 and 65 pounds, and growing up to three feet.

Beavers make their homes in fresh water environments, building lodges along the banks of a river. The lodges are made with sticks and plastered with mud. The sticks are cut by the beavers from the woods surrounding the pond or river where the beaver makes it's home. The water surrounding a beaver lodge is ideally four to five feet deep. This creates a secure underwater entrance into the lodge, protecting them from predators, such as eagles and wolves that don't know how, or cannot enter the lodge. The depth of the water surrounding the lodge is also important because it provides an underwater food storage area and prevents freezing during the winter months.

The lodge has several levels, including a level above the water surface, and several underwater for food storage and protection. A lodge may be as large as five feet high and 15 feet long.



Beavers may inhabit a lodge for many years or just one. Beavers sometimes abandon their lodges to find a more suitable place to build their home.

**How a beaver *is built* to survive and thrive, or physical adaptations:**

The coat of the beaver is oiled, keeping them dry in their water habitat. The bodies of the beaver have a layer of fat that insulates them against the cold.

Eyes have a protective coating that allows them to keep their eyes open underwater and still see. Its nostrils and ears close while underwater.

Teeth are large and sharp, often compared to a chisel, allowing them to cut large, hardwood trees. A beaver can cut a four-inch tree in ten minutes. A beaver has 20 teeth, 10 in its top jaw and 10 in its bottom. It gnaws and bites with its front teeth, called incisors, which continue to grow throughout its life.

Beavers have hind paws that are long and webbed. Its front paws are not webbed and are small with toes that have long claws. These paws serve as hands for the beaver, allowing them to hold and carry building materials and food matter, such as plants, sticks and stones. Their webbed feet help them to paddle through the water quickly, and their oiled coat helps them to glide through the water.

Their large and scaly tail acts as a rudder in the water, also helping them to swim. Beavers will use their tail to slap the water, creating a warning signal to other beavers when a predator is near. The beaver also uses its tail to balance its body while walking on its hind legs as it carries materials with its front paws.



**What a beaver *does* to survive and thrive, or behavioral adaptations:**

Beavers change their diet with the seasons: when plants are growing and readily available, beavers eat river plants, grasses, leaves and fruits; in the winter months, beavers switch their diet to woody growths, tree bark and small twigs.

In the fall, beavers create a cache, or store, of food for the winter months when food is scarce. These caches are made in deep water or along the shore close to the lodge.

When water in a large pond becomes too high, beavers will move to a burrow along the shore. If the water is not deep enough for a lodge, beavers will create a dam downstream to form a deep pond suitable for their lodge.

Beavers cannot move very quickly on land, swimming is their best method of escaping a predator. They are very good swimmers, and can swim up to five miles an hour and can stay underwater for up to 15 minutes!

Beavers spray *castorium*, a strong scent that is used to mark their territory or attract a mate. The scent is sprayed from a gland at the base of the beaver's tail. Its smell has been compared to a strong black licorice scent.



## What To Do:

### What You'll Need:

- Materials for creating "new river animals"
- Human props to compare to beaver adaptations: flippers, rain slicker, goggles, chisel
- Writing paper
- Beaver images found at the end of this lesson

Ask students to think about the habitat of the beaver, talking about how beavers live along rivers and in ponds and that they live in lodges that are partially submerged in water. Explain that beavers have special features and characteristics that make them well prepared for living in their water habitat. Discuss the term adaptation. Talk about the physical and behavioral adaptations of the beaver. Encourage students to think about and explain how they help the beaver live in its environment.

Students might compare and contrast the features of the beaver to their own features and behaviors. Use the information below, or the handout included at the end of this lesson. Here are some to focus on:

**Teeth:** people have incisors for biting like those of the beaver. Students can identify their incisors and look at their own or their neighbor's teeth to observe the similarities. People also use chisels to chop through hard materials.

**Hair/Fur:** beavers have oiled fur coats to keep dry. Although people have hair similar to a beavers, it does not keep them dry, and so people need rain slickers to keep dry.

**Fat layer:** beavers have a layer of fat that keep their bodies insulated against the cold, while people wear down coats and layers of clothing to keep warm.

**Eyes:** beavers have a clear eyelid that closes, but allows them to see underwater, while people wear goggles.

**Front and hind feet:** the front feet of beavers are similar to those of humans, while the hind feet are webbed like the flippers that people often wear on their feet to swim.

Students might also compare and contrast their homes to the design of beaver lodges, thinking about how both provide protection from outdoor elements, as well as having areas for storage, sleeping and even grooming. Although it does not relate to adaptations, it might also be fun to have students think about the typical size of a beaver, up to 65 pounds, and compare that to their own weight to give them a sense of just how big these rodents are! Have students create a "new," made-up animal that lives in the river habitat we've been studying. Using what they know about the river ecosystem and what they know about what living things need to survive, students should design their animal with certain adaptations to help it live in the river habitat. Students can also create a representation of their animal. Students might draw pictures of their new animal, although some other ways students could represent their animal is with paint, clay sculpture, or papier mache. The adaptations of their animal should be represented



in their creation.

### ***What Did You Discover?***

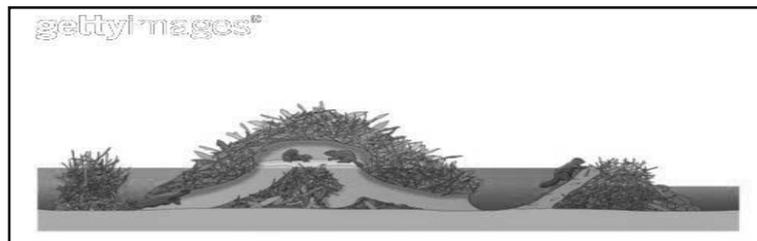
Students should present their animals to the class and answer questions about its needs for survival and its physical and behavioral adaptations. Some questions to pose:

- What is your animal called?
- Describe what it looks like.
- How is it physically adapted to live in a river habitat? What are some of the physical features of this animal that help it to live in the river habitat?
- How has it adapted its behavior to survive and thrive in a river habitat? What are some of the behaviors of this animal that help it live in the river habitat?
- Would your animal be able to survive in another habitat, such as a desert or mountain habitat? Why or why not?

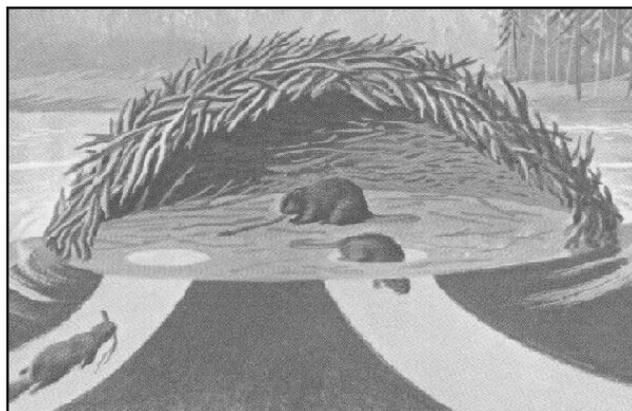
### ***More On The Subject:***

New Hampshire is home to many species of plants and animals that survive and thrive here due to both physical and behavioral adaptations. Students might research species of plants and/or animals that are increasing or decreasing in numbers in New Hampshire. Ask students to find out why their numbers are changing. How is this related to their physical and behavioral adaptations? One possible topic is the invasive species of aquatic plant known as milfoil, which has adaptations that allow it to reproduce and survive in a variety of conditions. Learn about the unique adaptations of insects that live in and around water. Aquatic insects are adapted in the ways that they take in air, travel on, around and through water, and in the ways that they feed. A great on-line resource for learning more about aquatic insect adaptations is:

<http://www.dnr.state.md.us/education/envirothon/aquaticinsectecology.pdf>



<http://www.saskschools.ca/~gregory/animals/bvr1.html>





Name \_\_\_\_\_ Date \_\_\_\_\_

### Beavers and Humans – How Adaptations Help Us Survive

Using the chart below, use words and/or pictures to explain and compare how humans and beavers are physically built and how they behave to survive in their habitats.

Adaptation	Beavers	Humans
TEETH		
HAIR/FUR		
FAT LAYER		
EYES		
FEET/HANDS		
WHERE THEY LIVE		
HOW THEY MOVE		
WHAT THEY EAT		





## Traveling the River Highway: The Migrating Alewife

### **Big Ideas:**

- Using the alewife as an example, students will explore how the migration of fish in the waterways of New Hampshire effects the populations of other creatures.
- Students will learn about the life cycle of the alewife.
- Students will be introduced to the ways that humans have created structures to both catch migrating fish and assist fish in their attempts to migrate up the river.

### **Standards:**

- **Reproduction:** Recognize that living things have a life cycle during which they are born, grow and die. Include birth, growth, development, reproduction and death.
- **Environment:** Identify and describe the factors that influence the number and kinds of organisms an ecosystem can support, including the resources that are available, the differences in temperature, the composition of the soil, any disease, the threat of predators and competition from other organisms.
- **Recycling materials:** describe ways plants and animals depend on each other.

### **What You'll Need:**

- Script for Alewife Migration Game included in this lesson
- Open space for students to play Alewife Migration Game
- Labels for students to wear to identify their roles in the game: alewife, osprey and alewife floaters or fresh water mussels found at the end of this lesson

### **A Little Background:**

#### **Alewife:**

#### **What is an alewife and why do they migrate up and down rivers?**

Alewives are an abundant species of fish found off the Atlantic coast and in the coastal waterways and rivers of New Hampshire and New England. They live most of their lives in the salt water of the ocean, and migrate or travel upstream through the fresh water of rivers, lakes and ponds to spawn, or produce and deposit their eggs.

#### **When do alewife migrate and what happens during this journey?**

Adult alewives living in the ocean enter rivers between April and June each spring, when river waters become warmer than the ocean. This is what scientists believe signals the alewives to migrate. Guided by their sense of smell, alewives travel up streams to spawn, or lay eggs, in ponds, lakes and slow-moving waters of rivers. A few days after spawning, alewives return to the ocean where they live most of their lives in large schools. The run, or roundtrip, of the alewife takes between six and eight weeks total.

Of the 60,000 to 100,000 eggs an alewife lays, only a tiny number live. The young alewives, called fry, live in freshwaters for three to seven months and grow up to six inches long. These young alewives make return migration to the ocean in mid-July to October. They will live in the ocean until they are three to five years old and a foot long. At this time, they will return upstream where they were born to spawn.



Alewives do not eat during the migration period or while spawning. They begin feeding again once they reach brackish waters (where fresh and seawaters meet) on their return to the ocean. Their main food sources are zooplankton, tiny crustaceans, and insect larvae.

### **Why are alewife and other migrating fish important to a river ecosystem?**

Alewives are important to river ecosystems because they provide food for other creatures in fresh water and ocean habitats. Almost every creature in the river habitat eats the alewife, making it a great food source in the river ecosystem. Nutrients also come from their eggs, as well as their dead and decaying bodies. After spawning, many alewives die. Approximately 25-75% of returning alewife do not return to the sea and become food for their predators. Young alewives are prey for larger fish, such as salmon, trout and bass as well as osprey, grey herons and eagles. Large groups of alewife migrating upstream also provide great cover for young salmon swimming downstream at the same time. A hungry osprey perched above the river watching a stream of migrating alewife are more likely to eat them than the smaller young salmon traveling among them.

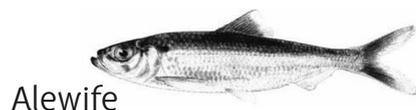
Alewives are the host of a fresh water mussel called an “alewife floater.” The female mussels release larvae into the water, which then attach themselves to the gills or fins of a suitable host fish. This freshwater mussel is an endangered species, so the return of the alewife to its freshwater habitat is important for its survival. Freshwater mussels play an important role in the ecosystem of rivers and ponds. Freshwater mussels are a food source for many animals, including muskrats, otters, birds and some game fish. Freshwater mussels also help to filter the water as they breathe and feed on algae in the water. If a dam blocks alewives from reaching upstream spawning grounds, the alewife floater will go extinct in upstream areas.

### **What kinds of obstacles do alewife and other creatures face when trying to migrate up the river?**

The migration of the alewife has been challenged and impeded by the construction of dams. When dams stop the alewife migration upstream, the alewife cannot lay its eggs. When alewife cannot lay eggs, young cannot be born and the alewife population declines. When the alewife population declines, all the animals and fish that count on alewives as a major food source in the freshwater ecosystem are affected. The population of freshwater mussels depends upon the alewives’ return, as do the striped bass, eagles and osprey that feed on them in the early spring.

### **How are humans trying to help them migrate?**

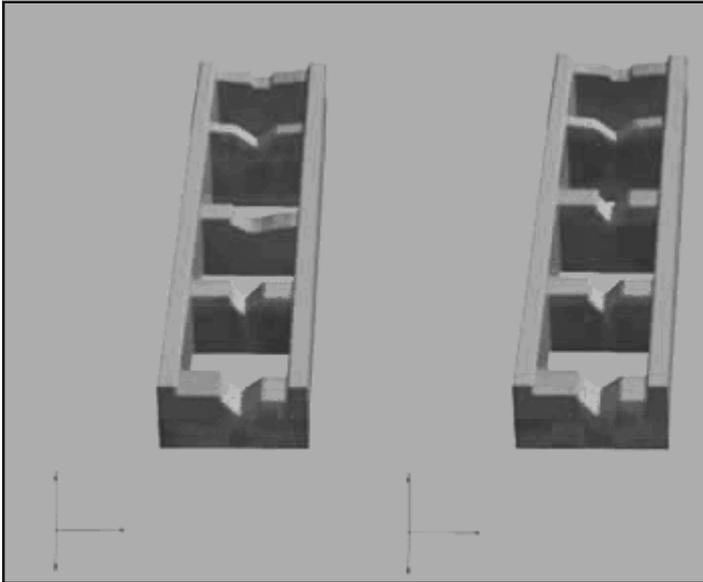
Fish ladders, also called fish ways, are placed around structures such as dams that impede the alewives’ migration upstream. One common type of fish ladder is a series of low steps that create pools. Fish swim into these pools and toward an opening that allows them to ascend to the next level. To “climb” the steps, the fish actually swim through the downward flowing water. It is also the current of the water that attracts the fish to the opening of the fish ladder and up each step. Moving through the series of steps, fish ascend beyond the barrier and upstream.



Alewife



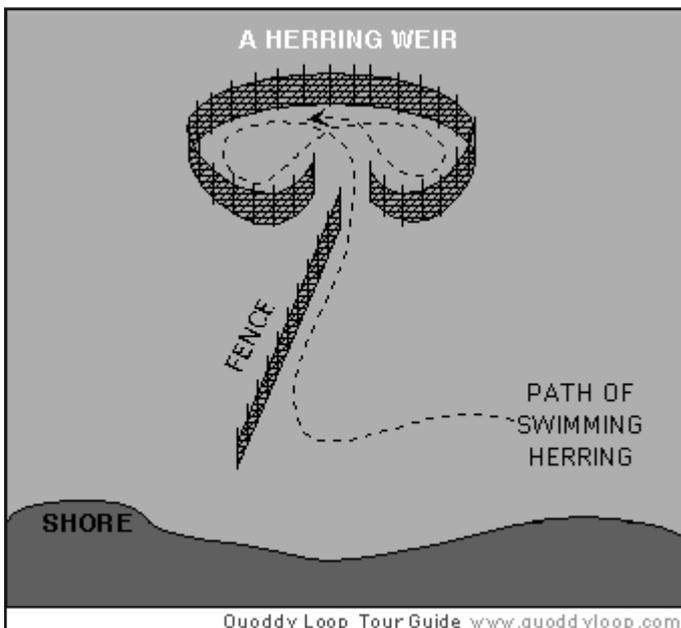
Alewife Floater



[Image from: [http://www.flow3d.com/pdfs/tp/wat\\_env\\_tp/FloSci-Bib06-07.pdf](http://www.flow3d.com/pdfs/tp/wat_env_tp/FloSci-Bib06-07.pdf)]

### How did Native Americans catch migrating fish?

Before modern day fish ladders, Native Americans built structures along rivers to direct migrating fish. They built these structures with upright wooden stakes and stones that allowed fish to swim upstream but *not* back down. These structures are called fish weirs. Fish weirs functioned more as a funnel, trapping the fish into the waters within the weir and not as an aid to migration and spawning. Fish weirs were effective means for catching fish during migration periods, when large numbers of fish are moving upstream.



### What To Do:

Begin by introducing students to the concept of migration. Ask students if they have heard of that word and if they know of any animals that migrate. Gather their ideas. Next explain that they are going to be learning about a fish that lives in the rivers of New Hampshire called the alewife. The alewife is an anadromous fish, meaning they spend most of their lives in the ocean but migrate up rivers to spawn in fresh waters.



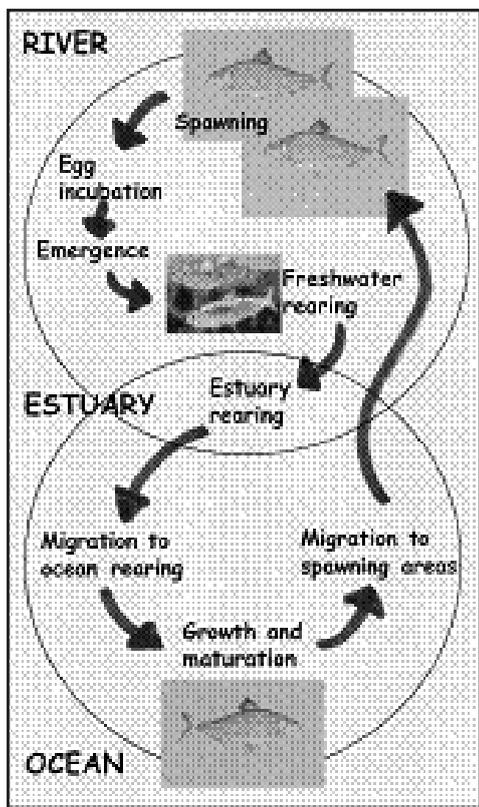
**What To Do:**

**What You'll Need:**

- Script for Alewife Migration Game included in this lesson
- Open space for students to play Alewife Migration Game
- Labels for students to wear to identify their roles in the game: alewife, osprey and alewife floaters or fresh water mussels found at the end of this lesson

Begin by introducing students to the concept of migration. Ask students if they have heard of that word and if they know of any animals that migrate. Gather their ideas. Next explain that they are going to be learning about a fish that lives in the rivers of New Hampshire called the alewife. The alewife is an anadromous fish, meaning they spend most of their lives in the ocean but migrate up rivers to spawn in fresh waters. Other anadromous fish that are native to New Hampshire are salmon, shad, lamprey, and blueback herring.

Talk to students about the life cycle of the alewife. Have students work independently or in groups to create a life cycle diagram for the alewife.



(Diagram from: <http://www.maine.gov/dmr/searunfish/alewife/index.htm>)



## Alewife Migration Game Script

Play a game of Alewife Migration. Gather students and explain that they will be playing a game that tells the story of the migration of alewives and shows the effects of the events that occur in different situations. Students will be assigned to be alewives, osprey or a type of fresh water mussel called an "alewife floater." Remind students that they are not individual creatures, but represent the population of alewives, osprey or fresh water mussels. Remind students that osprey are not the only predators of alewives, but for the sake of this game this is the population of bird predators they will represent. Ask students to keep in mind that as they learned in studying food webs and populations, when one food source is scarce, predators often shift to another, but that in this game we will consider the alewife as the main food source of the osprey.

### Round 1:

1. Assign student roles and hand out name cards to tape on their shirts. To begin have two alewives, one mussel and one osprey.
2. Designate an area to be the ocean, another to be stream and another to be the pond.
3. Gather alewives in the ocean. Have the alewife floaters in the stream and the osprey at the pond.
4. Alewives should begin to swim up the stream. As they do, the alewife floaters should attach itself to one of the alewives and ride upstream to the pond. This demonstrates the way in which the freshwater mussels hitchhike a ride with the alewife.
5. Once the alewife makes it to the pond, it spawns, laying eggs. The alewife doubles its population and two more students join the alewives. Be sure to mention to students that of the hundreds of eggs laid, only a small percentage hatch and become fry. Two alewives should swim back downstream to the ocean because adults return to the ocean shortly after they have spawned. Fry remain in the freshwater pond, stream or lake until they are approximately three to seven months old and six inches long.
6. The alewife floaters have made it to its freshwater habitat. Another student should join the game as a mussel, indicating an increase in its population.
7. The osprey should now hunt for food. The alewife population decreases and one alewife student sits out to indicate the natural flux of food web and life cycle patterns. The remaining alewife makes the return trip to the ocean and joins the other alewives.

This is the end of Round 1. There should be three alewives, two mussels and two osprey. Ask students to reflect on the events and changes of the game so far. Where is the alewife migrating from and why does it head upstream? Who depends upon the migration of the alewife? How do the populations of each creature increase?

Continue with Round 2, following the same format as above. (The freshwater mussels should return to the stream before beginning). The populations should again increase to six alewives, four mussels and four osprey. However, once the osprey population increases, the alewife population should again decrease to demonstrate flux, sitting one student down. There are now five alewives, four mussels and four osprey.

Round 3 is the time to introduce the dam. Humans have built a dam in the river, preventing most alewife from successfully making their migration. Ask students to predict how this will affect the events of the game and the populations. Tell students that only two alewives successfully make the



migration. Continue play as in previous rounds. The alewife population increases after the laying of eggs. However, because only two alewives have made the migration, only two mussels can successfully reach their freshwater habitat. Once the adult alewife return to the ocean, only two fry remain. Ask students what they notice at this point in the game. Remind them that in the first round there were only two fry. How is this situation different? This indicates a shortage of food for the osprey population. The osprey population cannot sustain itself and decreases to three and one alewife sits down. At the end of round 3 there are three alewife, two mussels and three osprey.

As you begin Round 4, explain that humans are noticing a decrease in the number of alewives, particularly lobstermen who use the alewives as bait for their traps. They realize that dams are upsetting the river ecosystem and want to correct this. They know they need to help the alewives get up and around the dams. They begin constructing fish ladders. Continue play as in previous rounds. All three alewives successfully migrate, allowing two mussels to catch a ride upstream. Both populations increase, alewives to six, mussels to four. Osprey again find a plentiful supply of food and their population increases, causing one alewife to sit down. At the end of round 4 there are five alewives, four mussels and six osprey.

### ***What Did You Discover?***

Review the events of the game. Map out the causal story: showing events, effects and population trends and ask these questions:

- How is the migration of the alewife important?
- How is the population of the alewife floater affected by the alewife fish successfully making its migration to ponds and streams?
- How does the successful migration of the alewife affect other birds and fish in the river ecosystem?
- How do humans affect the migration of the alewife? What are some of the branching effects that impact other parts of the river ecosystem?
- Why are fish ladders beneficial?

### ***More On The Subject:***

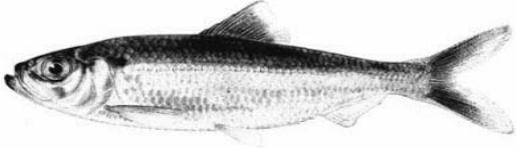
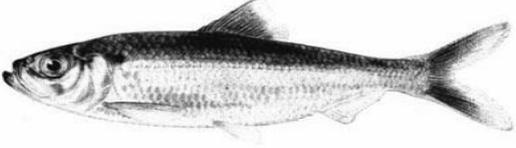
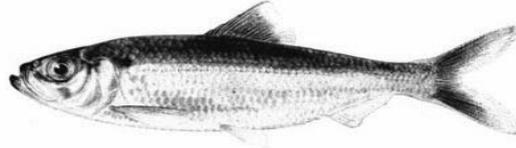
Visit a local fish ladder. There are seven fish ladders in the Great Bay water system and one in Manchester, New Hampshire. They are located as follows:

- Amoskeag Fishways, Merrimac River, Manchester.
- Exeter fish ladder, Great Dam, Exeter River, downtown Exeter
- Pickpocket Fish Ladder, Pickpocket dam, Exeter River
- Fish Ladder Park, Cocheco River, downtown Dover
- Oyster River Fish Ladder, Oyster River Dam, Durham
- Lamprey River, Newmarket
- Taylor River Fish Ladder, Hampton
- Winnicut fishway, Greenland (scheduled to be removed fall 2009)
- Study the fish weirs of Native Americans.
- Investigate other birds, fish and animals that migrate. Some to explore are osprey, monarch butterfly, salmon and hummingbirds.



### Alewife Migration Game

Make as many copies as needed. If played according to the script in this lesson, you will need 5 alewives, 4 alewife floaters and 6 ospreys.

	
	
	
	
	
	
	
	Alewife Migration Game





## Rolling On The River: The Amazing Life of Aquatic Insects

### **Big Ideas:**

- Students will learn about the life cycle of aquatic insects.
- Students will learn about the habitat of aquatic insects, an abundant form of life found in and around New Hampshire's rivers, streams and lakes.
- Students will learn about the ways in which aquatic insect interact with their environment.
- Students will review what they have learned about river ecosystems to create a field guide about aquatic insects.

### **Standards:**

- Classification: Identify the basic needs of plants and animals in order to stay alive.
- Reproduction: Recognize that living things have a life cycle during which they are born, grow and die.
- Environment: Recognize that animals interact with their surroundings.
- Recognize that some plants and animals go through changes in appearance when the seasons change.
- Identify and describe the factors that influence the number and kinds of organisms an ecosystem can support.
- Flow of Energy: Identify the resources plants and animals need for growth and energy and describe how their habitat provides these basic needs.
- Recycling of Materials: Recognize that plants and animals interact with one another in various ways besides providing food, such as seed dispersal or pollination.
- Describe ways plants and animals depend on each other.
- Using food webs, identify and describe the ways in which organisms interact and depend on one another in an ecosystem.

### **What You'll Need:**

- Life cycle diagrams\*
- Images of common aquatic insects\*
- Aquatic insect information handouts\*
- Internet access and a printer
- Field guides
- Writing paper
- Colored pencils, markers

\* found at the end of this lesson

### **A Little Background:**

#### **What are aquatic insects?**

Aquatic insects are small air-breathing invertebrates (without a backbone) that spend some part of their life cycle in a water habitat. Aquatic insects might live atop the surface of the water or under the water. Some common aquatic insects are: dragonflies, damselflies, mayflies, stoneflies, caddis flies, various types of water beetles and moths.



### How do they important to the health of rivers?

Aquatic insects are important to a river ecosystem because they provide food for fish, water birds and amphibians. They also play a role in the breakdown and release of nutrients from organic matter in the river. By eating dead leaf matter, some aquatic insects play a part in filtering the water. This is important because filtering the water allows light to reach plants and algae growing in the stream. By eating debris, aquatic insects are breaking down the dead plant matter and releasing nutrients that benefit the food web of the river. By eating some of the algae growing on rocks and plants in a river or by stirring up the muddy river bottom, some aquatic insects help to release more oxygen in the water.

Aquatic insects can also be an indicator of the health of a river or stream. Many types of aquatic insects are intolerant of pollutants because pollutants make it difficult to breathe underwater. If a river or stream has a wide variety of sensitive species of aquatic insects present, it suggests that the waterway is healthy. If species of sensitive insects are not easily found in a river system, it suggests that the water may be polluted. Likewise there are species that are less sensitive to pollutants and an abundance of these species may suggest a high level of pollution. This type of study of a river or body of water is called *biological monitoring* or *biomonitoring*. Some insects that are intolerant of pollutants are the stonefly, mayfly, caddis fly, and dobsonfly. Insects that are tolerant of pollutants include damselfly, dragonfly, mosquitoes, snails, aquatic worms and leeches.

### Where do aquatic insects live on the river? OR How does the river habitat help shape where aquatic insects call home?

The physical characteristics of a river change from the spring at its headwaters to the section of river that flows through woods, meadows and cities and towns. There are four factors that determine where various species of aquatic insects are found in a river. They are water temperature, water volume/velocity, substrates, and energy relationships.

The **temperature** of the water affects an insect's metabolism and lifecycle. Usually if the river water is warmer, an insect's metabolism is faster. If the water is colder, the insect's metabolism is slower. Aquatic insects tend to emerge earlier and the eggs of particular species will hatch earlier in the spring where warmer water temperatures can be found.

**Water velocity**, or the speed that a current is flowing, is important because some insects rely on the current of a river to carry leaf matter, a food source, from upstream and wash waste matter downstream. One factor that influences the water current is the boulders and rocks found in a river. Rocks and stones in a stream or river help to slow the current around them, creating a boundary in which an insect can be protected and not carried away downstream. In pools where the current is slow, oxygen levels are low, which is not ideal for some species. **Substrates**, or the materials found underneath the flowing river, including rocks, pebbles, twigs, sand, leaf and plant matter, provide a source of food and shelter for insects. The caddis fly uses areas sheltered by rocks from river currents and pieces of substrate such as rocks and twigs to build a case as part of its life cycle.

Another factor that influences water velocity is the land surrounding a river. If the riverbank or land close to a stream or river can absorb snowmelt and precipitation then the



current will remain constant. Having healthy plant life, trees and a porous ground surface all help with the absorption of water into the earth. If the area around a stream is paved and cannot absorb rainfall or snowmelt, the current may change dramatically, depending on the amount of runoff into the river. This affects both the current and water temperature (making it faster and warmer). **Energy relationships** refer to the type of energy, in many cases food and oxygen, that is carried downstream from the headwaters to the outlet of a river. The type of food source that is available in the river habitat will determine which species will be found there. If a river is in a wooded area where plant and leaf matter can be carried downstream, insects that eat this type of matter will be found. In contrast, insects that eat algae and aquatic plants will be found in the waters of streams and rivers near fields and meadows.

Most aquatic insects prefer a stream that is not too deep, usually less than three feet deep, and where the water is moving fast enough to produce some sort of rippling. There are however, aquatic insects that are suited to live in freshwater bodies of all types. Rocks, river plants, gravel or murky bottoms, a cluster of dead leaves, grass and vegetation along the rivers edge are examples of microhabitats of aquatic insects. Some aquatic insects live in streams, ponds and ditches that are filled with water during spring but dry up in the summer. If they mature into adults, these insects fly away to a more suitable habitat. Others burrow into the mud and are dormant until the following spring when their habitat is again filled with water.

### What is the life cycle of an aquatic insect?

The life cycle of an insect begins with the egg stage. Insects hatch from eggs that are usually laid in large numbers. The individual insects hatch as nymphs or larvae. **Nymphs** can be thought of as “baby insects” since they look a lot like the mature version of the insect, only smaller and often without wings. They continue to grow, shedding their exoskeleton, or **molting**, three to five times in the process of becoming adults. This is called an **incomplete metamorphosis**. Dragonflies, mayflies, beetles and stoneflies are all examples of insects that emerge from eggs as nymphs.

Insects that hatch from eggs in the **larvae** stage go through a different process. The larvae does not resemble the adult insect it will become, and will pass through a **pupa** stage on its way to becoming an adult. This is called a **complete metamorphosis**. In the pupa stage, the insect forms a cocoon in which it transforms into the adult form that looks quite different from its larva form. Aquatic insects that go through these stages of metamorphosis include the caddis fly and the true fly.

Some insects feed on leaf debris during the winter months and emerge as pupa or adults in the late winter to early summer. These insects include the mayfly and stonefly. Other insects have a long egg cycle, which might last from August to March. Their larva cycle might be from March to June and they may mature in June or July. These insects include some caddis flies. Still other species of aquatic insects have life cycles that do not depend upon the seasons and there may be insects of all different stages present at any given time.

The average life cycle of an aquatic insect in New Hampshire is approximately one year, however there are many exceptions to this. Most insects found in streams and rivers are in the larvae and nymph stage, while their adult forms live on land.

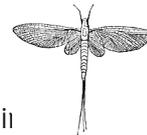


## What adaptations do aquatic insects have to help them survive and thrive in water habitats?

To survive in their water habitat, aquatic insects have many adaptations:

- Many aquatic insects are covered with a waxy layer that repels water and prevents too much water from entering their bodies.
- As nymphs and larvae, aquatic insects are strong swimmers and crawlers.
- To be able to breathe, some aquatic insect larvae develop gills to breathe oxygen that is dissolved in the water (as opposed to oxygen that is in the air).
- Other aquatic insects have breathing tubes that stick out from the water surface to obtain oxygen in the air. Mosquitoes have this type of breathing adaptation. With this type of breathing adaptation insects cannot swim too deep from the water's surface.
- Still other insects develop an air tank of sorts, trapping air between a layer of skin and breathing this air through their abdomen.
- Some aquatic insects can walk on the surface of the water. They do this by spreading out their body weight. These insects often have long, thin, waterproof legs.
- Most aquatic insects are able to sense ripples in water. Some of these insects have two tails at the end of their abdomen that detects vibrations or ripples. These ripples can alert them to predators in the water. Some use a form of "echo-location" to hunt prey. They create their own ripples in the water to listen for "echoes" to ripple back to inform them of the location of prey. Other insects use this as a form of communication.
- Many aquatic insects have abdomens that are streamlined, or flattened or torpedo shaped, ideal for propelling through the water.
- Many aquatic insects have long legs that are flattened like oars. These legs make it possible for them to paddle through the water. Hairy or fringed legs also help to break the water tension and paddle through the water easily.
- Some insects have suction-like features on their legs or they produce a sticky silky substance. This allows them to cling to a rock even in a moving stream of water. The long flat torsos of some aquatic insects allow the current of the water to flow around them without knocking them over or carrying them away. This allows them to rest on rocks in the stream.
- Long legs that extend far to the sides allow aquatic insects to rest upon a murky bottom without sinking in. The long legs let the insects distribute their weight evenly. Others have legs or heads that allow them to burrow into the muddy river bottom.
- The caddis fly produces a sticky silk web that they use to build a case from stones, twigs, shells or pine needles. The caddis fly lives in this case, which serves as protection from predators, camouflaging it at the bottom of a stream.

## What do aquatic insects eat and *how* do they eat?



Aquatic insects feed on a variety of resources in their habitat. These include plants, animal matter, leaves, wood and even blood. There are a few different ways how they feed and they can be characterized in the following way:

**Predator feeders** are those that catch prey using sharp claws, spiny legs or a strong jaw or teeth. The prey is usually other insects or smaller invertebrates, but can also be plant life or pollen. Some aquatic insects are especially equipped to even catch fish and tadpoles.



**Shredders** are those that use their mouths to break off pieces of flowers, leaves or twigs and grind them with their mouthparts. Most insects feed off vegetation that has fallen off of trees and plants growing nearby the stream. Few eat living plants.

**Scrapers** are those that use their mouths to scrape algae off of rocks.

**Collectors** are those that use long hairs on their legs or silk nets to filter decaying plant material from the water.

### ***What You'll Need:***

- Life cycle diagrams\*
- Images of common aquatic insects\*
- Aquatic insect information handouts\*
- Internet access and a printer
- Field guides
- Writing paper
- Colored pencils, markers

\* found at the end of this lesson

### ***What To Do:***

Tell students that they have become experts in river ecosystems through the course of studying about river habitats and the organisms that live there. Quickly review the topics that have been the focus of their activities and lessons, including food webs, habitats, adaptations, river geography and river plant life.

Explain that today they are going to think about a group of organisms that live in rivers and streams that are not always obvious but which play an important role in the ecosystem of a river. Explain that aquatic insects are those that live in or near a body of freshwater for part or all of their life cycle. Introduce the term "life cycle" and explain that there are two different types: complete metamorphosis and incomplete metamorphosis. Display the life cycle diagrams included at the end of this lesson to illustrate these processes.

Ask students if they have noticed insects in, or around streams, brooks, rivers or ponds. Have students share their observations, recording some of the different types of aquatic insects they mention. Display the images of some common aquatic insects found in New Hampshire rivers and streams. Talk about how some look like smaller versions of their adult self and that some will mature into a completely different form as an adult.

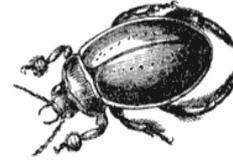
Ask students to share their ideas about how aquatic insects are important to a river ecosystem. They are likely to mention their role in the food web. Record their ideas. Explain that aquatic insects benefit streams and rivers in several ways.

The aquatic insect information handouts found at the end of this lesson could be distributed and read at this time.



Now tell students that they are going to be investigators trying to find the answers to the following questions:

- Where in the stream or river can aquatic insects be found?
- What is their habitat like?
- What role do aquatic insects play in a river ecosystem?
- How have aquatic insects adapted to survive in the river habitat?
- What does their life cycle look like?



Divide students into small groups to work on creating a report on a particular aquatic insect, ideally one that is present in their area. Students might choose the insect to research or it may be assigned to them. Tell students that the reports will be compiled together to create a field guide for the class and other classes at their school to use when visiting a stream. Encourage students to take ownership of their reports and provide information in a way that suits their particular learning style. In addition to written information, students can share what they find by constructing 3-D models of their insects, making drawings, sharing oral reports or even writing songs about their aquatic insect.

Students should work together to research their insect, finding information about:

- The life cycle of this insect, including descriptions and images of its nymph and adult forms
- Where in streams it is likely to be found
- How it feeds
- What role it plays in its river ecosystem
- Physical characteristics and special adaptations that help it survive in its habitat (for example, how does it protect itself? hunt prey?)

A great on-line resource for students to research information about aquatic insects can be found at: <http://www.ext.vt.edu/pubs/fisheries/420-531/420-531.html>

### ***What Did You Discover?***

Have students share their reports with the class. Discuss the following issues and questions:

- How are aquatic insects valuable to the river ecosystem?
- Knowing what they do about how rivers flow, how does developing areas around rivers and paving the land near riverbanks affect aquatic insects?
- How do trees and plants help aquatic insects? How does the removal of plants and trees around rivers affect aquatic insects?
- If there are fewer aquatic insects in a stream, how does that affect the rest of a river food web?
- What adaptations does the insect they researched have that allow it to survive in its habitat?
- What type of microhabitat does the insect they researched live in?



***More On The Subject:***

**Life cycle diagrams:** Have students create diagrams detailing the life cycle of aquatic insects.

**Design an aquatic insect:** Challenge students to design their own aquatic insects using features that will help them survive in their water habitats. They should detail its food source, method of feeding, means of protection from predators, and its physical adaptations and features.

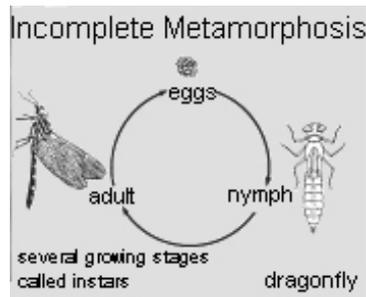
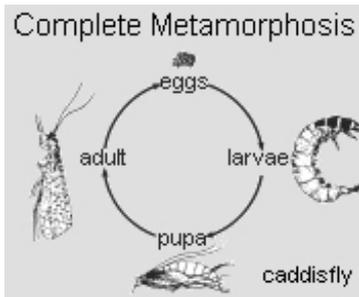
**Create a Venn diagram** comparing and contrasting two aquatic insects that undergo complete/incomplete metamorphosis.

**Observe and collect aquatic insects** at a nearby stream. Identify the insects found using the field guide created by the students. Are the insects' behaviors and location in the stream consistent with what you have learned about them? Does anything you find surprise you?



### Life Cycles of Aquatic Insects

Images from <http://www.epa.gov/bioindicators/html/lifecycle.html>



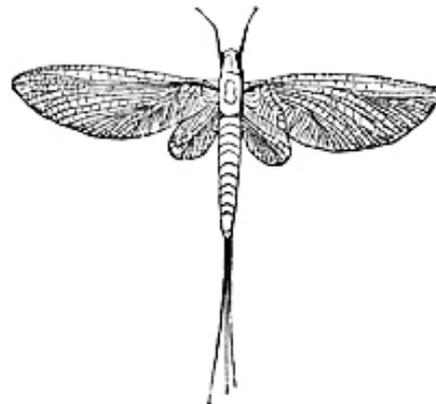
Images of common Aquatic Insects found in New Hampshire rivers and streams:

Reference: <http://www.bpa.gov/Corporate/KR/ed/kidsinthecreek/materials/macro/bugcard.pdf>

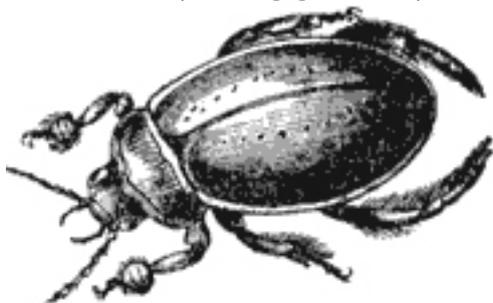
Dragonfly



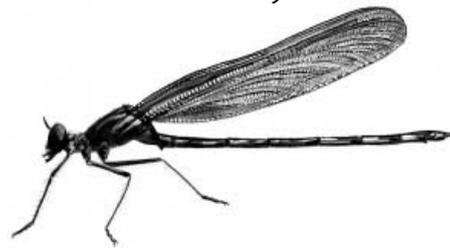
Mayfly



Water beetle  
(whirligig beetle)



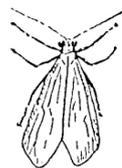
Damselfly



Caddis fly

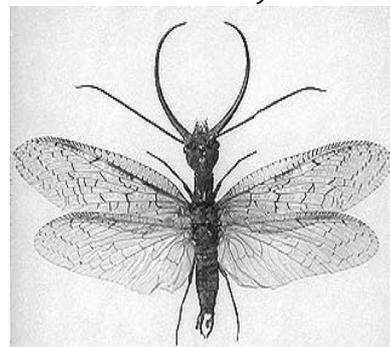


Caddis Worm Cases



Adult Caddis Fly  
Trichoptera

Dobsonfly





## Where do aquatic insects live?

### The habitat of aquatic insects:

Aquatic insects are usually found in water that is not too deep. They prefer to live in waters that are less than three feet deep.

Most aquatic insects choose water that is moving fast enough to create some rippling, as water that is moving tends to have more oxygen. The water should not move too quickly though because the fast current could wash the insects away down stream.

Other insects live in shallow ponds, streams or ditches that fill with water during some seasons, but dry up at other times of the year. Often these insects are the ones that develop wings as adults, who fly away to another habitat in the dry season.

Fallen leaves, twigs, stones and gravel, murky mud and river plants are important for an aquatic insects' river habitat. They can provide protection from predators. By hiding behind a rock, an insect can be protected from being washed away with the current. River plants and rocks can also provide shade. Plant and leaf matter, as well as algae that grows on rocks, provide food for almost all aquatic insects.

The temperature of the water is another important factor in the habitat of aquatic insects. The temperature of the water tells the eggs of the insects when to hatch. This is important because eggs that hatch at the wrong time could mean that the insects will emerge and mature at times when the water might be too cold, food might not be available or when the temperature would make it difficult to live.

## What is the life cycle of aquatic insects?

The life cycle of an insect begins with the egg stage. Insects hatch from eggs that are usually laid in large numbers. The individual insects hatch as nymphs or larvae.

**Nymphs** can be thought of as "baby insects" since they look a lot like the mature version of the insect, only smaller and often without wings. They continue to grow, shedding their outer shell or skin. This is called **molting**. Most nymphs do this three to five times in the process of becoming adults. Dragonflies, mayflies, beetles and stoneflies are all examples of insects that emerge from eggs as nymphs.

Insects that hatch from eggs in the **larvae** stage go through a different process. The larvae do not resemble the adult insect it will become. It will pass through a **pupa** stage on its way to becoming an adult. In the pupa stage, the insect forms a cocoon in which it transforms into the adult form that looks quite different from its larva form. Aquatic insects that go through these stages of metamorphosis include the caddis fly and the true fly.

Some insects feed on dead leaf matter at the bottom of the river during the winter months and emerge as pupa or adults in the late winter to early summer. These insects include the mayfly and stonefly.



Other insects have a long egg cycle, which might last from August to March. Their larva cycle might be from March to June and they may mature in June or July. These insects include some caddis flies.

Still other species of aquatic insects have life cycles that do not depend upon the seasons and there may be insects of all different stages present at any given time.

The average life cycle of an aquatic insect in New Hampshire is approximately one year, however there are many exceptions to this. Most insects found in streams and rivers are in the larvae and nymph stage, while their adult forms live on land.

## How are aquatic insects adapted to live in their environment?

### To survive in their water habitat, aquatic insects have many adaptations:

Many aquatic insects are covered with a waxy layer that repels water like a rain jacket and prevents too much water from entering their bodies.

As nymphs and larvae, aquatic insects are strong swimmers and crawlers.



To be able to breathe, some aquatic insect larvae develop gills to breathe oxygen that is in the water (instead of oxygen that is in the air).

Other aquatic insects have breathing tubes that stick out from the water surface to obtain oxygen in the air. Mosquitoes have this type of breathing adaptation. With this type of breathing adaptation insects cannot swim too deep from the water's surface.

Still other insects develop an air tank of sorts, trapping air between a layer of skin and breathing this air through their abdomen.

Some aquatic insects can walk on the surface of the water. They do this by spreading out their body weight. These insects often have long, thin, waterproof legs.

Most aquatic insects are able to sense ripples in water. Some of these insects have two tails at the end of their abdomen that detects vibrations or ripples. These ripples can alert them to predators in the water, like frogs, toads and fish. Some use a form of "echo-location" to hunt prey. They create their own ripples in the water to listen for "echoes" to ripple back, which gives them information about the location of prey. Other insects use this as a form of communication.

Many aquatic insects have abdomens that are streamlined, flattened or torpedo shaped. This helps them to propel through the water when swimming.

Many aquatic insects have long legs that are flattened like oars. These legs make it possible for them to paddle through the water. Hairy or fringed legs also help to move and paddle through the water easily.



Some insects have suction-like features on their legs or they produce a sticky silky substance. This allows them to cling to a rock even in a moving stream of water. The long flat bodies of some aquatic insects allow the current of the water to flow around them without knocking them over or carrying them away. This allows them to rest on rocks in the stream.

Long legs that extend far to the sides allow aquatic insects to rest upon a murky bottom without sinking in. The long legs let the insects distribute their weight evenly. Others have legs or heads that allow them to burrow into the muddy river bottom.

The caddis fly produces a sticky silk web that they use to build a case from stones, twigs, shells or pine needles. The caddis fly lives in this case, which serves as protection from predators, camouflaging it at the bottom of a stream.

### **What do aquatic insects eat and how do they eat?**

There are many different things that aquatic insects feed on in their river habitat. Some of these are plant and animal matter, leaves, wood and even blood.

There are different ways that aquatic insects catch prey and feed:

**Predator feeders** are those that catch prey using sharp claws, spiny legs or a strong jaw or teeth. The prey is usually other insects or smaller invertebrates, but can also be plant life or pollen. Some aquatic insects are especially equipped to even catch fish and tadpoles.

**Shredders** are those that use their mouths to break off pieces of flowers, leaves or twigs and grind them with their mouthparts. Most insects feed off vegetation that has fallen off of trees and plants growing nearby the stream. Few eat living plants.

**Scrapers** are those that use their mouths to scrape algae off of rocks.

**Collectors** are those that use long hairs on their legs or silk nets to filter decaying plant material from the water.



## Natural Science Extension Activities for Grades K-2:

*Here are some activities and ways to modify the lessons in the River Life and Ecosystems portion of this unit for younger students.*

From the lesson: *It's Alive!...Or Is It?:*

**What's Living (and non-living) along the river?**



1. After the discussion with students about how scientists classify living and non-living things in our world and what living things need, have students look for and cut pictures from magazines to create a chart of living and nonliving things.
2. A bean as a living thing:

### ***What You'll Need:***

- Small plastic or paper cups
- Potting Soil
- Beans
- Water



Show students a bean. Ask them whether they think it is a living thing or non-living thing and to give reasons that support their idea. If students say that it is a living thing and predict that it will become a plant, ask them what the bean needs to live (reminding them of what they learned all living things need). Place the bean in a cup of soil and water it. Ask students to make predictions of what, if anything, will happen. Record their ideas to review later. Give each student a bean to place into cups of soil. Water lightly. Ask students to record their predictions on the handout sheet or in their science journal. Place the cups near a window or sunny spot in the classroom. Observe on a regular basis, having students record their observations and reviewing their predictions. Have student's ideas and predictions about the bean been changed or reinforced?

## Natural Science Extension Activities for Grades K-2:

From the lesson: *Home, Wet, Home: A River Habitat* 

1. After the discussion about what a habitat is, go on a river walk or read books about river habitats. Ask students to think about and share what parts of the river environment create a supportive habitat for the creatures that live there. Encourage them to think about the river, ponds, trees and plant-life, as well as the soil and rocks and other physical elements. Help students see that a river habitat meets the needs of many different types of creatures, from birds, fish, aquatic insects and small and large animals.



2. Discuss the types of animals and birds that make their home along a river. Ask students to name animals they have seen near a river or that they think might make their home there. Ask them to think about what things these animals need that the river habitat provides? Ask students to identify river wildlife on the *river wildlife* handout sheet . (cut out an put in a chart or identify by coloring/circling among a group of non-river wildlife?)
3. Have students draw and write about a habitat around their home (their neighborhood; wooded area; field; ocean). Students should describe who lives there, what are the parts of the habitat that make it a suitable living environment, including resources for food, protection, and nesting.

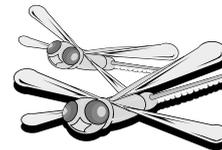
## Natural Science Extension Activities for Grades K-2:

From the lesson: *What's On The Menu?*

*Food Chain Interactions In A River Ecosystem*



1. Ask students to think about the different types of living things found in a river habitat. Record students' answers. Talk about plant life, insects, birds and small and big animals. Ask students to think about the way in which these animals are important to each other. Remind students of the need for food and to think about where these creatures find energy within their river habitat. Explain that a chain can be made, showing who depends on what for energy. Together with students or working in small groups create food chains using the river food web images found in the *What's On The Menu* lesson.
2. Create a river life book (Grades 1-2). In small groups, have students research a river plant, insect or animal and write a brief description of the animal and what the animals needs from its river habitat, what it needs for food and who its predators are. Have students draw pictures and bind the pages together to create a river field guide or reference book for class.
3. Create a River Café menu. Have students choose an animal, insect, fish or bird and write a menu of items that this creature might "order" from the offerings at the river habitat café. Students should research what foods their creature eats. This is an opportunity to talk about the terms carnivore, herbivore and omnivores. Students can draw, cut out or print pictures from the computer to create a menu for their creatures.



## Natural Science Extension Activities for Grades K-2:

From the lesson: *How Rivers Form and Flow*



This lesson is designed to introduce younger students to rivers and river habitats.

1. Ask students to think about how they would describe what a river is. Where do rivers come from? Where do they flow?
2. Create a model to demonstrate how water flows downstream from headwaters to the ocean. Use a large rectangular plastic container as the base. Arrange rocks of various sizes throughout to create a topographical model, with high and low levels. Place a large sheet of plastic over the rocks. This sheet may be painted to illustrate the hills and river basin. Now ask students to predict where the water goes when it rains. Using a spray bottle filled with water and blue food coloring, spray the river model. Ask students to observe where the water flows. Explain to students that in addition to rain, snow melt from the mountains also flows downstream toward the ocean.
3. Look at a map to locate a nearby river and follow its path to the sea. Show students how tributaries flow into the river, which rivers flow together or whether the river flows directly into the sea. Handout maps to students and help them locate different rivers. Have students color each river a different color and where tributaries merge they can blend the colors together. For instance, students might color the Little River yellow and the Exeter River blue, and where they merge they could blend those colors to make green.



## Natural Science Extension Activities for Grades K-2:

From the lesson: *Plant Life: Helping Rivers*



1. Talk to students about the important roles aquatic plants play in a river habitat. Discuss how plants, grasses, shrubs and trees provide food and shelter for river wildlife. Create a list of ideas students have. Identify river plant life using pictures from the handout.
2. If possible, bring a cattail to class and talk about the different parts of the plant as well as its many benefits to wildlife as well as humans. People have used the white fluffy-seed matter that emerges in fall as stuffing for pillows and mattresses, used the leaves to weave mats and baskets, and the stalk and pollen is edible (it is compared to asparagus). Many birds use the fluff and leaves of the cattails in making nests, and ducks and geese eat the plants. Make a cattail using straws, green construction paper and paper bag.

### **What You'll Need:**

- Straws
- Green colored construction paper or tissue paper
- Brown paper bag



To make the stalk, cover the straw using green construction paper or green tissue paper. For each cattail, cut two long leaf shapes out of the green paper to make leaves. Using the brown paper bag, cut and roll a square into a cylindrical shape, twisting the ends into a point. Glue one end of the paper bag "flower" into the straw. Glue the leaves onto the straw "stem."

## Natural Science Extension Activities for Grades K-2:

From the lesson: *It's All About Survival: Adaptations of the Beaver*



Create a Venn diagram to compare their physical characteristics to those of a beaver, as well as their physical and behavioral adaptations. Questions that students should think about are:

- How does a beaver keep warm? How do I?
- How does a beaver keep dry? How do I?
- How does a beaver groom itself? How do I?
- What parts of a beaver's body help it to do what it does? What parts of my body help me to do the things that I do?
- How does a beaver make its home? What are the parts of its home? Where do I live and what are the parts of my home?

## Natural Science Extension Activities for Grades K-2:



From the lesson: *Traveling the River Highway: The Migrating Alewife*

1. Ask students in grades 1-2 to write a story about the life cycle of the alewife and the migration it makes each year. Their stories should include facts about the life cycle, as well as its migration pattern during the seasons and the challenges they face in their migration.
2. Create a map for alewives to find their way from the ocean to the pond where they will spawn. Ask students to include markers on the map that identify notable landmarks, tributaries, fish ladders, and bridges. Older students might create written directions as well.

## Natural Science Extension Activities for Grades K-2:

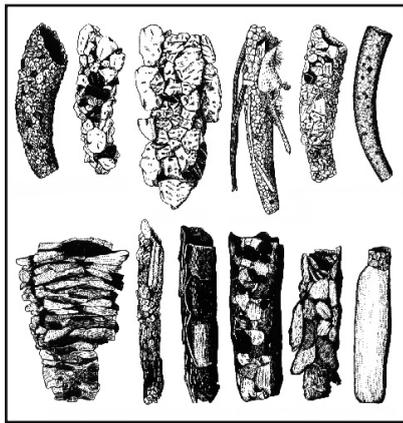


From the lesson: *Rolling On The River: The Amazing Life of Aquatic Insects:*

1. Learn about the caddis fly through internet research. Talk about its life cycle and habitat.
2. Make a caddis fly case using toilet paper tube and glue on stones, twigs, and shells.

### **What You'll Need:**

- Images of caddis fly cases
- Toilet paper tubes or paper towel tubes cut in half
- Stones, pebbles, twigs and shells
- Tacky glue



[Caddis fly cases]

Have students create their own caddis fly cases by gluing the pebbles, twigs or shells to the toilet paper tubes. Talk about how the caddis fly creates a sticky web that it uses to adhere the materials to its case. Ask students to compare these cases to the homes and shelter of other creatures.

3. Research the dragonfly, learning why they are beneficial, especially in areas near water. Talk about how other insects are beneficial. Learn about the adaptations and special features of a dragonfly that help it hunt prey and live in and around water. Make dragonflies.

### **What You'll Need:**

- Wooden doll pins ( old style clothes pins with rounded tops)
- Wax paper
- Glue
- Pipe cleaners
- Mini pompoms

Using the wooden doll pin for the body, have students cut wings from wax paper and glue to body. Pipe cleaners can be attached for legs, and the mini pompoms for eyes. Students may decorate and add other features.

## Natural Science Lessons Suggested Readings

### Home, Wet, Home: A River Habitat

Let's Explore a River, by Jane McCauley.  
Ponds and Streams, by John Stidworthy  
Animals of Rivers, Lakes and Ponds, by Sandra Donovan  
Life in a Stream, by Carol Lindeen  
Puddles and Ponds, by Rose Wyler



### What's On The Menu? Food Chain Interactions in a River Ecosystem

River of Life, by Debbie S. Miller  
What River Animals Eat, by Joanne Mattern

### Traveling the River Highway: The Migrating Alewife

Salmon Forest, by David Suzuki

### Rolling on the River: The Amazing Life of Aquatic Insects

Insects in the Pond, by Kubo Hidekazu  
Water Insects, by Sylvia Johnson  
Spring Pool: A Guide to the Ecology of Temporary Ponds (New England Aquarium Books),  
by Ann Downer





Photo courtesy of the Dover Public Library, NH

Rivers: Bringing New Hampshire To Life  
People & Industry  
Along the River





## Getting to Know Your Town

### **Big Ideas:**

- All towns have distinguishing features that make them similar to and different from other towns. Often this goes back to how they were set up when they were founded.
- Some towns grew in size and complexity during the industrial Revolution when they took on a larger role in New Hampshire's economy.
- Many New Hampshire cities and towns were developed and grew due to their location on rivers and the factories and mills that were built along these rivers.

### **Standards:**

- Identify national and New Hampshire celebrations, monuments, symbols and documents.
- Describe the impact of major national and state events on everyday life.

### **What You'll Need:**

- A town or city with a bustling downtown and plenty of features to explore or access to the internet application *Google Earth*
- Old and new maps of the chosen town
- A digital camera
- Materials for mapping activity (your choice)
- A partial list of New Hampshire cities and towns, including the role they played in the growth of the state (found at end of this lesson)

### **A Little Background:**

Many towns and cities in New Hampshire can be called mill towns. Mill towns have specific features including brick mills or factories built directly along the riverbank to take advantage of water power to run the machinery. The majority of these mills were built in the 1800s.

A mill town is typically a settlement that is developed around one or more mills or factories. As mills were built, the need for new businesses and services to support the thousands of mill workers and their families who relocated to the city or town grew as well. Much of the land in mill towns was owned by companies that ran the mills. These companies not only built the mills, but were also responsible for planning and building the services needed around the mills. The mill overseers were responsible for the management of boarding houses and commercial establishments like company stores for mill workers. Homes, boarding houses, stores, banks, theatres, restaurants and other commercial establishments were built close to the mills to serve mill workers as well.

Towns located away from rivers relied on other forms of industry such as the production of goods in small buildings or on family farms, such as piecework for shoe manufacturing, spinning, weaving and woodworking.

While many cities and towns were able to take advantage of rivers as a source of transportation and power, early New Hampshire towns were also frequently built around a predominant social landmark like a church or meetinghouse. Due to limited transportation, town centers were designed to house everything citizens needed within a manageable walking distance.



In the early 1900s, many mills were closed as the textile industry began to move their operations to the southern states, where worker's wages were lower and materials such as cotton were readily available and less expensive than having to ship them to New England.

Over the past century, town and city centers have changed. People have easier access to public transportation and cars, encouraging the movement of people from city and town centers to more rural areas where land was available. Chain stores carrying a wide variety of products replaced the need for smaller specialty stores found in a typical downtown. Many New Hampshire city centers were neglected, stores closed. In recent decades, cities have been working hard to re-establish vibrant downtown areas. Mills have been refurbished and house new businesses.

A list of New Hampshire mill towns includes: Belmont, Berlin, Claremont, Dover, Franklin, Gorham, Greenville, Groveton, Harrisville, Keene, Laconia, Lancaster, Lebanon, Lincoln, Manchester, Milford, Milton, Nashua, Newmarket, Newport, Penacook, Pittsfield, Rochester, Somersworth, Suncook, Tilton, Troy, Wilton

### ***What To Do:***

#### ***What You'll Need:***

- A town or city with a bustling downtown and plenty of features to explore or access to the internet application Google Earth
- Old and new maps of the chosen town
- A digital camera
- Materials for mapping activity (your choice)
- A partial list of New Hampshire cities and towns, including the role they played in the growth of the state (found at end of this lesson)

In this activity students will be stepping out of the classroom to explore their town (or a nearby town) to see what is there and where stores, churches, homes, schools, parks and other public buildings and services are located.

Students will come away from this activity with a better understanding of how their town is mapped out, what important features are there, and what the role of the town has been in New Hampshire's industrial and cultural history.

### **In The Classroom**

Examine both old and new maps of the town you'll visit. Pick out the predominant features- both where they are now and where they were located in the past, or what they are used for now and what they were used for in the past. For example, brick mills throughout New Hampshire have been converted to business space, restaurants, apartments and more. Churches, schools, theatres and storefronts and more have served multiple purposes over time. Your local city/town hall, historical society, community elders or internet research may help you identify sites that have transformed over time.

Plan a tour of your chosen town or city (the teacher can do this part alone or with the help of the



class) that highlights important locations in or near the town center.

These may include:

- Town hall, meeting house
- Historic sites, museums, churches etc.
- Library
- Mills and other areas of industry Fire/Police
- Schools, parks, monuments
- Geological features (rivers, etc.)
- Storefronts, restaurants and services
- Churches

Depending on the size of the town or city it may not be possible to cover all the features listed above. Select what is most important/ what can easily be covered in a specific area. If you don't have access to a major city or town, using an internet application such as *Google Earth* will allow you to study any town you choose using satellite imagery.

### On The Town

Walk around town pointing out the features you located on the maps in the classroom. Take digital pictures of each building, monument or natural feature for reference back in the classroom. Discuss each feature with students and ask questions such as:

- What is this building's function now?
- Did it have a different purpose in the past?
- Why do you think it was built where it is located?
- Why is it important to the town?
- Is it centrally located (or easy to get to from other places in town)?
- Is it close to where people live and work?

If you can, have people who live or work at these locations speak with students and provide some background information about each site. Look for experts, such as a town historian or local historical society that can provide your students with answers to questions such as:

- Who were the people that first settled in this town?
- What brought them here?
- How did they shape the features of this town?

### Take It Further, A Mapping Activity

Back in the classroom, review what you found with students using your town/city maps and the photographs taken during your tour. As a culminating activity, have students create their own maps of your town. These can be as simple or elaborate as you choose to make them. A simple version could be created using paper and pencil, and copies of photographs taken. A 3-D model could be made using construction paper covered containers such as milk cartons to represent locations visited. The entire class could work together to create a bulletin board or table-sized map of their



town.

### ***What Did You Discover?***

- Was my city or town built around a central location such as a river, church or meetinghouse?
- Does my town have mills or factories?
- If so, what other features can be found in the area surrounding the mills?
- If not, how did my town develop and grow?
- What are the important and/or historic features of my town?
- How has my town changed over time? Did the functions of different buildings or businesses change? Why do you think so?

### ***More On The Subject:***

#### **Take A Walk**

Walking tour itineraries can be found at:

[www.visitnh.gov/what-to-do/mills-and-mainstreams.aspx](http://www.visitnh.gov/what-to-do/mills-and-mainstreams.aspx)

#### **Research Your Hometown**

- When was it founded?
- By whom?
- For what reason?
- What have the major industries been there over the years?
- What is the current population?
- What major events have occurred there?
- Compare your town with one of the mill towns on the list above, or if your town is a mill town, research one in a different part of the state.
- How do they compare in size?
- How are their current and past industries different and alike?
- Looking at the two towns as a whole, how are they alike and different?
- Are these towns affected by geography as well as industry?



## New Hampshire Cities and Towns

Below you will find a partial list of New Hampshire cities and towns with vibrant town centers and/or ties to the Industrial Revolution.

### **Berlin**

Situated on the Androscoggin River, Berlin became the center of the pulp and papermaking industry in New England from 1800s through the early 20th century. Today, Berlin's historic downtown still reflects its history with turn of the century building facades.

### **Claremont**

Downtown Claremont features historical architecture and spectacular views of textile mills along the Sugar River.

### **Dover**

Dover is situated between the Bellamy and Cochecho Rivers in the center of the Seacoast region of New Hampshire. Dover's mill buildings once produced and printed fabric, including the country's largest production of printed calico. Today the mills are home to a variety of businesses and arts organizations.

### **Hillsborough**

Home to preserved and restored buildings, as well as historic textile mills perched along the banks of the Contoocook River that once made Hillsborough a booming town.

### **Jaffrey**

Nestled at the base of Mount Monadnock, Jaffrey is home to lakes, rolling countryside, village greens, museums, and shops.

### **Keene**

Home of Keene State College, Keene is full of history with Chase's mill and Colony Block. Keene's downtown offers a 19th century woolen mill and the Colony Mill Marketplace which now houses specialty stores and restaurants.

### **Littleton**

Located on the Ammonoosuc River in the White Mountains, Littleton was named one of the top ten small towns in America. The Littleton Grist Mill and sawmill that was established in 1798 was the beginning of what would become the town center.

### **Manchester**

The state's largest city is also called the "Queen City." Manchester once contained the world's largest single millyard and employed 17,000 men, women and children in its many mills.

### **Meredith**

Meredith, located on Lake Winnepesaukee, is home to lake and mountain views, tourist attractions, historic sites, outdoor adventures and shops.



### Nashua

The “Gate City” is the state’s second largest and named for its location bordering Massachusetts. Thanks to a canal linking Nashua with Boston, during the Industrial Revolution the city flourished with a variety of industries; from the manufacturing of cotton and an assortment of goods, Nashua was also home to machine shops, iron foundries, railroad shops, and paper-printing companies. In 1836, Nashua was home to the first chartered railroad in the state, the Nashua & Lowell.

### Peterborough

Named one of the 10 Coolest Small Towns in America by Budget Travel magazine, Peterborough is home to art museums, lakes, shops, and state parks.

### Somersworth

Situated on the Salmon Falls River, Somersworth has been home to many industries including: cotton, wool and shoe making, fabric bleaching, machine shops, and consolidated light and power.

### Tilton

Once home to the Arthur S. Brown textile mill which is now a waterfront park, Tilton is home to a quaint downtown containing shops and sights such as the Tilton Arch, the 1879 Town Hall, the Iron Bridge and historic statues.

Example of downtown Dover New Hampshire, Henry Law Park:



1800's

Image courtesy of Dover Public Library, NH

Cocheco Printworks is on the left, Mill No.1 is on the right. Approximately fifteen buildings filling what is now Henry Law Park, were constructed between 1842 and 1844.



2008

Image courtesy of ARQ Architects, Kittery ME & Sean W. Hennessey Photography

The Children’s Museum of New Hampshire, transformed a historic mill building, located in Henry Law Park, into a public Children’s Museum using LEED certified technology and design.

<http://images.dover.lib.nh.us/mills.htm>



## Mills: Machines of Industry

### *Big Ideas:*

- A mill is a simple machine where raw materials go in and a finished product comes out.
- The force of moving water currents found in rivers can be used to create power.
- Mills are run by both water power and human power.

### *Standards:*

- Explore major developments and changes in economic productivity.
- Demonstrate an understanding of major developments and changes in American productivity.

### *What You'll Need:*

- Mill Times DVD based on Mill by David Macaulay 60 minutes (available online from Amazon.com etc., from Act Advantage [www.actadvantage.org](http://www.actadvantage.org), and from many public libraries) or the book itself: Mill by David Macaulay, Houghton Mifflin Company
- Glossary of Textile Mill Terms (found at the end of this lesson)
- Library/computer time for students' mill research
- Implements for design (markers, paper, rulers)
- Aluminum pie plate, scissors, wooden spools, wide rubber bands, and material for axles such as narrow wooden dowels, pencils round wooden or metal kebob skewers

### *A Little Background:*

Long before the first mill was built in Europe, goods that people needed were made at home or on small family farms. At home-based enterprises, timber was cut, leather tanned, wheat ground for flour, and cotton spun into yarn and woven into fabric. That all changed as technology advanced in England and Scotland in the mid-1700s. Harnessing power from riverways, and using simple machines, Europeans constructed long, narrow, multi-storied buildings called mills to efficiently manufacture large quantities of goods that were previously made at home, including cotton fabric.

At the same time, in New England, people found ways to harness the power of almost every river.

Cotton mills were prevalent in New Hampshire and provide an excellent example of how a mill works.

Before the development of the steam engine, all mills were located on fast rivers in order to use water, or hydroelectric power to move the mill machinery. The **water wheel** was able to generate this power from the water passing over it.

When equipment in the mill couldn't be run directly from the **shaft** of the water wheel, a system of gears, pulleys, additional shafts, and belts was used. This was called a **power train**.

Cloth or textile manufacturing was a prominent mill industry in New Hampshire and New England.



With abundant rivers to transport raw materials and finished goods, strong river currents to generate power, and a large workforce to work in the mills, this industry grew and thrived in the 1800s.

The process of turning raw cotton fibers into yarn, then woven cloth is described briefly below:

The **carding** machine untangled and aligned the cotton fibers.

It produced a loosely connected rope called a sliver.

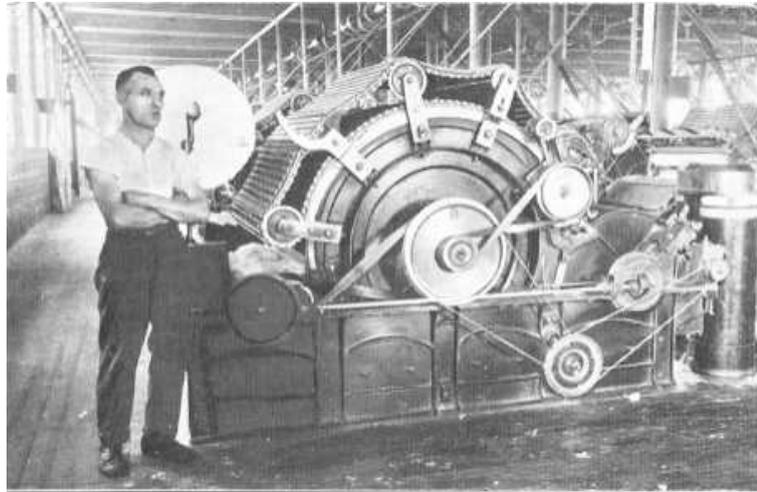


Image courtesy of Dover Public Library, NH

The **roving** machine drew the cotton further then dropped it into the **roving can** where it was given a slight twist.

The roving was removed from the roving can and wound around a **bobbin**. Each worker was responsible for as many as 100 bobbins at a time.



Mill workers and their bobbins

Photo courtesy of the Dover Public Library, NH

When there were enough bobbins wound, they were taken to a **spinning** machine called a **throstle**. The throstle continued the drawing and refining of the rope but did it with a much stronger action. The rope was further twisted as it was wound around another bobbin. The finished yarn was tied



into bundles called **hanks** and delivered to the **weavers** who would manufacture the cloth.

### *What To Do:*

#### ***What You'll Need:***

- Mill Times DVD based on Mill by David Macaulay 60 minutes (available online from Amazon.com, from Act Advantage [www.actadvantage.org](http://www.actadvantage.org), and from many public libraries) or the book itself: Mill by David Macaulay, Houghton Mifflin Company
- Glossary of Textile Mill Terms (found at the end of this lesson)
- Library/computer time for students' mill research
- Implements for design (markers, paper, rulers)
- Aluminum pie plate, scissors, wooden spools, wide rubber bands, and material for axles such as narrow wooden dowels, pencils round wooden or metal kebob skewers

We have provided two ways of approaching the subject of mills below. The first activity introduces students to the machines and processes used to transform raw materials into finished products in mills. It involves having students research what kinds of products were produced in mills throughout New Hampshire in the 1800s. The second activity invites students to experiment with water wheels and how water can be used to run a complex system in a mill.

### **How Mills Work and What They Produced**

In this activity students will be examining what makes up a mill and how raw materials become a finished product in such a system. Students will come away from this project knowing that even though a mill is made up of individual machines, these individual parts constitute a whole that transforms raw material into something marketable.

Watch the Mill Times DVD and discuss the dynamics of the cotton mills featured. If you cannot get a copy of the DVD, you may choose to read an excerpt describing the building of The Yellow Mill, a cotton mill in Rhode Island, in the book Mill by David Macaulay. Both of these sources will provide detailed descriptions of how cotton mills were built, as well as detailed images of machines.

What machines were used? How was raw cotton transformed into cloth? What was the role of humans in this process? Why were mills located on rivers?

We have already seen the cotton mill and its contribution to New England industry, but what other products were manufactured in New Hampshire and why?

Mills in New Hampshire produced a variety of goods – paper, leather, lumber, and textiles. Trees to make lumber and paper and hides to produce leather were readily available locally so little was required in the way of transportation to get these materials to a mill to be processed.

Some of the raw materials for textiles were also available locally (wool for instance) and some were transported from the south (like cotton) using waterways or the railroad later on. In places like Dover and Exeter the rivers were not only powerful enough to run mills, they were also wide and deep enough to accommodate boats or Piscataqua gundalows bringing materials in from out of state.



Have students research the different products made in 19<sup>th</sup> century mills.

- What kinds of products were produced in New Hampshire mills?
- In what part of the state were they produced?
- Where did the raw materials come from?
- Where did these products go after they were manufactured?
- Were they sold locally or shipped elsewhere for sale?
- Did they leave the country?

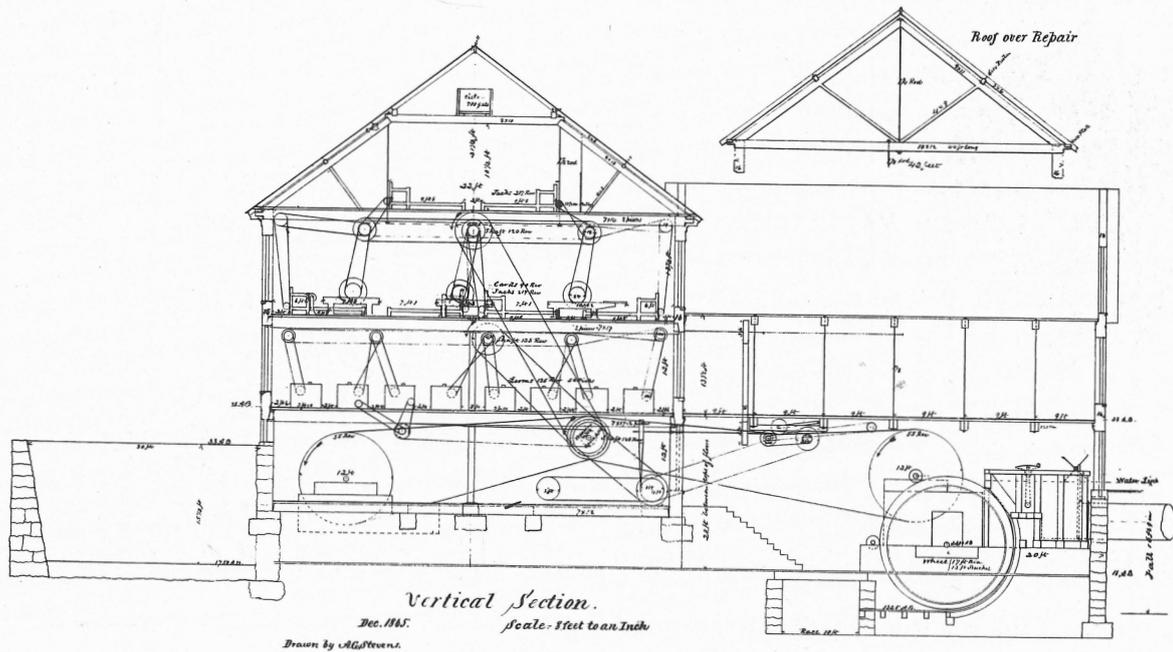
### Experiment with Water Power

As explained above, before the invention of the steam engine, all mills were located on swift-moving rivers and used the power of that water to run their machinery. Power was generated as river's current passed over a water wheel, causing a shaft in the middle to rotate. To run additional machinery, a series of gears, pulleys, shafts and belts were attached to the shaft of the water wheel to make one big machine.

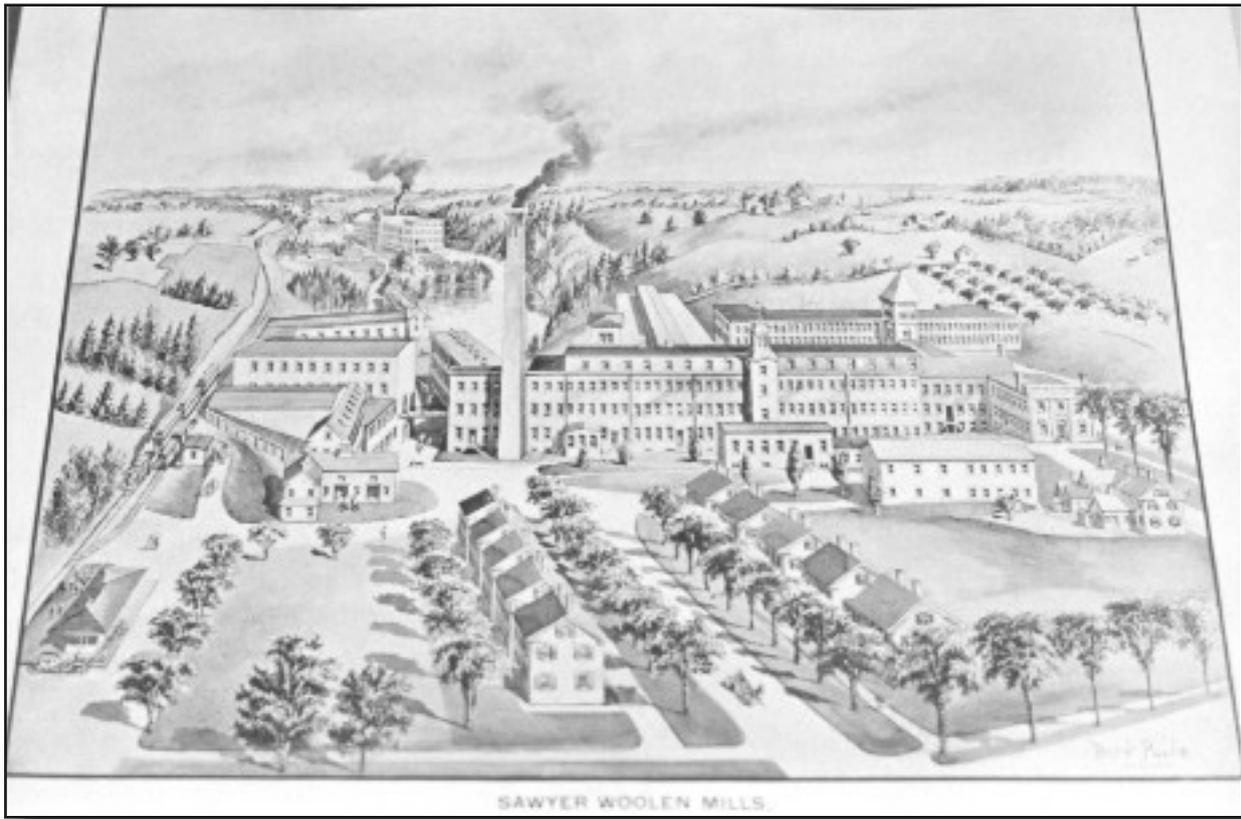
For this project, students can work independently or in groups using everyday materials to create their own water wheels and power trains. Instructions for creating a simple water wheel are found below:

Create a water wheel (wheel and axle) by using an aluminum pie plate with eight equally spaced cuts made from the edge to the bottom of the pan. Twist the "blades" somewhat until they look like a windmill. Poke a hole through the center of the plate. Insert a pencil or wooden dowel as an axle. Test your creation by holding it gently by the axle under running water at a sink to simulate the rush of river water. To conserve water, use a pitcher and gently pour water over the blades into a plastic bin. What happens? When holding it loosely, the shaft should rotate as water is poured over the water wheel. If the shaft is too loose where it connects to the middle of the pie plate, the water wheel may turn independently. If this happens, use duct tape to make a strong connection between the pie plate and shaft. If the shaft does not rotate, it cannot produce the power needed for the rest of the experiment.

Once water wheels are constructed and tested, provide students with materials to represent gears and pulleys (such as wooden spools, cork with a hole in the middle), belts (wide rubber bands) and shafts (pencils, wooden or metal kebob skewers). Challenge students to use these materials to create a power train that starts at the shaft of the water wheel and uses simulated pulleys, gears, belts and other shafts. How can they harness the power of their water wheel to make other machines move? Allow students enough time to test their ideas, redesign their models, re-test, and share their power train models with the class.



Drawing of the Stevens Mill in North Andover, Massachusetts, shows the 17-foot-diameter breast wheel that provides power through a series of pulleys and belts. *Image courtesy of American Textile History Museum*



Sawyer's Woolen Mills on the Bellamy River, 1824-1899

*Image courtesy of the Dover Public Library, NH*



Sawyer's Woolen Mills Spinning Room

*Image courtesy of the Dover Public Library, NH*



### ***What Did You Discover?***

- What role did rivers play in the industrialization of New Hampshire?
- How can rivers create power?
- How do water wheels generate power?
- How does a power train work?

### ***More On The Subject:***

As an alternate or follow-up project, challenge students to design their own mill. Using their imaginations or educated guesses, ask them to figure out what machines need to be in place to run the mill, what materials they need to make their finished product, and what role people play in the manufacturing process.

This can be a mill to create anything they like - cookies, shoes, pencils, etc. The important part is they design it using simple machines such as gears, pulleys, and water wheels to make the mill run. They should think about the raw materials needed to create their product (if a cookie mill for example, the flour, eggs, chocolate chips, etc. all need to go in so the cookies can come out) and what steps must be followed to create the final product. Before choosing their final project, either give students time to do some preliminary research on the product and how it is manufactured, or give them free reign to be creative and use their imaginations to design a mill run by simple machines. Encourage them to choose a simple product, one that they can recognize the "ingredients" and can make an educated guess as to how those ingredients create the final product. (A cell phone or television would not be a simple product.)

You can approach this project in several different ways with your students. Mills can be drawn on paper, the manufacturing process can be drawn in steps using a comic book format, students can describe the steps through writing or build a three-dimensional model of their mill.

Questions for student reflection:

- What did you find difficult about designing your own mill?
- What did you find easy?
- Do you think your mill accurately explains how the product is actually made? Why or why not?
- What role did people play in the mill you designed?
- Which mill required the fewest machines?
- Which mill required the most machines to create a product?
- How were these mills similar to the cotton mills in the movie?
- How were they different?

Students can then present their mills to the class so everyone can see the variety of mills designed, and the different processes fellow classmates imagined were needed to create the final product.



## Glossary of Textile Mill Terms

**Bobbin** - A small wooden or metal core around which yarn is wound.

**Carding** - The process of separating and cleaning cotton fibers to prepare them for spinning.

**Draw** - To stretch a strand of cotton, usually by running the strand between several pairs of rollers, each pair turning faster than the pair before it.

**Hanks** - A measure of yarn varying for different materials; the cotton hank is 840 yards.

**Power Train** - The intervening mechanism by which power is transmitted from a power source (eg; water wheel) to a propeller or axel that it drives.

**Roving** - Natural fiber yarns that have been drawn out and slightly twisted in preparation for spinning.

**Roving Can** - The container into which the yarn drops once the roving process has taken place.

**Shaft** - A commonly cylindrical bar used to support rotating pieces or to transmit power or motion by rotation.

**Sliver** - The loose, untwisted strand of cotton fibers produced on the carding machine, drawing frame, and combing machine.

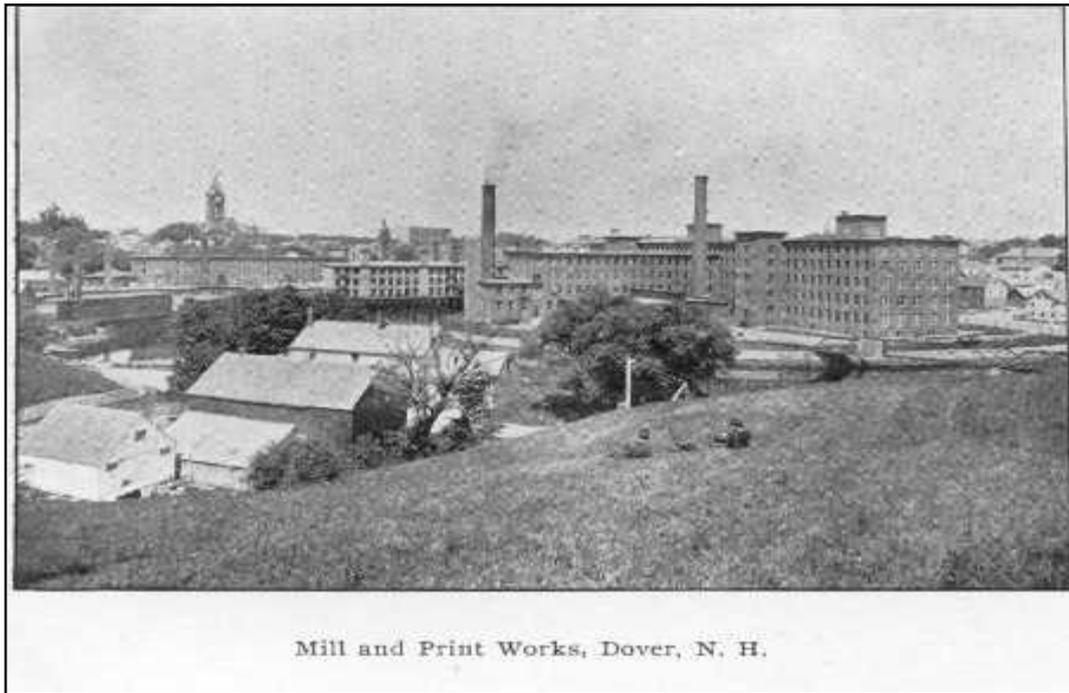
**Spinning** - The process of making yarn from cotton fibers by drawing out and twisting the fibers into a thin strand.

**Throstle** - A machine for spinning wool, cotton, etc. in which the twisting and winding are simultaneous and continuous.

**Water Wheel** - A wheel made to rotate by the direct action of water.

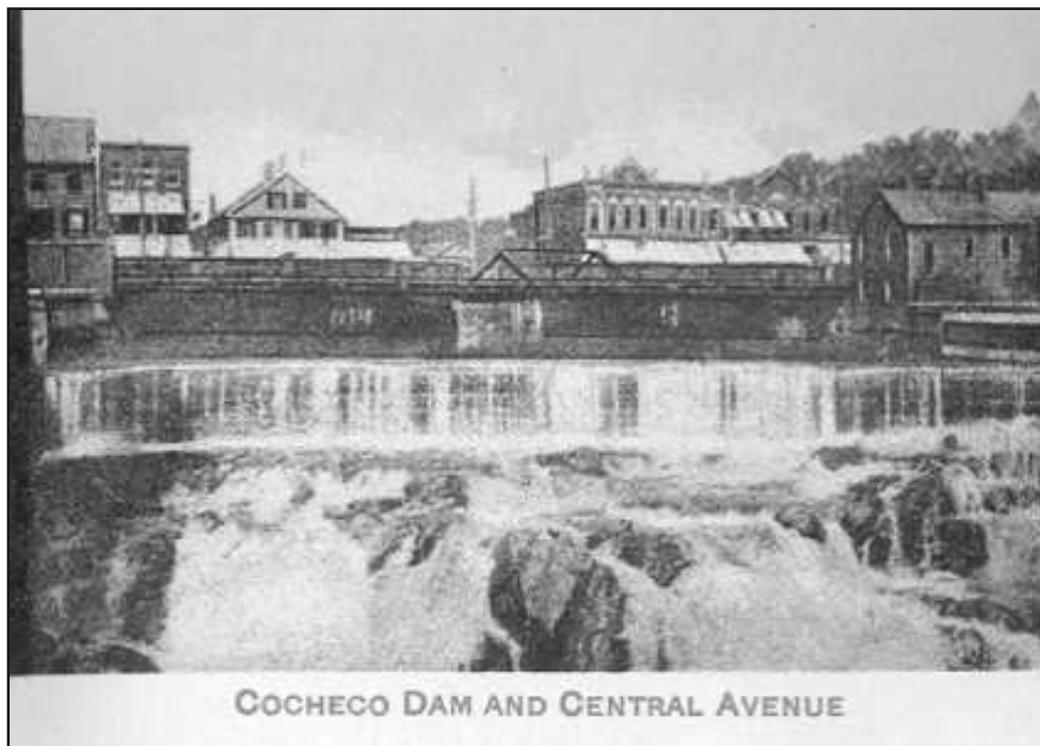


Additional Images



Cocheco Mills and Printworks Postcard

*Image courtesy of the Dover Public Library, NH*



Cocheco Dam and Central Avenue

*Image courtesy of the Dover Public Library, NH*



Cocheco Falls and the dam provided the water power.

*Image courtesy of the Dover Public Library, NH*



Two drivers for the Cocheco Mill Company loading their cart with cotton.

*Image courtesy of the Dover Public Library, NH*



## Transportation and the Growth of a State

### **Big Ideas:**

- The transportation of goods and people throughout the state had an impact in New Hampshire's growth and development in the 1800s.
- Mills in New Hampshire could not have been successful without a steady supply of raw materials coming in and a way to convey manufactured items to the marketplace.
- Schooners, Piscataqua gundalows, and later railroads made the Industrial Revolution and the transportation of materials and finished goods possible.

### **Standards Addressed:**

- Recognize the world is interconnected, e.g. trade or transportation
- Explain the impact of important technological innovations

### **What You'll Need:**

- Background information on the Piscataqua gundalow, schooner and railroad (found within the lesson, can be printed for students)
- Maps of New Hampshire that include railroads, navigable waterways, and ports (students can find these as part of their research)
- New Hampshire map activity cards (found at the end of this lesson)

### **A Little Background:**

Today, if you wanted to transport goods from town to town around the state of New Hampshire, what would be the fastest and most efficient way of doing so? Most likely students would say to travel by truck or tractor-trailer using the over 17,000 miles of highways and roads that criss-cross the state.

If you could go back in time over 400 years, you would find different ways of moving raw materials or finished goods from one location to another. Rivers were the state's first highways. Native Americans used these waterways, as well as travel by foot, to travel throughout the state.

Once European colonists began to settle and explore the area, rivers were the highway they used to transport lumber, furs and dried fish from this new land back to England, and bring manufactured goods such as furniture, cloth, spices and tea back from England. Tidal waterways provided an easy means of transporting heavy materials up and down the river needed to create mills and factories in the 19<sup>th</sup> century. Mills were built along rivers to take advantage of the hydropower provided by the rushing waters and the river highway.

As settlers began moving further inland, away from major waterways in the late 1700s, they used ox-carts and horse-drawn carts to transport themselves and goods on trails created by the Native Americans. By the mid-1800s, the horse-drawn coach replaced the horse-drawn cart as the preferred way to travel. Coaches provided a more comfortable ride than a cart, could carry as many as fifteen passengers and their luggage, and traveled up to five miles an hour. Another form of transportation would revolutionize travel in the state of New Hampshire, and



throughout the country in the 1800s. By the middle of the century, railroads connected cities and towns with each other and the world. Railroads could move raw goods and finished products, as well as passengers, quickly and efficiently throughout the state. They did not rely on the existence of waterways, and could travel up to 30 miles an hour.

Although new modes of transportation had positive effects such as increased trade and ease of moving raw materials and people, they also had negative impacts on the environment. Forests were stripped and natural resources depleted for the lumber needed to build homes and ships and furs for trade. New railway lines disrupted natural environments and the wildlife that lived there, as well as the layout of cities and towns that they passed through.

In this activity students will learn about several modes of transportation used during the 1800s, what they were, what they did, and why they were used, and what impact they had on the natural resources, cities and towns of New Hampshire.



B. & M. Railroad Station, located on Third Street in Dover, NH

*Image courtesy of the Dover Public Library, NH*



## The Piscataqua gundalows

### What is a Piscataqua gundalow?

Piscataqua gundalows were flat-bottomed wooden boats that traveled up and down New Hampshire's tidal rivers with open space on deck for transporting cargo and a large sail that could be lowered to deck level to help the boat fit under bridges. Gundalows were used exclusively in the Piscataqua River region from the 1600s through World War I in the early 1900s. Gundalows could carry up to 35 tons of cordwood, grass, hay or bales of cotton. Even when they were fully loaded, they could travel on rivers at half-tide due to their shallow, flat bottom.



Gundalow

*Photo courtesy of the Dover Public Library*

The appearance of the gundalow went through several changes over time. They started out rather barge-like and over time added rigging and a sail, finally becoming a “fully decked, spoon bowed vessel with a wheel lateen sail, and lee board.” (Douglas P. Adams) Gundalows had oars that were 40 feet long and balanced to make them easily used by crew members. These “oars” were especially useful in times of no wind and when positioning the gundalow to travel in swift currents.

### Why were gundalows an important mode of transportation in coastal New Hampshire?

Gundalows were mainly used to transport goods, not passengers. Gundalows had several jobs. They would row out to large ships that were unable to dock and unload all the cargo to convey to the mainland, they transported goods up and down river, they brought coal and cotton to the mills and brought finished products to the port to be shipped around the world, and they moved wood from farmers woodlots to the port.

#### *Terms to know:*

**Spoon bowed-** an overhanging bow having a convex curved stern

**Lateen sail-** a triangular sail set on a long sloping yard

**Lee board-** one of a pair of movable plates attached to the hull of a sailing vessel to reduce downwind drift

**Yard-** a long spar, supported more or less at its center, to which the head of a square sail, lateen sail, or lug sail is bent



## Schooners

### What is a schooner?

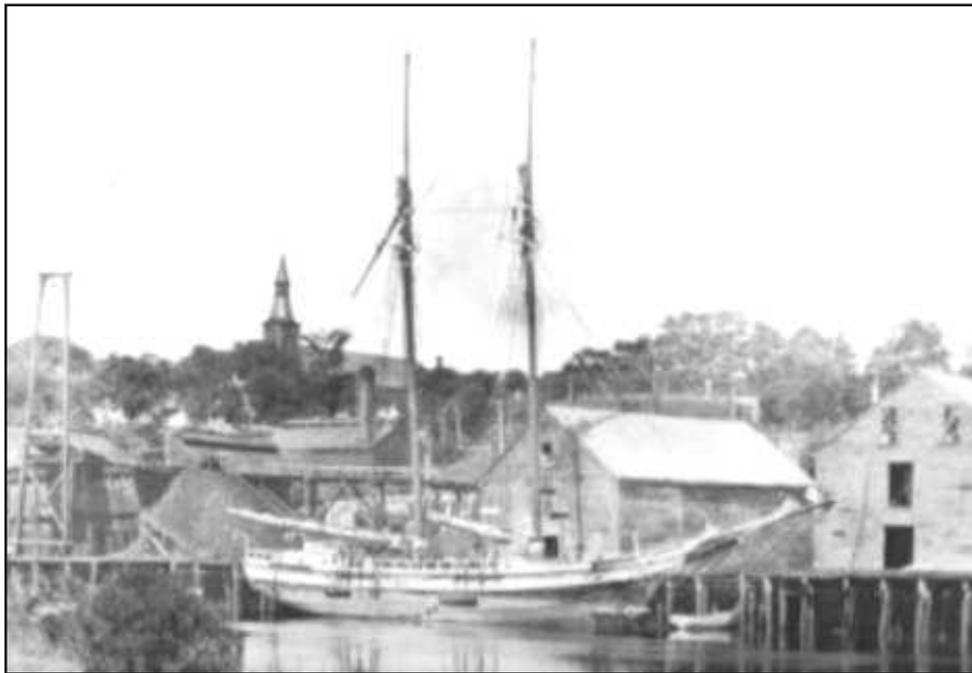
Schooners are sailing ships with at least two masts that were built to haul large amounts of cargo. Beginning with their advent in the 1700s, schooners were easier to navigate and required smaller crews than the larger square-sailed ships. Schooners were made possible due to the plentiful supply of timber in New England to build the wooden boats and available straight lengths of trees for masts.

### What role did schooners play in the transportation of goods and materials?

Schooners were the 18-wheelers of coastal seas and deep inland waterways of the 19<sup>th</sup> century. They were used to transport heavy materials and all types of goods from port to port in New England and all along the country's east coast. They brought coal from Virginia to the mills of New Hampshire and were very useful in transporting the massive quantities of bricks produced along the Piscataqua River in the late nineteenth century.

March 1, 1896 was later called Dover, New Hampshire's "Black Day." A storm destroyed bridges and caused a ten-foot rise in river levels. As the water receded, it brought tons of sand, silt, and debris back into the river with it. Schooners were no longer able to make their way inland after this event due to this material on the river bottom.

Several New Hampshire port towns established shipbuilding industries. Coastal towns like Portsmouth, New Castle, Rye, Hampton, and Seabrook all participated in the trade, as well as inland towns that had rivers flowing to the sea: Durham, Dover, Somersworth, Newmarket, and Exeter.



The Silver Spray Schooner in Dover Landing, circa 1895

*Image courtesy of the Dover Public Library, NH*

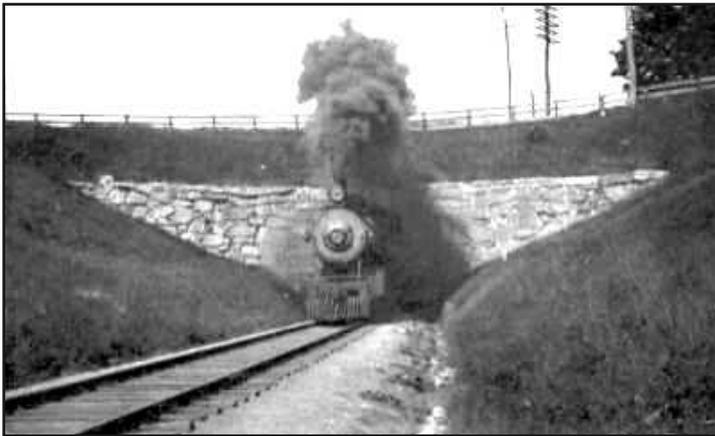


## Railroads

The second half of the 19<sup>th</sup> century saw a great expansion in the role of railroads for transport and travel throughout the state.

In 1837 the B&M railroad was granted authority to extend from Massachusetts into New Hampshire. By the following year, there was less than 40 miles of track laid. The B&M railroad opened in East Kingston in January of 1840, Exeter in June of 1841, Newmarket in July of 1841, and Dover in September of 1841. In 1878, a charter was granted to extend B&M throughout the state. By the year 1900, over 1,200 miles of railroad track connected every part of the state.

The trains went about 20 miles an hour. The ones that could reach speeds of 30 miles an hour were "fast trains." Railroads soon became the most effective way to move people and goods quickly over long distances. Without having to rely on waterways as the only means of efficient transportation, textile manufacturers expanded their ability to market their goods to other parts of the country, and people in New Hampshire gained access to goods made in other parts of the country as well. Railroads allowed people to work farther away from their homes and opened up vast possibilities for the lumber trade out of northern New Hampshire.



*Image courtesy of the Dover Public Library, NH*

Late 1800  
B & M Railroad Arch Bridge,  
Washington Street, Dover, NH,



*Image courtesy of the Dover Public Library, NH*

Late 1800  
B & M Railroad Arch Bridge,  
Washington Street, Dover, NH,



What To Do:

***What You'll Need:***

- Background information on the Piscataqua gundalow, schooner and railroad (found within the lesson, can be printed for students)
- Maps of New Hampshire that include railroads, navigable waterways, and ports (students can find these as part of their research)
- New Hampshire map activity cards (found at the end of this lesson)

The year is 1850 and you need to get your goods from one place to another. What are the best modes of transportation available at this time? How will you get your products where they need to go in the fastest and most cost-efficient way possible?

- Break the class into groups and hand out the activity cards provided.
- Give all groups time to research the modes of transportation available in 1850 in their given areas and have them prepare an explanation of how they would get each product from one city or town to another.
- Have each group present their challenge and how they solved it.
- Have each group decide how they would have transported the same goods today.

***What Did You Discover?***

- How were Piscataqua gundalows and schooners used to transport goods?
- What advantages did each boat have?
- How did the advent of the railroad change shipping in New Hampshire?
- What kind of an impact did each mode of transportation have on the people, industry and development of the state of New Hampshire?
- How do we transport goods today?

***More On The Subject:***

**Transportation Today**

Have students research transportation today. Using a detailed atlas or topographical map, observe the paths taken by modern roads and highways. What do you see? Do they follow any natural paths? (Do they take the path of least resistance?) Do any roads compare with the pathways of rivers, mountain valleys or railroads? What kinds of obstacles had to be overcome to build roads or railroads in the past?

**Visit the Gundalow**

Plan a visit to the reproduction gundalow or have the Gundalow Company come to your school for a presentation. [www.gundalow.org](http://www.gundalow.org)



## Coach Travel

Research the history of travel by horse-drawn coach and the Abbott-Downing Company of Concord, New Hampshire in the 1800s. Although not used to haul large amounts of cargo, these passenger vehicles provided a comfortable way for people to travel and made interior and northern portions of the state more accessible to travelers. An interesting list of rules for stage coach passengers can be found at: <http://www.deadwoodmagazine.com/archivedsite/Archives/Stage.htm>

## Unique to New Hampshire – Traveling up Mount Washington

At 6,288 feet, Mount Washington is the highest peak east of the Mississippi. How have people traveled up and down Mount Washington over the ages? (Cog Railroad, Mount Washington Auto Road, Horse and buggy, unicycle, hiking and more) Research some of these ways and see what other interesting stories you can find! Have the class decide how they would choose to get to the top.



F.M. Bunker poses outside his Hay and Grain store which was located on Third Street.

*Photo courtesy of the Dover Public Library, NH*



## Lyrics to The Gundalow Song:

About a small boat I'll now sing a song  
That played a big part when our country was young.  
She was built on these shores and called gundalow,  
And long may her story be told.



*CHORUS: Gundalow roll, gundalow sail.  
Carry the lumber, the crops & the mail.  
Carry the freight on river & bay. Gundalow, gundalow boat.*

They were shallow of draft, they were chubby & square,  
They could sail on the dew, they could go anywhere.  
Down the river on one tide & home on the next,  
With 10 tons of cargo stacked high on the decks.

*CHORUS: Gundalow roll, gundalow sail.  
Carry the lumber, the crops & the mail.  
Carry the freight on river & bay. Gundalow, gundalow boat.*

From Exeter, Newmarket, Durham & Dover, South Berwick &  
Portsmouth,  
They traveled all over the towns all around the Piscataqua Basin.  
They carried the goods to build a new nation.

*CHORUS: Gundalow roll, gundalow sail.  
Carry the lumber, the crops & the mail.  
Carry the freight on river & bay. Gundalow, gundalow boat.*

So here's to the gundalow, here's to the men,  
And though we may never see their likes again,  
Their story & glory & pride will live on  
Whenever we join in the gundalow song.

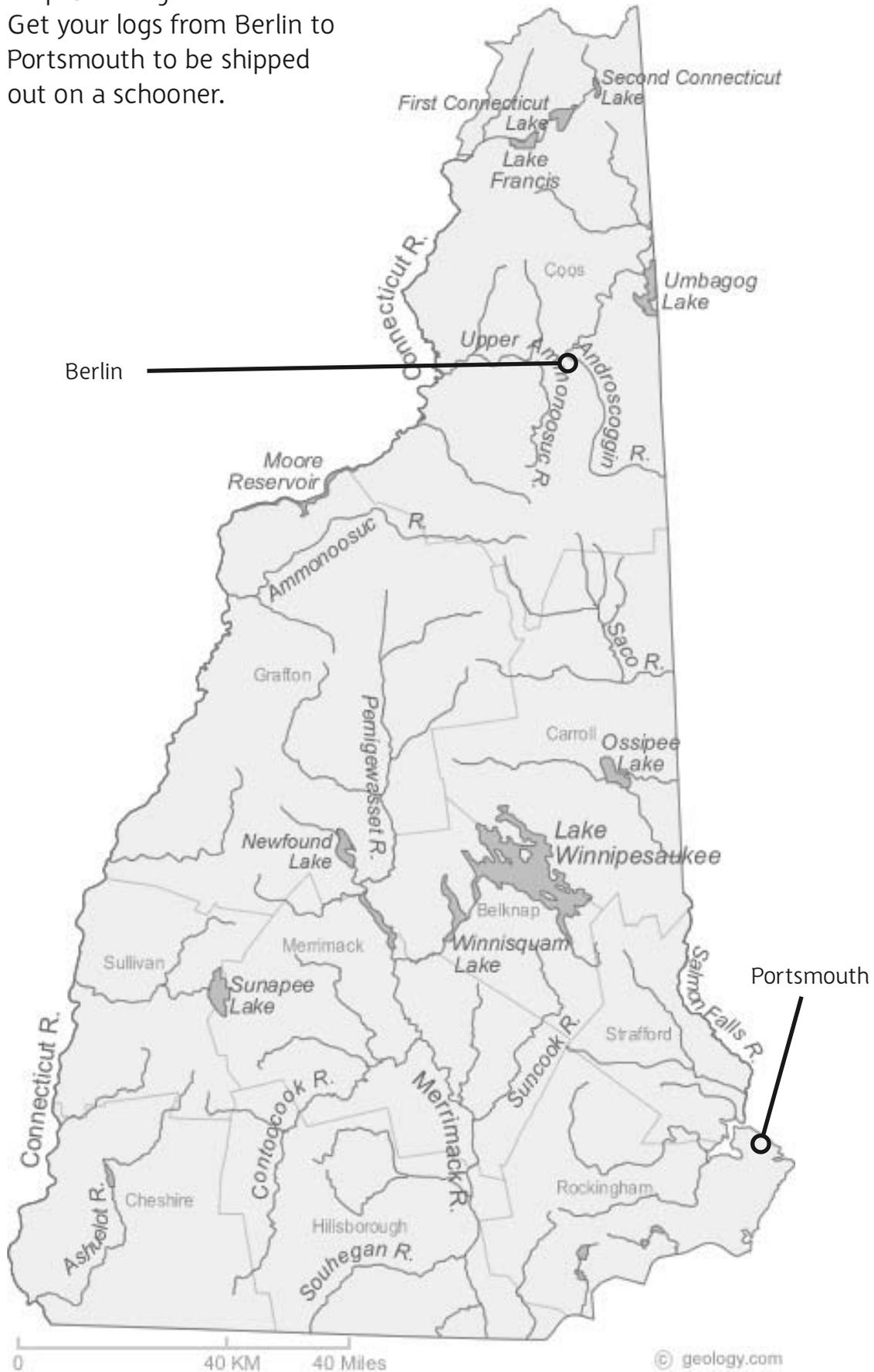
*LAST CHORUS:  
Gundalow roll, gundalow sail.  
Carry the lumber, the crops & the mail.  
Carry the freight on river & bay.  
Gundalow, gundalow boat.  
Gundalow roll, gundalow sail.  
Carry the lumber, the crops & the mail.  
Carry the freight on river & bay. Gundalow, gundalow boat.*

*Lyrics by the Shaw Brothers*



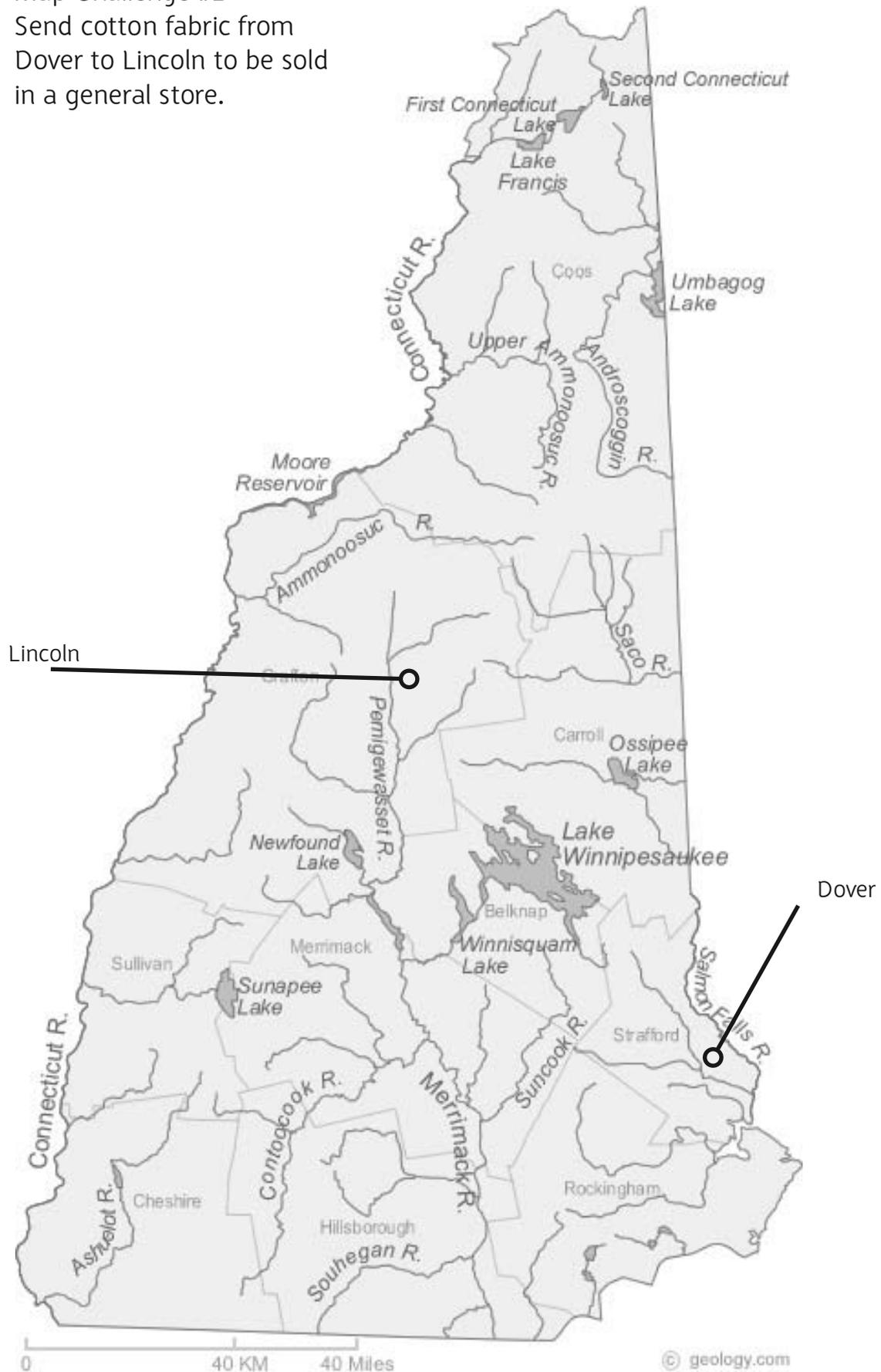
### Map Challenge #1

Get your logs from Berlin to Portsmouth to be shipped out on a schooner.



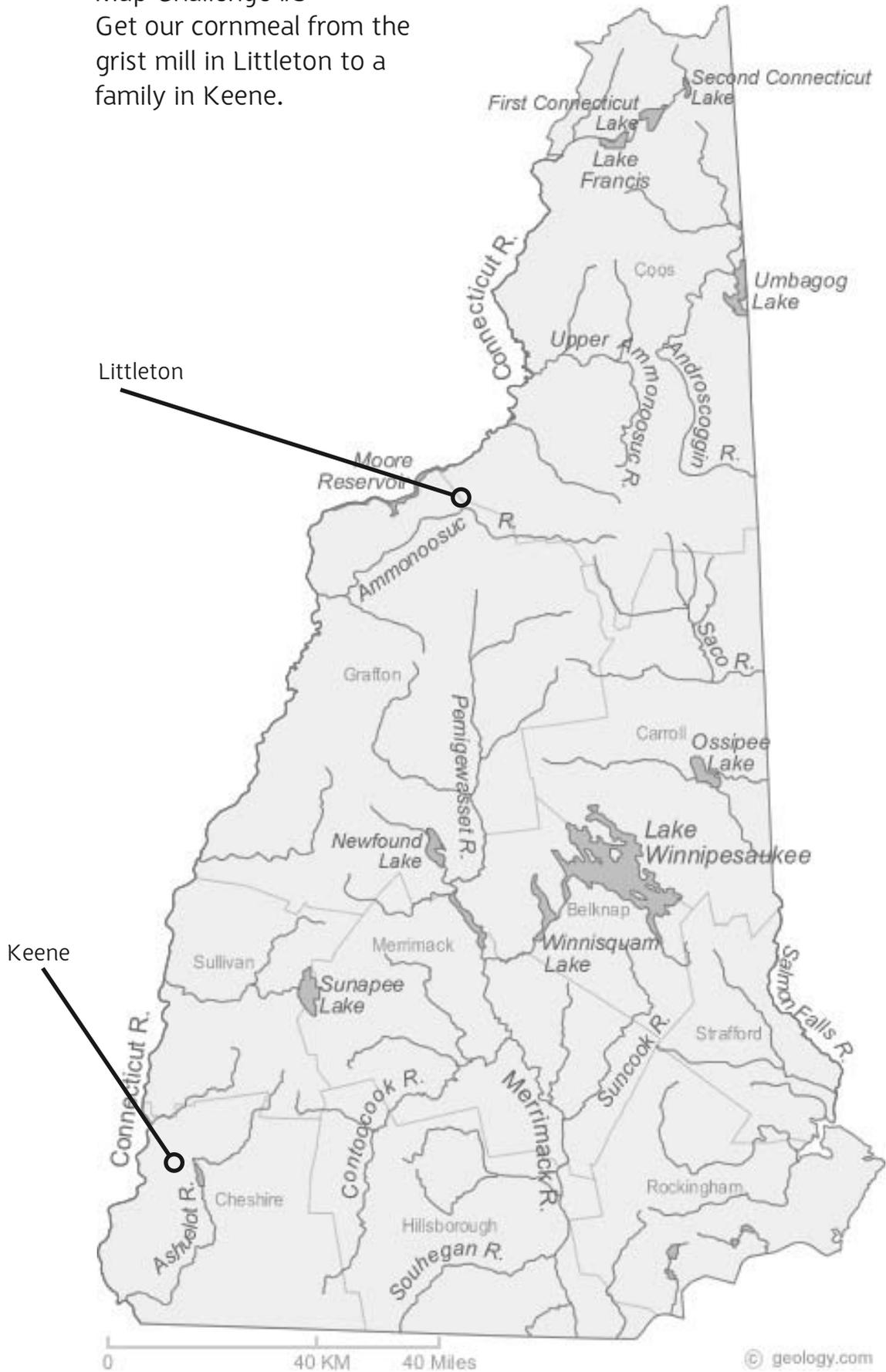


Map Challenge #2  
Send cotton fabric from  
Dover to Lincoln to be sold  
in a general store.



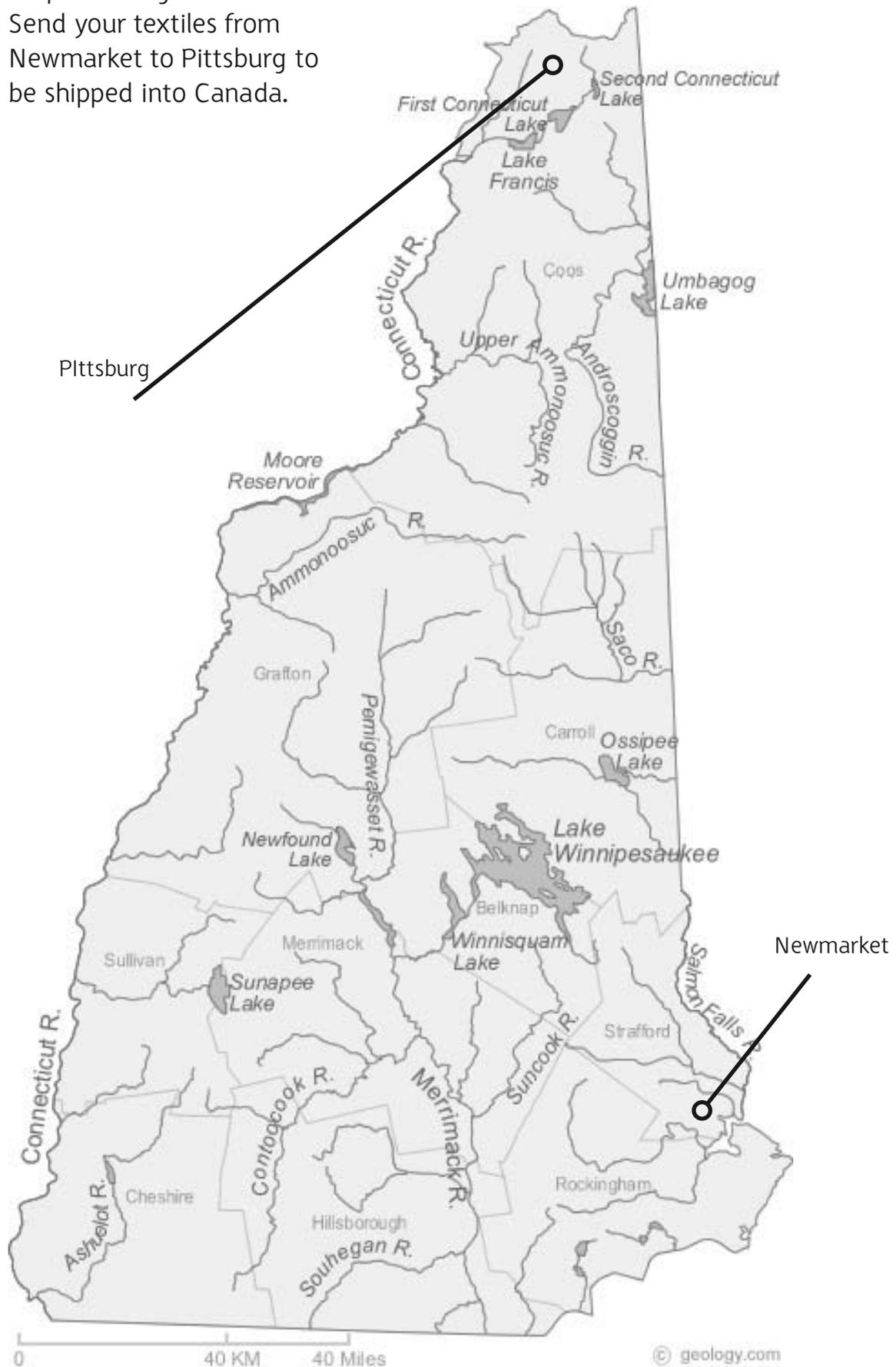


Map Challenge #3  
Get our cornmeal from the  
grist mill in Littleton to a  
family in Keene.





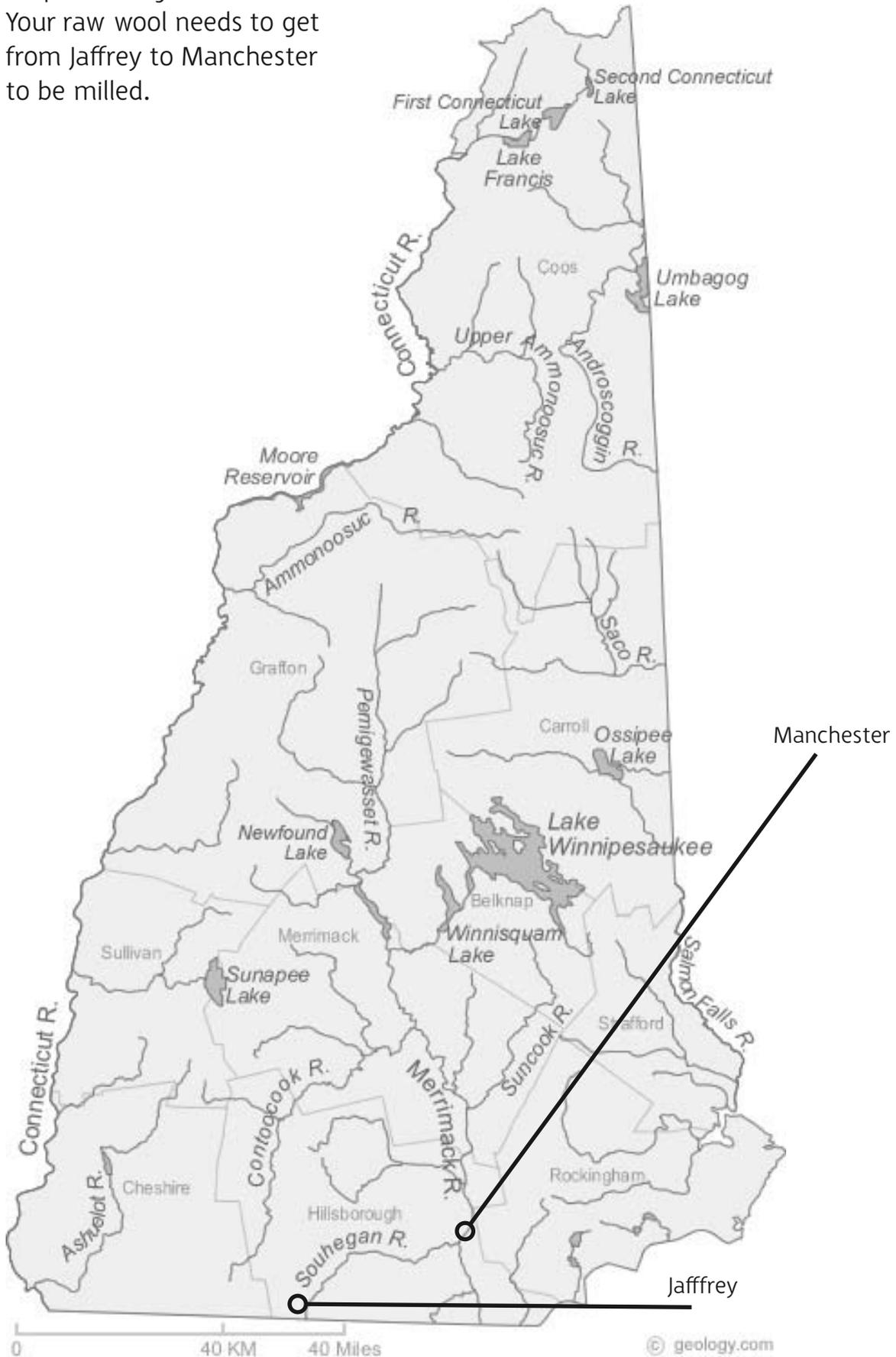
Map Challenge #4  
Send your textiles from  
Newmarket to Pittsburg to  
be shipped into Canada.





### Map Challenge #5

Your raw wool needs to get from Jaffrey to Manchester to be milled.







## Children In The Mills

### **Big Ideas:**

- The roles, expectations, and life experiences of children in our society have changed over time.
- In the nineteenth century, children as young as eight years old worked in New Hampshire's textile mills to earn money for their families.
- Compare and contrast the lifestyles and obligations of children today with those from the 19<sup>th</sup> century.

### **Standards:**

- Identify how the lives of women and children have changed over time in our country.
- Investigate the evolution of the United States economy.

### **What You'll Need:**

- Photographs by Lewis Hine of children who worked in the mills \*
  - Historical fiction about children who worked in the mills
  - *Roleplaying: Questions for Thought* handouts \*
- \* found at the end of this lesson*

### **A Little Background:**

As early as the 1830s, many states in the country had enacted laws prohibiting the employment of young children in industrial settings. However, in rural communities where child labor on farms was common, the employment of children in mills and factories didn't cause concern. In fact, people considered that employing children benefited poor families and the community.

Children had been working alongside their families on New England farms before heading to mill work in the nineteenth-century. Although it became a source of debate and disgrace later, it was little noticed at the time.

Many times the entire family went to work for the same mill; this was known as the "family system" of employment. The factory system redefined child labor by classifying children as a distinct labor force.

Many jobs associated with cotton mill machinery didn't require much skill or effort, making them easily done by children. Jobs for children in the mills included moving bobbins and cans of yarn and bringing the finished product of one machine to the next machine in the sequence.

Like all mill workers, children worked from dawn until sunset each day, six days a week, or an average of a 68 – 72 hour work week.

In Dover, New Hampshire, there was a night school provided for children who worked in the mills during the day- it cost \$1 for every 12 lessons.



It wasn't until 1941 that all workers had a forty hour work week, a minimum wage of 40 cents per hour, and a minimum age of employment being sixteen. Teens aged 14 and 15 were allowed to work in non-hazardous environments.

Students will come away from this lesson knowing what children's roles were in the mills and what similarities and differences they have from the lives of children today.

#### Who was Lewis Hine?

Lewis Hine (1874-1940) was an American sociologist and photographer who used photography as a way to educate the public. In 1907, he became the photographer for the National Child Labor Committee (NCLC). For the next ten years, he documented child labor practices in this country to help the NCLC in their efforts to abolish child labor practices. Several of his photographs are found at the end of this lesson, as well as in the **New England Mill Girls** lesson.

#### *What To Do:*

##### Read All About It:

Share one of the historical fiction novels below, written for elementary and middle school readers, with your class. The final listing is an autobiography written in the late 1800s. Some interesting portions are noted in the book's description, but in general this may be the least engaging choice for students. You may choose to read your selection aloud to the entire class, or if you can obtain enough copies, have students read one or more of the book titles individually or in small groups.

##### Counting on Grace by Elizabeth Winthrop, 2006

This story was inspired by a Lewis Hine photograph of a French Canadian girl working in a 1910 Pownal, Vermont textile mill. At age 12, Grace and her best friend Arthur must leave school and go to work as a "doffers" on their mothers' looms in the mill. Grace's mother is the best worker, fast and powerful, and Grace desperately wants to help her. But she's left-handed and doffing is a right-handed job. Grace's every mistake costs her mother, and the family. She only feels capable on Sundays, when she and Arthur receive special lessons from their teacher. Together they write a secret letter to the Child Labor Board about underage children working in Pownal. A few weeks later a man with a camera shows up. It is the famous social reformer Lewis Hine, undercover, collecting evidence for the Child Labor Board. Grace's brief acquaintance with Hine and the photos he takes of her are a gift that changes her sense of herself, her future, and her family's future.

##### Sing Me A Song by Virginia Taylor, 2001.

This fictional novel, based on real family letters, recounts the journey of 15-year-old Barilla Taylor who, against her father's wishes, leaves her rural life on a Maine farmstead for a taste of hard-won independence in the Lowell mills.

##### Yvonne and the Amoskeag Textile Mills by Alice Daley Noyes, 2000

One of the few novels to focus on the life of mill workers in Manchester, New Hampshire, this



story focuses on Yvonne, her friend Jenny, and their adventures in the world of textile mills. For elementary and middle school readers.

*A New England Girlhood, Outlined from Memory* by Lucy Larcom, forward by Nancy Cott, 1986. [Originally published in 1889].

After her father's death, 11-year-old Lucy moves from the seaport town of Beverly to the urban center of Lowell, Massachusetts, where, like other girls of her age, she goes to work in the factories while her mother runs a boardinghouse. This autobiography is available in its entirety on the Internet. It can be found by using Google to search for the book title and author. Interesting excerpts related to Lucy's work in the mills can be found on pages 153 – 155, 175 and 182.

### **Roleplaying:**

After reading your chosen novel(s), divide the class into small groups of two to four students. Have half of the groups write and act out a scene putting themselves in the role of the book's child or children who worked in the mills. Have the other half do the same from the point of view of children today. At the end of this lesson you will find two handouts that you may choose to distribute to students to assist them with this project. Titled *Roleplaying: Questions for Thought*, each page provides questions to help focus students as they write scripts.

#### ***What Did You Discover?***

- How were the lives of children in the nineteenth century similar to those of today?
- How were their lives different?
- Why did children begin working in the mills at young ages?
- Why did mills hire children? What motivated them to do so?
- What did child mill workers think about their jobs? How did they describe their lives?
- How did the hiring of children affect their lives, the lives of their families and the future of labor laws?

### ***More On The Subject:***

#### **Creative Writing Using Photographs**

Choose one or more of the photographs of children who worked in the mills found at the end of this lesson. Using what students have learned about the lives of these children through readings and their imaginations, have students write a detailed caption and/or back-story for this photograph.

#### **Child Labor Laws**

Have students research the movement to bring about child labor laws. What was the catalyst for change? Who was involved? What role did children play? What issues are your students interested in and invested in working for change today?

Another way to approach this subject is by sharing all photographs, as well as the short description



of Lewis Hine. He took these photographs to document child labor. While looking at the photos with students, ask for their thoughts on how these pictures might bring about change in child labor laws. How do the photos make you feel? Do they seem to share a message with you, the viewer? How do you think photographs could change labor laws?

### **Current Events**

Although this lesson focuses on child labor in the mills of New England one century ago, child labor exists today. Have students find a recently reported account of child labor using the Internet, or find appropriate stories to print and share with students. Compare the current report of child labor with what you know about child labor a century ago. How are the two incidences similar? How are they different?



## Children in The Mills Images



"Boys in front work in Amoskeag Mills, Manchester, New Hampshire." May 1909

Source: Lewis Hine photographs



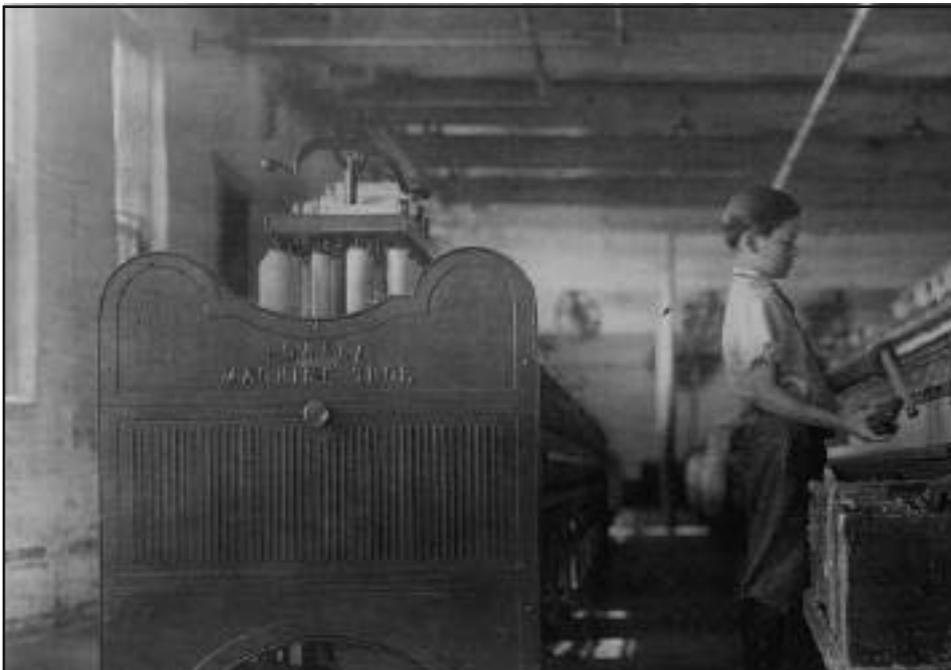
"This boy works in Mill No. 1, Amoskeag Mfg. Co., Manchester, NH." May 26, 1909

Source: Lewis Hine photographs



"Boys working in Amoskeag Mills, Manchester, NH. Smallest boy is Napoleon Cammery, 194 Merrimac Street. Been at mill 1 year. Next boy is Jerry Moore, 352 Chestnut Street. Martin Markey, 33 State Street. Location: Manchester, New Hampshire, May 1909, Lewis Hine."

*Source: Lewis Hine photographs*



"Erenne LaPrise, a doffer, apparently 13 year[s] old, doffing at his machine in Spring Village Mill. Said he had been working a year and a half. Location: Winchendon, Massachusetts, September 1911, Lewis Hine."

*Source: Lewis Hine photographs*



"Addie Card, 12 years. Anemic little spinner in North Pownal Cotton Mill, Vt. Girls says she is ten years. She admitted to me she was twelve; that she started during school vacation and now would "stay." Location: North Pownal, Vermont, August 1910, Lewis Hlne."

*Source: Lewis Hine photographs*



"Left, Frank Chebarro (Charbonneau), admitted 13 years old, been making bands all summer in Glenallen Mill. Said 'I wouldn't go to school until they come after me.' Also brother Edgar, 8 years old, who 'helps' brother. 'He picks up bobbins and things like that.' Location: Winchendon, Massachusetts. September 1911. Lewis Hine."

*Source: Lewis Hine photographs*



“Group of sweepers and doffers in the filling spinning room of Glenallen Mill. The boys were smuggled out of back window during hours by second hand. Smallest boy is Francis Pagnette. Also Henry Smith, Maple St. Location: Winchendon, Massachusetts, September 1911, Lewis Hine.”

*Source: Lewis Hine photographs*



“Joseph Crapo (Crepo), 47 Fruit St. Works in Eclipse Mills. Apparently 13 years old. Location: North Adams, Massachusetts, August 1911, Lewis Hine.”

*Source: Lewis Hine photographs*



“Erenne LaPrise; on left, apparently is 13 years old, a doffer at Spring Village Mill, said he had been working a year and a half. Als de Gauthier (Alcide), apparently under 14 (next to Erenne) also a doffer at Spring Village Mill. Location: Winchendon, Massachusetts, September 1911, Lewis Hine.”

*Source: Lewis Hine photographs*



Name \_\_\_\_\_ Date \_\_\_\_\_

Roleplaying: Questions For Thought

Questions to guide scripts for children working in 19th century mills:

How old are you?

Where do you live and who lives with you?

What does your typical day look like?

Do you work? Who is your employer?

Describe your job.

How much do you earn?

Who do you work with?

What do you wear?

What time do you get up in the morning? When do you get home each day?

Do you have chores or care of younger siblings when you are at home?

How do you spend the money you earn? Where does it go?

Do you go to school? Why or why not?

What do you do for fun?

Describe how you feel about your life.

Are you happy, sad, or frustrated? Is there anything you would change or you wish were different?



Name \_\_\_\_\_ Date \_\_\_\_\_

Roleplaying: Questions For Thought

Questions to guide scripts for the modern life of children:

How old are you?

Where do you live?

What does your typical day look like?

Do you have a job or earn money another way? Describe.

How much do you earn?

How do you spend the money you earn? Where does it go?

What time do you get up each morning? When do you get home?

What do you wear?

Do you have chores or care of younger siblings when you are at home?

When and where do you go to school?

What do you do for fun?

Describe how you feel about your life. Are you happy, sad, or frustrated? Is there anything you would change or you wish were different?





## New England Mill Girls: A Personal and Industrial Revolution

### **Big Ideas:**

- Using the alewife as an example, students will explore how the migration of fish in the waterways of New Hampshire effects the populations of other creatures.
- Students will learn about the life cycle of the alewife.
- Students will be introduced to the ways that humans have created structures to both catch migrating fish and assist fish in their attempts to migrate up the river.

### **Standards:**

- Explore major developments and changes in economic productivity.
- Investigate the evolution of the United States economy.
- Trace the changes in the roles and lives of women and children and their impact on society.

### **What You'll Need:**

- Dover Mill Girls, a historical essay\*
- Images of women and girls working in mills\*
- The Factory Bell – A Poem from Exeter\*
- Time Table for Workers at the Lowell Mills, 1851\*
- Cost of Living Comparisons\*
- Questions for Thought\*

\* found at the end of this lesson

### **A Little Background:**

If you look around the cities and towns of New Hampshire today, you will find large brick buildings, many being factories or textile mills built during the 1800s. Before the building of mills and the industrialization of the state and region, goods that people needed were produced in small shops or on family farms. Spinning of thread, weaving of cloth, woodworking and shoemaking could all be done on the family farm to supplement a family's income.

As the population of New England grew, so did the need for more goods. By 1820, mills and factories were built on rivers throughout the state, to take advantage of the available water power and the greater need for goods that were produced in small quantities on family farms. Thousands of workers were needed to work in the mills and factories, and young women were actively recruited to move from rural locations to fill much needed jobs. Moving to large towns and cities to work in mills and factories gave these young women experiences and income they couldn't get living and working on the family farm.

Women provided nearly two-thirds of the workforce in cotton mills. Working in the mills provided opportunities for women to earn their own money- usually \$2 to \$3 a week. To earn these wages, textile mill workers had to produce 10 to 12 yards of cloth per day. After paying \$1.25 a week for a place to sleep and their meals, otherwise known as room and board, they were able to save money for themselves and their families back home. Although mill owners paid women lower wages than



men, these earnings were more than women could make doing domestic work or staying on the farm.

As more single young women came from the country to make their way in jobs at the mills, boarding houses became an increasingly popular living situation. Companies provided boarding houses both as a cost efficient place to mill girls to live, and also as a way to keep control of the outside lives of their workers.

Employers were also able to control the lives of mill girls using rules and regulations such as instituting an evening curfew of 10 pm, mandatory attendance of church services and that any sign of improper behavior is grounds for dismissal.

The gathering of so many like-minded women in one place prompted unanticipated social changes. As women left the house and farm to begin earning wages out in the world, a role once reserved for men, they began to see themselves more as equals to men, wanting the same rights in society and the workplace. This was a gradual movement that would build up steam into the 1900s.

The changes started with women demanding better pay and working conditions from the mills. As technology increased and mills were able to produce more materials more quickly, demands on the workers increased as well.

A typical workday was eleven hours long. As production increased, many mills tried to increase the number of hours employees worked, prompting action from the workers demanding a shorter workday.

The average length of employment for young women working in the mills was four years. Many left to return home or to marry, having saved money for their family or items and money that they would need to start their own homes and families. Many of the mill girls' jobs were filled by immigrants new to the country.

### ***What To Do:***

There are many different ways you can approach the subject of women working in the mills of New England. Using the sources found at the end of this lesson, you may choose to do one or more of the following activities:

#### **Read All About It**

This lesson plan includes four written accounts of women in the mills: *Dover's Mill Girls*, *A Description of Factory Life*, *Reminiscences of Lowell Mill Girls* and *Mill Work in Newmarket*. Have students either work individually or in small groups to read one or more of the accounts. Take it further by having students use the *Questions For Thought* page to reflect on what they have learned in the readings. Come back as a class and share your findings.

Would you like to read a related book aloud to your students? One great choice is [So Far From Home: The Diary of Mary Driscoll, an Irish Mill Girl](#), published by Scholastic. It is a diary account of



a 14-year-old's journey from Ireland in 1847 and her work in a mill in Lowell, Massachusetts.

### The Call Of The Factory Bell

The mill workers' day was a long one, with an average workday of 11 hours in the 1800s. Bells would ring at each mill at the beginning of each day, for meal breaks, and at the end of the day. Read the poem written by a mill girl in Exeter titled *The Factory Bell* aloud to students. Discuss what they think the poem means. Does the author seem happy with her job at the mill? Does the poem give you any hints into how she is feeling? How would you describe what the factory bells mean to her?

You can extend this activity using the *Time Table For Workers at the Lowell Mills* chart and related questions.

### Write All About It

After reading the source material in this lesson, students will have a better understanding of the lives of women (and men) who worked in New England textile mills in the 1800s. Have students take on the role of a mill girl writing in her journal or writing a letter home to her family on the farm describing what is going on in her new life working in a textile mill. Encourage students to share details about their job, where they live, what they do for fun, and what they like and don't like about life away from home. Have students share their letters/journals aloud with the class or compile them and create a class book.

### Compare and Contrast

Read *A Description of Factory Life by an Associationist* in 1846 and *Reminiscences of Lowell Mill Girls* aloud with your students. How are they the same and how are they different? Which account puts a more positive spin on the life and work of women who worked in the mills? Explain why you think so. Do you think one is more accurate than the other? Why or why not?

#### ***What Did You Discover?***

- Why were women leaving small towns and farms in the 1800s?
- What attracted women to work in the mills? Why did the mills actively recruit women to work in the mills?
- How were New Hampshire's towns affected culturally by the transition of women from farm to mill?
- How did the mills play an important role in women gaining their independence to work outside of the home?
- Put yourself in their place. Would you consider leaving your home on a family farm for a steady manufacturing job in a city? Why or why not?



## ***More On The Subject:***

### **The Cost of Living**

Using the *Cost of Living Comparisons* included, have students create a budget using their earnings as a mill worker.

How much could they earn in one year?

What did they pay for room and board per week?

What were their other expenses?

What did everyday items cost?

As a take-home project, write down expenses that a mill worker had to pay on a weekly or monthly basis, such as room and board, entertainment, transportation. Ask your family to write down a list of what they have to pay for weekly/monthly: rent/mortgage, car payment, car insurance, health insurance or medical bills, groceries, gas, utilities, etc.

Compare the number of different expenses the mill worker paid as compared to your family. Do you think the average mill worker was able to save more money from their pay compared to a family today? Why or why not? (We do not suggest that you ask families to supply any personal information about actual family expenses or salaries, but instead focus on the number and variety of expenses).

### **What I Do Best**

Look at the photographs of 19<sup>th</sup> century weavers found at the end of this lesson.

Many women who held the high position of weaver in the mills had their photographs taken with their shuttle to signify their rank.

Have each student bring in something that signifies what they do best.

Take a picture of each student holding his/her own signifier. For extra fun try doing it in the very strict upright pose of the 1800s.

The students can each talk or write about what they do best and why they chose the item to have their picture taken with.



**Dover Mill Workers**

*Photo courtesy of the Dover Public Library, NH*



*The historical essay below was provided courtesy of the Dover Public Library, Dover, NH.*

## Dover's Mill Girls

Advertisement from the Strafford Register August 12, 1822:

Wanted to Hire: At the Dover Cotton Factory, Upper establishment, 50 smart, capable girls between 12 and 25 years of age to work in the factory to whom constant employment and good encouragement will be given.

The work was hard and the pay was low. Girls were given \$ .47 cents a day plus room and board. Two cents were deducted for medical insurance. Talking was not permitted, not that it would be heard above the rumble and clatter of the machinery. The eleven hour workday was ruled by a system of bells. From March through October, work began at 6:30 a.m. and ended at 6:30 p.m. except on Saturday when the bell tolled a little earlier. The dinner bell clanged at 12:30, lunch was finished by 1:15 p.m. Workers who were late would be locked out and subjected to a 12 1/2 cent fine. The mill policy was as follows: "Yard gates will be opened when the bell for commencing work begins to ring, and closed when it stops tolling. Ringing in bells will ring 5 minutes, pause 2, and toll 3 minutes, when all hands must be in. Mill gates will be hoisted when the last bell begins to ring."

The work was also dangerous. Newspaper accounts frequently reported accidents such as a woman's hand being mangled in machinery, or a girl losing her scalp when her hair became stuck in the looms.

Unmarried mill girls lived in boarding houses that were built and run by the management of the Cocheco Manufacturing Company. Girls could get permission to live elsewhere but it was discouraged. Widows were hired to run the boarding houses. The widow in charge assumed responsibility for the physical and moral well-being of her charges. The mill company posted strict rules of behavior for the girls to follow.

The factories changed hands in 1828. The new owner was even more strict. Wages were reduced by five cents a day for female workers, but not men, who were already paid at a higher rate. The mill girls were finally driven to rebellion, enacting the first women's strike in the United States. On December 30, 1828, about half of the 800 mill girls walked out. They marched around the Mill with signs and banners and even ignited two barrels of gunpowder.

Local newspapers were biased in favor of Dover's major industry, the mills, in their reporting of the incident. The Dover Enquirer December 30, 1828 wrote:

Turn Out- A general turn out of the girls employed in the cotton factories in this town to the number of 6 or 800 took place on Friday last, on account of some imaginary grievance. It has, we believe, turned out to their cost, as well as disgrace; and since that time many of them have returned to work, and all, who are permitted, will without doubt, return in the course of a few days.

The girls on leaving the factory yard formed a procession of nearly half a mile in length, and marched through the town, with martial music: accompanied with roar of artillery. The whole



presented one of the most disgusting scenes ever witnessed.

On the weekend following the turn out, over 600 of the mill girls met to formulate a plan. They passed the following resolutions:

1st, Resolved, That we will never consent to work for the Cocheco Manufacturing Company at their reduced "Tariff of Wages".

2nd, Resolved, That we believe the "unusual pressure of the time", which is so much complained of, to have been caused by artful and designing men to subserve party purposes, or more wickedly still, to promote their own private ends.

3rd, Resolved, That we view with feelings of indignation the attempt made to throw upon us, who are least able to bear it, the effect of this "pressure" by reducing our wages, while those of our overseers and Agent are continued to them at their former high rate. That we think of our wage already low enough, when the peculiar circumstances of our situation are considered; that we are many of us far from our homes, parents, and friends, and it is only by strict economy and untiring industry that any of us have been able to lay up anything...

We view this attempt to reduce our wages as part of a general plan of the proprietors of the different manufacturing establishments to reduce the females in their employ to that state of dependence on them in which they openly, as they do now secretly, abuse and insult them by calling them their "slaves".

In spite of these resolutions the Dover mill girls were forced to give in when the mill owners immediately began advertising for replacement workers. Striking workers returned to work January 1, 1829 at reduced wages.

This article was copied in its entirety with permission from the Dover Public Library and can be found at: <http://www.dover.lib.nh.us/DoverHistory/millgirls.htm>



## Images of Women and Girls Working In Mills

All images and information found below was collected by photographer Lewis Hine in the early 1900s.



"This girl works in Amoskeag Mfg. Co. Manchester, NH." May 1909"



"One of the young girls I found working at the Amoskeag Mfg. Co. Manchester, NH. May 25, 1909, Lewis Hine"



"Some of the girls who work in Amoskeag Mills, Manchester, NH. Location: Manchester, New Hampshire. May, 1909, Lewis Hine"



"King Phillip Mill – Card Room. Bertha Bonneau, 15 years, 105 Slade St. Location: Fall River, Massachusetts, June 21, 1916, Lewis Hine"



“Group of workers in Glenallen Mill. Smallest girl helps her sister Dora Roberts in mill. Lives at 13 Woodlawn St. There are 13 in the family, five or six working. Apparently prosperous. In this group is also Corinne Cuillette. Location: Winchendon, Massachusetts, September, 1911, Lewis Hine.”



“Mamie and her sister Eglantine, about 15 yr. Location: Winchendon, Massachusetts, September, 1911, Lewis Hine.”



"Mamie LaBarge at her machine. Under legal age. Location: Winchendon, Massachusetts, September, 1911, Lewis Hine."



### The Factory Bell – A Poem From Exeter

Loud the morning bell is ringing,  
Up, up sleepers, haste away;  
Yonder sits the redbreast singing,  
But to list we must not stay.

Not for us is morning breaking,  
Though we with Aurora rise;  
Nor for us is Nature waking,  
All her smiles through earth and skies.

Sisters, haste, the bell is tolling,  
Soon will close the dreadful gate;  
Then, alas we must go strolling,  
Through the counting-room, too late.

Now the sun is upward climbing,  
And the breakfast hour has come;  
Ding, dong, ding, the bell is chiming,  
Hasten, sisters, hasten home.

Quickly now we take our ration,  
For the bell will babble soon;  
Each must hurry to her station,  
There to toil till weary noon.

Mid-day sun in heaven is shining,  
Merrily now the clear bell rings  
And the grateful hour of dining,  
To us weary sisters brings.

Now we give a welcome greeting,  
To these viands cooked so well;  
Horrors! Oh not half done eating,  
Rattle, rattle goes the bell!

Sol behind the hills descended,  
Upward throws his ruby light;  
Ding dong ding – our toil is ended,  
Joyous bell, good night, good night.

*Source: Factory Girl's Garland,  
Exeter, NH May 25, 1844*



### Time Table for Workers at the Lowell, MA Mills from 1851

Use the chart below to figure out how many hours the Lowell mill workers worked each week, what time they started work and ended work each day, when they had breaks to eat their meals, how much time they were given to eat and which day they did NOT have to work each week.

**TIME TABLE OF THE LOWELL MILLS,**

Arranged to make the working time throughout the year average 11 hours per day.  
**TO TAKE EFFECT SEPTEMBER 21st., 1853.**  
 The Standard time being that of the meridian of Lowell, as shown by the Regulator  
 Clock of AMOS SANBORN, Post Office Corner, Central Street.

---

**From March 20th to September 19th, inclusive.**  
 COMMENCE WORK, at 6.30 A. M. LEAVE OFF WORK, at 6.30 P. M., except on Saturday Evenings.  
 BREAKFAST at 6 A. M. DINNER, at 12 M. Commence Work, after dinner, 12.45 P. M.

**From September 20th to March 19th, inclusive.**  
 COMMENCE WORK at 7.00 A. M. LEAVE OFF WORK, at 7.00 P. M., except on Saturday Evenings.  
 BREAKFAST at 6.30 A. M. DINNER, at 12.30 P. M. Commence Work, after dinner, 1.15 P. M.

---

**BELLS.**

**From March 20th to September 19th, inclusive.**

<i>Morning Bells.</i>	<i>Dinner Bells.</i>	<i>Evening Bells.</i>
First bell,..... 4.30 A. M.	Ring out,..... 12.00 M.	Ring out,..... 6.30 P. M.
Second, 5.30 A. M. ; Third, 6.20.	Ring in,..... 12.35 P. M.	Except on Saturday Evenings.

**From September 20th to March 19th, inclusive.**

<i>Morning Bells.</i>	<i>Dinner Bells.</i>	<i>Evening Bells.</i>
First bell,..... 5.00 A. M.	Ring out,..... 12.30 P. M.	Ring out at..... 7.00 P. M.
Second, 6.00 A. M. ; Third, 6.50.	Ring in,..... 1.05 P. M.	Except on Saturday Evenings.

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**SATURDAY EVENING BELLS.**

During APRIL, MAY, JUNE, JULY, and AUGUST, Ring Out, at 6.00 P. M.  
 The remaining Saturday Evenings in the year, ring out as follows :

SEPTEMBER.	NOVEMBER.	JANUARY.
First Saturday, ring out 6.00 P. M.	Third Saturday ring out 4.00 P. M.	Third Saturday, ring out 4.25 P. M.
Second " " 5.45 "	Fourth " " 3.55 "	Fourth " " 4.35 "
Third " " 5.30 "		
Fourth " " 5.20 "		
OCTOBER.	DECEMBER.	FEBRUARY.
First Saturday, ring out 5.05 P. M.	First Saturday, ring out 3.50 P. M.	First Saturday, ring out 4.45 P. M.
Second " " 4.55 "	Second " " 3.55 "	Second " " 4.55 "
Third " " 4.45 "	Third " " 3.55 "	Third " " 5.00 "
Fourth " " 4.35 "	Fourth " " 4.00 "	Fourth " " 5.10 "
Fifth " " 4.25 "	Fifth " " 4.00 "	
NOVEMBER.	JANUARY.	MARCH.
First Saturday, ring out 4.15 P. M.	First Saturday, ring out 4.10 P. M.	First Saturday, ring out 5.25 P. M.
Second " " 4.05 "	Second " " 4.15 "	Second " " 5.30 "
		Third " " 5.35 "
		Fourth " " 5.45 "

---

YARD GATES will be opened at the first stroke of the bells for entering or leaving the Mills.

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\* \* \* *SPEED GATES* commence hoisting three minutes before commencing work.



## Penhallow, Printer, Wyman's Exchange, 28 Merrimack St. Cost of Living Comparisons

In the 1830s, the average mill worker made \$3.25 a week, working eleven hours each day for six days a week.

Using the prices below from that same time period, what could workers buy using their weekly wages? Even if they just pay the basic expenses of room and board each week, how long would someone have to work to save up enough money to purchase a gold watch? A horse and carriage? A house? How much money could they save to send home to support their family?

<u>Item</u>	<u>Cost</u>
1 lb cheese	.06
dozen eggs	.10
1 bag of flour	\$1.80
Weeks' worth of potatoes	\$1.19
1/4 lb of tea	.38
1 qt milk	.56
1 lb cheap coffee	.35
Sugar 3 1/2 lb	\$1.05
1/2 ration meats per week	\$3.50
4 lb. butter	\$1.60
2 lb. lard	.38
Dried apples for treats	.25
Vegetables	.50
Soap, starch, pepper, salt, vinegar, etc.	\$1.00
2 bushels of coal	\$1.36
Book	.25
Kerosene	.30
Train fare	.75
Concert admission	.10
Bonnet	\$5.00
Pair of shoes	.75 - \$1.75
Shawl	\$2.00
Gold watch	\$20.00 - \$25.00
Wood-fired cook stove	\$25.00
Room & board	\$1.25/week
women, \$1.75/week men	
One-story house	\$500
Carriage with harness and horse	\$150

Price information from: <http://www.oldreipebook.com> and [http://www.uml.edu/tsongas/activities/value\\_dollar.com](http://www.uml.edu/tsongas/activities/value_dollar.com)



Name \_\_\_\_\_ Date \_\_\_\_\_

### Questions For Thought

Use the various resources provided with this lesson, or other sources such as Internet research, to explore the answers to the questions below. You can also add your own questions to the list.

1. How many hours were in a typical work day at the mills?
2. What did mill girls do for fun?
3. How old were the women who worked in the mills?
4. On average, how long did they work at the mills?
5. What were some reasons women stopped working at the mills?
6. What specific jobs did they do in the mills?
7. What hazards did they face working in the mills?
8. Where did they live?
9. Where did these women come from before working in the mills?
10. Why did they decide to work in the mills?
11. Did they continue their education while working in the mills? Did they go to school or attend lectures?
12. How did the mill girls spend their earnings?



## A Description of Factory Life by an Associationist in 1846

The account below is a peek into the lives of women working in the textile mills of Lowell, Massachusetts and Manchester, New Hampshire in the mid-1800s. The word “operative” is used as another word for “mill worker.”

“...We have lately visited the cities of Lowell and Manchester, and have had an opportunity of examining the factory system more closely than before. We had distrusted the accounts, which we had heard from persons engaged in the Labor Reform, now beginning to agitate New England; we could scarcely credit the statements made in relation to the exhausting nature of the labor in the mills, and to the manner in which the young women, the operatives, lived in their boarding-houses, six sleeping in a room, poorly ventilated.

We went through many of the mills, talked particularly to a large number of the operatives, and ate at their boarding-houses, on purpose to ascertain by personal inspection the facts of the case. We assure our readers that very little information is possessed, and no correct judgments formed, by the public at large, of our factory system, which is the first germ of the Industrial or Commercial Feudalism, that is to spread over our land.

In Lowell live between seven and eight thousand young women, who are generally daughters of farmers of the different States of New England; Some of them are members of families that were rich the generation before.

The operatives work thirteen hours a day in the summer time, and from daylight to dark in the winter. At half past four in the morning the factory bell rings, and at five the girls must be in the mills. A clerk, placed as a watch, observes those who are a few minutes behind the time, and effectual means are taken to stimulate to punctuality. This is the morning commencement of the industrial discipline- (should we not rather say industrial tyranny?) which is established in these Associations of this moral and Christian community. At seven the girls are allowed thirty minutes for breakfast, and at noon thirty minutes more for dinner, except during the first quarter of the year, when the time is extended to forty-five minutes. But within this time they must hurry to their boarding-houses and return to the factory, and that through the hot sun, or the rain and cold. A meal eaten under such circumstances must be quite unfavorable to digestion and health, as any medical man will inform us. At seven o'clock in the evening the factory bell sounds the close of the days work.

Thus thirteen hours per day of close attention and monotonous labor are exacted from the young women in these manufactories. . . So fatigued-we should say, exhausted and worn out but we wish to speak of the system in the simplest language-are numbers of the girls, that they go to bed soon after their evening meal and endeavor by a comparatively long sleep to resuscitate their weakened frames for the toils of the coming day. When Capital has got thirteen hours of labor daily out of a being, it can get nothing more. It could be a poor speculation in an industrial point of view to own the operative; for the trouble and expense of providing for times of sickness and old age could more than counterbalance the difference between the price of wages and the expense of board and clothing. The far greater number of fortunes, accumulated by the North in comparison with the South, shows that hiring labor is more profitable for Capital than slave labor.



Now let us examine the nature of the labor itself, and the conditions under which it is performed. Enter with us into the large rooms, when the looms are at work. The largest that we saw is in the Amoskeag Mills at Manchester. It is four hundred feet long, and about seventy broad; there are five hundred looms, and twenty-one thousand spindles in it. The din and clatter of these five hundred looms under full operation, struck us on first entering as something frightful and infernal, for it seemed such an atrocious violation of one of the faculties of the human soul, the sense of hearing. After a while we became somewhat inured to it, and by speaking quite close to the ear of an operative and quite loud, we could hold a conversation, and make the inquiries we wished.

The girls attend upon an average three looms; many attend four, but this requires a very active person, and the most unremitting care. However, a great many do it. Attention to two is as much as should be demanded of an operative. This gives us some idea of the application required during the thirteen hours of daily laborer. The atmosphere of such a room cannot of course be pure; on the contrary it is charged with cotton filaments and dust, which, we were told, are very injurious to the lungs. On entering the room, although the day was warm, we remarked that the windows were down; we asked the reason, and a young woman answered very naively, and without seeming to be in the least aware that this privation of fresh air was anything else than perfectly natural, that "when the wind blew, the threads did not work so well." After we had been in the room for fifteen or twenty minutes, we found ourselves, as did the persons who accompanied us, in quite a perspiration, produced by a certain moisture which we observed in the air, as well as by the heat.

The young women sleep upon an average six in room; three beds to a room. There is no privacy, no retirement here; it is almost impossible to read or write alone, as the parlor is full and so many sleep in the same chamber. A young woman remarked to us, that if she had a letter to write, she did it on the head of a band-box, sitting on a trunk, as there was not space for a table. So live and toil the young women of our country in the boarding-houses and manufactories, which the rich and influential of our land have built for them.

The Editor of the Courier and Enquirer has often accused the Associationists of wishing to reduce men "to herd together like beasts of the field." We would ask him whether he does not find as much of what may be called "herding together in these modern industrial Associations, established by men of his own kidney as he thinks would exist in one of the Industrial Phalanxes, which we propose."

Source: <http://www.kentlaw.edu/ilhs/lowell.html>

## Reminiscences of Lowell Mill Girls

At the time the Lowell cotton- mills were started, the factory girl was the lowest among women ... But in short time the prejudice against factory labor wore away, the Lowell mills became filled with blooming and energetic New England women. They were naturally intelligent, had mother-wit, and fell easily into the ways of their new life. They soon began to associate with those who formed the community in which they had come to live, and were invited to their houses. They went to the same church, and sometimes married into some of the best families. Or if they returned to their secluded homes again, instead of being looked down upon as "factory girls" by the squire's or lawyer's family, they were more often welcomed as coming from the metropolis, bringing new fashions, new books, and new ideas with them.



... Except in rare instances, the rights of the early mill- girls were secure. They were subject to no extortion, if they did extra work they were always paid in full, and their own account of labor done by the piece was always accepted. They kept the figures, and were always paid accordingly. Though the hours of labor were long, they were not overworked; they were obliged to tend no more looms and frames than they could easily take care of, and they had plenty of time to sit and rest. I have known a girl to sit idle twenty or thirty minutes at a time. They were not driven, and their work-a-day life was made easy. They were treated with consideration by their employers, and there was a feeling of respectful equality among them ...

Their life in the factory was made pleasant to them. In those days there was no need of advocating the doctrine of proper relation between employer and employed. *Help was too valuable to be ill-treated.* If these early agents, or overseers, had been disposed to exercise undue authority, or to establish unjust or arbitrary laws, the high character of the operatives, and the fact that women employees were scarce would have prevented it ... The agents and overseers were usually married men, with families of growing sons and daughters. They were members, and sometimes deacons, of the church, and teachers in the same Sunday-school with the girls employed under them. They were generally of good morals and temperate habits, and often exercised a good influence over their help.

The feeling that the agents and overseers were interested in their welfare caused the girls, in turn, to feel an interest in the work for which their employers were responsible. The conscientious among them took as much pride in spinning a smooth thread, drawing in a perfect web, or in making good cloth, as they would have done if the material had been for their own wearing. And thus was practised, long before it was preached, that principle of true political economy, -- the just relation, the mutual interest, that ought to exist between employers and employed.

Those of the mill- girls who had homes generally worked from eight to ten months in the year; the rest of the time was spent with parents or friends. A few taught school during the summer months ...

Of their literary and studious habits, Professor A.P. Peabody, of Harvard University, gives his opinion in an article written not long ago in the *Atlantic Monthly*. He says, "...used every winter to lecture for the Lowell Lyceum. Not amusement, but instruction, was the lecturer's aim ... The Lowell Hall was always crowded, and four- fifths of the audience were factory- girls. When the lecturer entered, almost every girl had a book in her hand, and was intent upon it. When he rose, the book was laid aside, and paper and pencil taken instead; and there were very few who did not carry home full notes of what they had heard ..."

By reading the weekly newspaper the girls became interested in public events; they knew all about the Mexican war, and the anti-slavery cause had its adherents among them ... It may be added here, that the majority of the mill- girls made just as good use of their money, so newly earned, and of whose value they had hitherto known so little. They were necessarily industrious. They were also frugal and saving. It was their custom on the first day of every month, after paying their board-bill (\$1.25 a week), to put their wages in the savings-bank. There the money stayed, on interest, until they withdrew it, to carry home or to use for a special purpose. It is easy to see how much good this sum would do in a rural community where money, as a means of exchange, had been scarce. fashions, new books, and new ideas with them.



Into the barren homes many of them had left it went like a quiet stream, carrying with it beauty and refreshment. The mortgage was lifted from the homestead; the farmhouse was painted; the barn rebuilt; modern improvement (including Mrs. Child's "Frugal Housewife" – the first American cook-book) were introduced into the mother's kitchen, and books and newspapers began to ornament the sitting-room table. Some of the mill-girls helped maintain widowed mothers, or drunken, incompetent, or invalid fathers. Many of them educated the younger children of the family, and young men were sent to college with the money furnished by the untiring industry of their women relatives ...

Source: Harriet H. Robinson, *Loom and Spindle: Or Life Among the Early Mill Girls* (New York, 1898)

### Mill Work In Newmarket

MR. EDITOR: The bustle and heartburning created by my former correspondence having nearly subsided in New Market, I shall venture to address you a short note respecting our condition in the mill. What are we coming to? I can hardly clear my way, having saved from four weeks steady work, but three hundred and ninety-one cents! And yet the time I give to the corporation, amounts to about fourteen or fifteen hours. We are obliged to rise at six, and it is about eight before we get our tea, making fourteen hours.

What a glorious privilege we enjoy in this boasted republican land, don't we? Here am I, a healthy New England Girl, quite well-behaved bestowing just half of all my hours including Sundays, upon a company, for less than two cents an hour, and out of the other half of my time, I am obliged to wash, mend, read, reflect, go to church!!! ... I repeat it,, what are we coming to? What is to make the manufacturing interest any better? Our overseer says America will never be able to sell any more cottons than she does now; then how are we to have any better times? I have been studying some new writers on Manufacturers, and shall ask this question often.

Octavia

*The Factory Girl*, New Market, NH, March 1, 1843

[Note – The word "republican," used in writings of this era, refers not to a political party but to the belief in a form of government in which power is held not by a monarch but by the elected representatives of the citizens.]

Source: [www.laney.peralta.edu/Projects/.../NHMillGirls-the10hourDay.pdf](http://www.laney.peralta.edu/Projects/.../NHMillGirls-the10hourDay.pdf)





## In Their Own Words: Immigrant Histories

### ***The Big Idea:***

- Using first-hand accounts given by immigrants in the 1930s reflecting on their lives, students will be introduced to the topic of immigrants and that New Hampshire has a rich and diverse immigrant background.
- Students will gain a better understanding of how immigrants in the late 1800s played an important role in the growth of industry in New Hampshire, why people chose to emigrate to New Hampshire, and what life was like for them in a new country.
- Students will explore their own family backgrounds, when and how members of their own families came to the United States of America.

### ***Standards:***

- Explore attitudes towards diversity, e.g. segregation or inclusion.
- Explain the unique contributions of different ethnic and religious groups to New Hampshire history and culture.
- Describe the reasons why various groups came to the United States.

### ***What You'll Need:***

- **Part 1 (in class) Immigrant Histories**  
Immigrant stories and life histories:  
Daniel Buckley from Ireland, Dover mill worker\*  
French Canadian textile worker\*  
Franco American grandmother\*  
Polish textile worker\*  
*Immigrant Histories* worksheet\*  
*A Letter Home* worksheet\*  
\* found at the end of this lesson
- **Part 2 (take home) Family Histories**  
Paper or a tape recorder  
Family members knowledgeable of the family history
- **Part 3 (in class) Celebrating Our Heritage**  
Ethnic music  
Ethnic decorations  
Ethnic food  
(all to be determined by the class and their collective history)



## ***A Little Background:***

### **What does it mean to be an immigrant?**

An immigrant is a person who comes to a country to take up permanent residence. In essence, we all come from an immigrant background. All of our ancestors moved to New Hampshire from somewhere else. Even the first settlers, the Native Americans, originally traveled to New Hampshire from the Great Lakes and Ohio River valley.

### **Why did immigrants choose to settle here?**

In the 1500s, Europeans arrived off the coast searching for fishing grounds and other resources such as timber, animal hides and granite. In 1623 the English began settling what is now New Hampshire. When they first arrived, settlers stayed along the coast. By the late 1700s, immigrants from England, Scotland and Ireland had ventured inland, with almost all parts of New Hampshire home to new immigrant settlers.

The 1800s – early 1900s was considered the era of immigration in the United States of America. Thousands of people from throughout Europe, French-Canada and beyond traveled to New Hampshire to look for work and start new lives in a new country, many times bringing their entire families and all of their possessions with them. Immigrants were likely to move to locations where people from their native countries already lived and worked, creating pockets of language and culture. Examples in New Hampshire include the French-Canadian population in Manchester or Eastern Europeans in Newmarket.

Immigrants found work building railroads, logging timber for construction of homes, boats and the masts of ships, quarrying granite and working in textile and other mills producing a variety of goods.

Immigrants were hired both for their special knowledge and as all around labor in the mills as well as many other trades. The mills in particular provided thousands of jobs for immigrants, with speaking the English language and having specialized skills not being necessary for employment. Immigrants provided the much-needed workforce to keep industry growing and thriving in New Hampshire. Willing to work for lower wages than women working in the mills in the 1800s, immigrants frequently replaced the “Yankee mill girls” as they went home to marry and start families.

### **Where did immigrants travel from to settle here?**

In addition to the Native Americans and English mentioned above, during the era of immigration (1880 – 1920), immigrants to New Hampshire came from the following countries: Ireland, Greece, Russia, Poland, Austria, Sweden, Germany, Italy, Finland, Lithuania and (Quebec) Canada. It should also be noted that not all “immigrants” came here voluntarily. A census report from 1790 showed over 200 slaves from Africa living in New Hampshire households.

The era of immigration ended in the 1920s, when the United States Congress began limiting the number of immigrants that could come into the country each year. Variations of these laws



existed until 1965. Today, immigrants continue to settle in the United States, but where they are coming from has changed. Immigrants from Canada and Germany are still among the largest immigrant groups, which also include India, China, Korea and Vietnam.

## ***What To Do:***

### **Part 1- Immigrant Histories**

#### ***What You'll Need:***

- Immigrant stories and life histories:
    - Daniel Buckley from Ireland, Dover mill worker\*
    - French Canadian textile worker\*
    - Franco American grandmother\*
    - Polish textile worker\*
  - *Immigrant Histories* worksheet\*
  - *A Letter Home* worksheet\*
- \* found at the end of this lesson

Before you begin, read the four immigrant histories included in this curriculum packet. They are all interesting, and in many ways personal accounts of the lives of four immigrants told from their perspective. They provide details as to how they traveled to this country, why they chose to emigrate, what they left behind, and what life was like for them in a new country. Depending on the age of the students you are presenting to, and the amount of time you have to devote to this project, you may choose to have students read the personal histories in small groups, or you may choose to read one or more aloud.

Let students know that three of these interviews were conducted about 70 years ago (the late 1930s) and the people sharing their stories are talking about a time starting about 150 years ago! The histories included are provided in their entirety. In several cases there is mention of topics such as drinking, cigarettes, racial prejudice and discrimination against other ethnic groups. You may choose to address these topics directly before sharing the histories with students.

There are many ways to extend the lesson:

- Use the *Immigrant Histories* worksheet provided at the end of this lesson to ask students focused questions about the individual accounts they have read.
- Break students into four groups, and have each group read one of the histories, and present the information to the rest of the class as a first-hand account. For example, my name is Philippe Lemay and I started working in the mills when I was eight years old.
- After reading a chosen history aloud to the class, have students sketch a picture of something that they pictured in their mind while the story was being shared – it could be what they think the person looked like, an image of them working, playing, traveling, their home, whatever comes to mind. There is no right or wrong way of completing this



task. When finished, have students share their work and explain what they chose to sketch.

- Use the *Letters to Home* worksheet provided at the end of this lesson to put students in the role of immigrant, as they write letters to their families back home detailing their life in a new country.

## Part 2 - Family Histories

### ***What You'll Need:***

- Paper or a tape recorder
- Family members knowledgeable of the family history

No matter where you live now, at some point your family came from somewhere else (another country, or in the case of Native Americans, another part of this country). The United States of America is a land of immigrants. As a class come up with a list of questions students could ask family members to find out more about where their family came from. These questions can help you get started:

- Where did our family members come from originally?
- Why did they leave their native countries?
- Where did they emigrate to in the United States of America?
- What did they do for work when they got here?
- Were the jobs they found in the USA different than their jobs in their native land?
- How and when did our family settle in New Hampshire?

At home, have students interview family members (they may need a week or two to do this if they need to contact grandparents, etc.). In addition to face-to-face or phone interviews, emailing questions to family members is also an option. Students could also collect any ethnic items that may be related to their families' origins and that are meaningful to them including photographs or recipes.

## Part 3- Celebrating Our Heritage

### ***What You'll Need:***

- Ethnic music\*
  - Ethnic decorations\*
  - Ethnic food\*
- \*all to be determined by the class and their collective history

Have an in class celebration of everyone's immigrant backgrounds. This could include food, music, and decoration. It can really be anything the class chooses to make it.

### **Don't want to get so personal?**

Exploring students' family histories can be awkward for students and teachers alike. With a variety of family situations, teachers may opt to focus this lesson on immigrant groups known to have settled their town instead of students' specific family backgrounds. Rather than interviewing family members, recruit people representing specific groups to speak to students about their cultural heritage and immigration stories. Engage students in researching your town's specific immigrant groups and hold a celebration, inviting your guest speakers.



### ***What Did You Discover?***

- Why did many immigrants come to New Hampshire in the 1800s?
- Into what areas of New Hampshire did various immigrant populations move?
- What attracted them to these areas?
- Where did class member's families come from?
- Why did they come to the United States?
- What did they do when they got here? What made this work attractive or available? Why did they choose it?
- Does anyone have family who recently came to the United States?
- Are the reasons they came the same or different from those of immigrants in the 1800s?

### ***More On The Subject:***

If you choose to focus this lesson on students' cultural background and immigration stories, a similar project described below could be used as an extension activity.

#### **"Who are the people in your neighborhood?"**

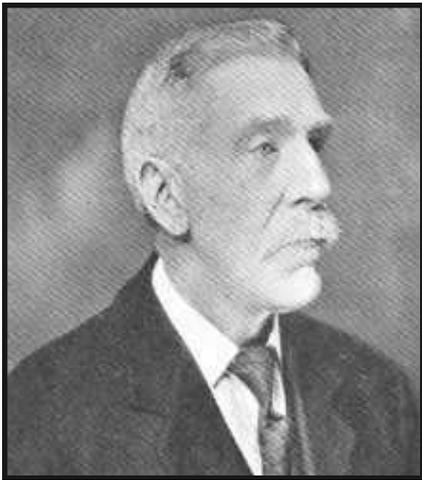
Depending on which town you live in, the immigrant population will vary. There may be different reasons for why they came here, when, and from where. Use Internet research and town directories and examine different social clubs, service organizations, town monuments, historical markers, businesses, festivals or celebrations, and grave markers to find evidence of immigration in your area. Share your findings with the class.

**As a class:** invite community members from these different organizations to come in and share some aspects of their heritage.



## Immigrant Stories and Life Histories

Daniel Buckley



Cocheco Chats, September 1921

*Image courtesy of Dover Public Library, NH*

It is sixty-five years since Mr. Daniel Buckley first entered these mills as a back boy in No. 4 Mule Room, under Overseer George Thompson. He says that he well remembers his first year as an employee here, because it was in the year of the Buchanan-Fremont presidential contest, when as a barefoot boy, he followed the parade up to Central Avenue to Garrison Hill to watch the firing of the cannon which is now being moved to a position near the observatory, which accidentally killed three men.

Mr. Buckley was born in Ireland in 1842 and emigrated to the United State when he was eight years old. Six years after entering the mill as back boy in 1856 at twenty-five cents per day- an interesting comparison with present day wages- he worked his way to head spinner at seven dollars per week. He was made second hand of No. 5 Mule Room in 1872. He later served as second hand in No.2 and No. 3 Mule Rooms, continuing in the Mule Room until 1914, when the mules were replaced by ring spinning frames.

Mr. Buckley left the mill at that time for a long rest on account of poor health. He says that Agent Irving Southworth, then superintendent here, told him that with the discarding of the mules, that he must not think there was no further work for him, but that there would be a position for him at any time that he wished to return. Mr. Buckley re-entered the mill as an employee in the Cloth Room in 1917, and there you will find him every day, a vigorous man, despite the fact that it is sixty-five years since he began to earn his living.

Mr. Buckley was married in 1872 to Miss Catherine McCarthy, also a native of Ireland and a resident of Dover. There are three children, Mrs. Annie G. Farley, Mr. Daniel Buckley, Jr., druggist; and Dr. James Buckley, physician, all of this city. Mrs. Buckley died in 1912.

Mr. Buckley talked very interestingly on education, past and present. "Do you know," he said, "that I have always felt handicapped by lack of education. I attended public school, in a school house back of the site of the Washington Street Baptist Church, for a short time; later



I attended evening school, where we had to pay one dollar for twelve lessons and furnish our own materials. We did not have the opportunities for education that the young people of today have, such as the many evening and correspondence schools. I was determined to give my children the education I believed they required. With the sacrificing help of my wife we succeeded. Daniel, after a thorough local education, attended and graduated from the School of Pharmacy in Boston and James is a graduate physician of Dartmouth Medical College. I think that all young people should try hard to obtain an education."

This article has been copied in its entirety with permission from the Dover Public Library directly from the library website which can be found at:  
[http://www.dover.lib.nh.us/DoverHistory/daniel\\_buckley.htm](http://www.dover.lib.nh.us/DoverHistory/daniel_buckley.htm).



## Living Lore in New England

Title: **The French Canadian Textile Worker**

Writer: **Louis Pare**

Assignment: **Manchester, New Hampshire**

Topic: **Philippe Lemay, 1938-39**

Source: **Library of Congress, Manuscript Division, WPA Federal Writers' Project Collection**

"French Canadians from the province of Quebec have worked in the mills of Manchester for a long, long time. There was one as far back as 1833, and for more than 50 years they kept on coming until now we are 35,000 strong, 40% of the entire population of the city. Ours is said to be the largest single nationality group.

I am going to tell you as well as I can the story of the French Canadian textile worker; what brought him here; how he came, lived, worked, played and suffered until he was recognized as a patriotic, useful and respected citizen, no longer a 'frog' and 'pea soup eater,' a despised Canuck. And it's the story of all the French Canadians who settled in New England mill towns. The picture of one French Canadian textile worker and the picture of another are just as much alike as *deux gouttes d'eau*, or, as we have learned to say in English, like two peas in a pod.

Let me say, first of all, Monsieur, that the current of immigration was strongest between 1850 and the early 70's. Some came before, as you will see, others after, as long as there was no limit by law on immigration, no head-tax nor passport required. In 1871, French Canadians here were strong enough to have a resident priest of their nationality and a parish of their own. A second parish was founded in 1880 on the west side of the Merrimack. At the time, New Hampshire was a part of the Portland diocese. In 1884, thanks to French Canadian immigration, the Manchester diocese was created.

Why did our people leave Canada and come to the States? Because they had to make sure of a living for their family and themselves for a number of years, and because they greatly needed money. The wages paid by textile mills was the attraction.

Here and wherever else they went, they didn't forget their duty to God: the churches, schools and other institutions they built testify to that. But their duty to the country that was feeding them, that was another thing. They didn't like to become citizens and feared it for more than one reason. They couldn't speak English, and that, let me tell you, was a big handicap. They were afraid of war and might be drafted. Most of them were still tax-payers in the province of Quebec and the different places from which they came, and they felt that they couldn't pay taxes here too. Most of them hadn't come here to stay. What they wanted most was to go back to their Canadian farms with the money earned in the textile mills. So they kept putting off taking out naturalization papers.

But we already had able leaders, among them Ferdinand Gagnon, and they preached Americanization to all those who intended to stay in this country. They pointed it out as a duty to ourselves as well as to the country. They told us that naturalization was something that gave to a foreigner all the rights belonging to the citizen in the country to which the foreigner swears allegiance. Our people began to realize that their ideas against being naturalized were wrong. They saw the privileges as well as the duties, and so, as early as 1871, we had fifty voters



in Manchester, fifty men who, supporting good Father Chevalier, were able to obtain from the city authorities, without cost to the French-speaking Catholics, a French language school; building, heating, lighting, books and lay teachers. This success was encouraging. Naturalization increased, and that, if you take account of the many births, tells you why so many of us are voters and tax-payers today, why so many of our folks settled here for all time.

Before we had the railroads, immigrants from the province of Quebec came to Manchester in wagons or other horse-drawn vehicles. If they brought their household goods with them, and that was rare enough, they traveled in hay-racks. Did some travel on foot from Canada? No, I don't think so. Perhaps from places near the border to northern Vermont, but if any immigrant had walked as far as Manchester, we certainly would have heard about it from old settlers, and there were quite a few left in 1872. Anyway, traveling in wagons was bad enough. Even the trip by train in 1864 was terribly slow. There wasn't much comfort for the voyageurs and it was expensive, because we had to stop over more than once and even children were obliged to pay full fare.

Here is the case of my own family, for example. It took us four days and as many nights to go from our home town, St. Ephrem d'Upton, to Lowell. Train engines weren't big and powerful in those days. Besides, they were wood-burners, and you couldn't put enough wood in the tender to make long trips. So trains didn't run far and never during the night. We started from St. Ephrem in the afternoon and went as far as Sherbrooke and slept there. The next days we reached Island Pond, in Vermont, and spent the night in that customs town. It was a very small place, too. The following morning, the old Grant Trunk took us to Portland, [Maine] and again we passed the night there, because the train went no further. After another night's rest, on a different railroad, we were on our way to Boston where we had to find lodgings once more. At last, the fifth day, we landed in Lowell where we were to live for eight years.

Many things can happen on such long trips, and something did while we were coming to the States, *aux Etats*, as French Canadians say it even today. At Island Pond, my mother was taken sick and couldn't go on with us when we left for Portland on the third stage of our journey. Father remained with her. We were told to continue towards Lowell and to mind our uncle and aunt who were making the trip with us from St. Ephrem. We promised to be good and followed our good aunt and uncle, but we worried on account of our parents. We weren't separated for long, though, for mother was a strong, healthy woman, of good Canadian stock. Father and mother arrived in Lowell only three days after we did, and what do you think they brought with them? A new little Lemay whom we all welcomed to our already rather large family.

The majority of French Canadian immigrants came to Manchester at their own expense. In fact, all of them did, so far as I know, and they didn't have to be coaxed, either. It is true that some companies, seeing in the type *quebecois* an honest, able workman, asking little for himself and rather unwilling to let himself be fooled by strike agitators, brought here a certain number through recruiting agents sent to Canada for the purpose. The companies built homes to house these new hands. However, if their fares and other expenses were paid by the textile corporations, it was never mentioned and I don't believe it was done.

Our people didn't come to the States with money they had saved up, though, since they



emigrated because they were really obliged to go where they could earn their daily bread and butter. To raise enough money to buy railroad tickets for the family and pay for food, rooms and other expenses on route, they had to *faire encan*, sell all their household goods at auction. That money was practically all gone when they arrived here, and all they possessed was the clothes they had on their backs, you might say. Parents and children alike were dressed in homespun and homemade clothes and they were recognized as coming from Quebec province the very moment they left the train. Most of them, you see, were from small towns and farming districts, very few coming from large cities like Montreal and Quebec. As they were poor, all those who were old enough went to work without waiting to take a much needed rest.

They boarded at first with relatives, if they were lucky enough to have any here, or in some French Canadian family until they could rent a tenement for themselves, mostly in corporation houses, and buy the furniture that was strictly needed.

Money was very precious to us in those days and we spent it carefully, getting along with only the things we couldn't do without, but we were able to make a living and save something besides. You understand that food, clothing, lodging, fuel, everything was much cheaper then than now. For lighting, we used kerosene lamps and the streets were lighted the same way. It was some time later that we had gas.

Our kitchen had to serve also as dining-room and living-room. There was no such thing as a parlor and no place for one, because all the other rooms, including the front one, were bedrooms and there weren't too many, you can bet on that. We had no draperies or sash-curtains in the windows, just paper shades without roller-springs such as we saw later. A narrow strip of wood, of the same width, was sold with this paper shade and we nailed it across the top to the window frame. In the morning, the shade was rolled by hand and held up by a string fastened to a nail. The floors, not always of hard wood, were bare and had to be scrubbed on hands and knees with lye or some other strong stuff, once a week at least, on Saturdays. The only floor coverings we knew were round braided carpets and catalognes, seven or eight feet long and three wide, all homemade with rags carefully put away for that purpose.

Once a week, sometimes twice, our women folks broke their backs over the washboard and wrung the family washing by hand, washing machines and wringers being unknown at the time. There was no hot water in large, convenient tanks, only the one you heated on the kitchen stove in the washboiler, pans and pots, or if you came to afford it, a tea-kettle. This hot water served for cooking, washing the dishes, clothes and floors and to take the weekly bath in the wash tub.

But we had big appetites and ate well and slept well, going to bed and getting up early every day in the week, except Sunday. Sunday nights, we had our *veilles du bon vieux temps*, as we had them in Canada. The younger folks enjoyed birthday parties, but early French Canadian textile workers, even in the 'Seventies, never thought of celebrating their golden or silver wedding anniversaries. In 1871, our first parish was established and our new church was opened in 1873. In the meantime, we worshipped in Smyth Hall and in the church located on the corner of Chestnut and Merrimack Streets. A few years later, we had two parishes, so we really could practice our religion as easily as we did in old Quebec. We said our morning prayer separately, but after supper, before the dishes were washed, we recited the beads and evening prayer *en*



*famille*, father or mother alternating with the children and the boarders.

After a while, the children became young men and women. They had been earning money for a few years and, being prouder, thought of changing from homespuns, worn even on Sunday, to more fashionable store clothes. We saved pennies until they became dollars and when there was enough, we dressed up, you bet, paying in full for what we bought, not a little down and so much a week, as so many do today with the creation and the spread of the installment plan.

"You must have heard about the earliest French Canadian settlers in Manchester, M. Lemay," M. Pare inquired.

"Yes, I learned much about then when I was a very young man, and I can tell you they all started in the textile mills where most of them stayed. The first one to come here was Louis Bonin, in 1833. I understand that a Madame Jutras kept a boarding house in Amoskeag village [the northwest corner of Manchester] in 1830. Hyacinthe Jutras was another old timer. In 1848, he was the best man at the marriage of Louis Bonin and Miss Henriette Bonenfant, the other witness being Miss Catherine Bonenfant. M. Jutras, who died in 1893, had a remarkable memory and was able to tell us much concerning the beginnings of the local French Canadian colony.

The records of births, marriages and deaths at City Hall were far from being complete. When the names of our people weren't changed so that no one could recognize them, they were left out altogether. It is true that the law wasn't strict so long ago, but certain doctors seemed to find it useless to register the names of children born of French Canadian parents. In some cases, they would simply report that on a certain day a boy or a girl had been born in a Frenchman's home.

The old records show that Louis Marchand married Sarah Robert in 1839. The first birth recorded is that of a child born of [M. et Mme.?] Cyrille Lebran in 1852. [Mme.?] Jean Jacques died in 1853. Others among the earliest settlers were J.P. Lariviere, John Montplaisir, Julie and Amelie Prevencher, Pierre Bonenfant, Michel Hevey, Jean Biron, Telesphore Lemire who died at Stoke Centre, P.Q., in 1891, Nazaire Laflotte, Joseph Janelle, Joseph Berard and Michel Cote, one of the men who, in 1849, chopped down the trees on the site of Saint Anne's church located on the corner of Merrimack and Union Streets where it still stands. The pastor was Father William McDonald who had come here in 1844. There was also a Thibodeau family and another by the name of Rocheleau.

In those early days, there was a City directory, but it was published only every two years. Those who came and left between the times names were taken didn't figure at all in the book. Here is, as far as we are concerned, a remarkable thing about this Directory: after almost every French Canadian name, you found this: occupation: mill-worker, and the addresses were always something like these: Amoskeag Corporation, Stark Corporation, Machine Shop, Print Works, with the number, just as you'd say today, John So-and-So, 40 Main Street.

Some doctors came to Manchester from Canada more than eighty years ago to minister to their sick fellow-countrymen, but none of them stayed very long because business wasn't very good for some other reason. The first was Dr. Joseph A. Parent who came here in 1852, had his



office at 20 Amherst St. and went away in 1854. That year, a Doctor Belisle became the resident French Canadian physician. He was still here in 1856 and had his office at No. 3 Granite Block, his residence at 12 Manchester St.

The first photographer of our nationality group was Benjamin Milette with a studio at No. 79 Elm St., his home at 20 Pine St., corner of Manchester St. He came in 1858 and was gone in 1860. Dr. Elzear Provencher arrived in 1858 but remained only a short time, not so long as those who came before. Olivier Desmarais, who also took pictures, lived here about 1882. In 1862, Nazaire Laflotte entered the employ of the Barton Company, owners of a dry goods and notions store, and was probably the first French Canadian store clerk in Manchester. Our first merchant was Joseph Duval who opened a grocery and liquor store in 1863. In 1870, Nestor Goudreault rents half of Marchand & Beausoleil's grocery store on Elm St. and starts the first French Canadian bakery. Godefroi Messier is doing so well with his oyster and refreshment shop opened in 1869, that he takes his sons Pierre and Luther as partners and moves to a larger place at 285 Elm St. In 1870, H. Girard owned a shoe store at No. 5 Well's Block; the same year, L. Lacroix was a wheelwright and carriage-maker on Elm St., opposite the Tremont building. In 1869, Dr. A.L. Tremblay, who came to Manchester in 1867, formed a company and started the first French language newspaper, *La Voix du [Peuple?]*, with Ferdinand Gagnon, noted leader and pioneer of our newspaper man, as editor. In 1871, Father Joseph Augustin Chevalier became the first resident priest and founded St. Augustine's parish. In 1872, he resided on the north side of Laurel St., No. 62, between Pine and Union Streets.

There are now eight Franco-American parishes, each with its cure and most of these with *vicaires* or *curates*. By Father Chevalier and those priests who followed him to Manchester from Quebec province, parish records were very carefully kept. Every birth, marriage and death is written down with all the names spelled as they should be, and if you want any information, you have it complete and right. A census is taken each year in all the parishes; that tells us the number of Franco-Americans at any time. That may be a difference of two or three hundred between that number and the real total because some French Catholics married into Irish families and belong to Irish parishes, and others lost their faith and joined Protestant denominations.

In 1871, there were about two thousand French Canadians in the city. After Father Chevalier's coming and the opening of the first church in 1873, immigration was speeded up for a while, as many as five or six families arriving on the Canadian train, the train du Canada, every day.

What was the pay of these earliest settlers? Well, in 1845, Michel Cote mixed mortar for five shillings a day, but in the mills where every other French Canadian was employed, the pay was fifty cents a day and the board cost two dollars a week. The workday began at five o'clock in the morning and finished at eight o'clock at night. The workers had a half hour off for breakfast, dinner and supper. Later, every day of the week, in summer as in winter, the working hours of millhands were from six in the morning till 6 at night and that schedule was continued for many years. Nobody complained because everybody was happy and contented. It was good to have a steady job and a steady pay with the assurance that you didn't have to loaf unless you wanted to.



Today, we live in other times and fit ourselves to new conditions. The workweek has been considerably shortened and there is talk of making it even shorter. Machinery has been perfected, everything is modern. Between yesterday and today, what a difference. During my fifty-three years in the local mills, I have seen a seventy-five percent improvement. New looms in which the machine stopped if a thread broke were introduced about 1885 and saved much time and cloth. Ring spinning succeeded fly spinning with fine results for everybody. In 1872, the mills made fancy shirting, fleeced and plain cotton cloth, as well as blue and brown drilling for frocks and over-alls; then came gingham and ticking and finally woolens, worsteds, every kind of textile product.

People work as hard now as they did years ago, but life is better, easier, more satisfactory for the mill-worker of the present time and we old timers are glad that it is so. We are glad that we have brought it about to a certain extent. We were proud and insisted on working for our living, instead of depending on charity. We wanted to better our condition; own our home; set aside something against a rainy day; give our children a better education than we had ourselves. So we did our work honestly and well in order to keep our jobs and got better ones. Out of our wages, we built churches, then schools, while supporting public schools and the government of our country, state and city. Our children, better educated, are already in higher positions or prepared to fill them with honor. Some of us have retired to the homes we worked so hard to buy, while others have bought farms and gone back to the occupation which was that of their fathers and ancestors in the country where we were born.

Some French Canadians were not afraid and fought for the Union during the Civil War; there were many more in the war against Spain, but the greatest number served in the World War, hundreds having enrolled as volunteers in 1917. Our men would be ready and willing to answer another such call tomorrow. They'd rather have peace, just as the rest of the nation does, but if the fight is brought to them, they'll want to be in it, just as sure as you're there. I guess those early settlers I told you about won't have to be ashamed of us, because we've done our best.

You would like to have me introduce myself? Because it will lead me up to my first job in the mills, I will try to satisfy you, but we'll make it short, because there are so many things much more interesting to tell.

I was born in St. Ephrem d'Upton, P.Q., not far from St. Hyacinthe and Montreal, June 29, 1856. I was the fourth in a family of fourteen children, five of whom are still living. I told you that my mother was of good old Canadian stock. She was 97 years old when she died. My father was killed in an accident while at work; he was 80 and in perfect health, so he might have lived for quite a few more years, don't you think so?

When we came here in 1872, we lived in 'Squog, on the west side of the river. After I was married, I occupied the same tenement for 44 1/2 years in an Amoskeag corporation house, on the north side of Stark Street, between Elm and Canal Streets. For the last ten years, we have lived in this cottage I own on Candia Road, near Lake Massabesic. I have with as my granddaughter, the housekeeper, and her son, 17 years old and a Freshman at St. Anselm's College.



I have always loved to travel, especially since I have been out of the mills. I have a son living in Florida and I have spent seven or eight winters with him. I drove my car both ways every time. This year, again by automobile, I went to Canada three times. No, I haven't forgotten my birthplace where father, mother and others of my family are buried.

I use glasses to read, but when it comes to see from a distance, my eyes are just as good as they were fifty years ago. Do I eat well? *Mon cher ami*, I can eat baked beans for supper and not feel the worse for it. I do quite a bit of work around the house. From spring until fall, I take care of my garden. My granddaughter thinks I work too much and often scolds me in a nice way; you hear her scold even now, but look at her smile. When I'm not working, I read and that brings me to a little nap in my rocking-chair. When you are going on 83, you too will like your *petit somme* in the afternoon. I am still considered the head of the family, loved and respected. With all that, who wouldn't be happy in his old days? As you see, we are able to speak English without a trace of accent, and that is natural; I have been in this country so long and the children were all born here.

After working for over sixty years, stomach ulcers began to bother me. I thought I wouldn't be able to go on any longer and spoke of leaving the mills, but they didn't want to let me go. The company in May and June, 1924, gave me a vacation with pay and told me that would put me on my feet. I did come back in July but things went from bad to worse with my stomach. In December, I was forced to retire and the Amoskeag, giving me a month's extra pay, had to let me quit my job as overseer of the Coolidge spinning mill. I went to the hospital where I spent quite a while and recovered my health.

I liked the people who were with me in the mills and I sympathized with them. I helped them as anybody else would have done in my place. Did I, when I was a boss, hide some who weren't quite sixteen, when inspectors visited the mills? I wouldn't have mentioned that if you hadn't put the question, but there is some truth in it, though I wonder who could have told you. You see, I started working in the Lowell mills when I was only eight years old and I could understand. If boys and girls were big and strong enough to work, even if they were a little under the legal age, I gave them a chance to keep their jobs. Their parents were poor and needed every cent they could get. So I'd tell these younger workers to keep out of sight until the inspector had gone away. There was no harm to anybody in that and it did a lot of good. And besides, the law wasn't so strict in those days. Looking back over the years, when I think of those who worked with me and for me, I feel in my heart that I miss a lot of friends and I'd be lonesome at times if I didn't have something to keep me busy around here. But let me talk about something else, about my first job, for instance, and then we'll go along.

When we landed at Lowell in 1864, there were very few French Canadians, only five families at one end of the city, fifteen at the other. Many more came after the Civil War was over. I was only eight years old, but that didn't stop me from going to work. My first job as a textile worker was in the Lawrence mill, No. 5, where I worked as a bagboy and doffer for about three years. Then I wanted to do outside work and one of my jobs was driving a one-horse wagon. In 1872, when I was sixteen, our family moved to Manchester. In 1875, father and mother returned to St. Ephrem.



Here, in the beginning, I started in a card room as roping and bobbin boy, but I wanted to be a spinner, not a mule-spinner. I had seen mule-spinning in Lowell and didn't like it at all; fly-spinning that makes cotton into thread, ready for the weave-room, that's what I wanted to do. But it wasn't until 1875, the year my folks went back to Canada for good, that I got my chance. How I landed in No. 1 spinning mill of the Amoskeag, where no French Canadian could be hired before, is a little story in itself.

Each spring and fall, it seems, the older immigrants had a touch of homesickness. Most of them still had farms in old Quebec. "I want to see if it is still where I left it," they'd smilingly tell the boss when they asked permission to be away for five or six weeks. So they went back to Canada twice a year. While there, they visited friends and relatives, that's sure, but their principal reason was a serious one, and they had to make many sacrifices in order to save up enough money to pay railroad fares and other necessary expenses.

At heart, Monsieur, they were still farmers like their ancestors had been, and they wanted to get something out of those farms, some of which had been in the family for many generations. In the spring, they attended to ploughing, harrowing and sowing; in the fall, to the harvesting of the crops. During the summer, some relative or neighbor kindly gave a look once in a while to see that all was well.

While they were absent from the mills--others having to loaf on account of sickness or for some other reason, spare-hands had their chance to work. That's how I got into spinning. The overseer was kept at home by sickness and the second hand hired me. When the boss came back, I was giving all my attention to my work and not losing a minute. We all did that. But the overseer didn't look pleased and he was mad when his assistant told him my name. He wanted to know why I had been hired when he didn't want any Frenchman working there in his mill. The second hand said he'd discharge me right away and I felt that my dream of becoming a fly-spinner was coming to an end quickly. I kept on working. The boss looked at me, seemed to think twice before he spoke and then said: "Don't do it now; wait until Smith comes back to work."

Smith did come back and I was out of a job, but not for long. The boss was sorry to let me go, that was plain. He took my address and said he'd let me know as soon as he needed me. He had changed his mind about hiring French Canadians after he had seen one of them at work. The very next day, at noon, he sent for me and after that I had a regular job in the Amoskeag. And that same boss hired many of my people, and that is the point I want to bring out in my story.

Later, I was transferred to No. 4 mill where there were, besides the overseer, three second hands in a department of 18,000 spindles. You can imagine how little work those assistant overseers had to do. They ought to have been running some of the frames to keep themselves busy. I went back to No. 1 with a job that paid me \$1.30 a day, 20 cents more than I was getting at No. 4. I was roping-boy, oiled the shafts and pulleys and did other jobs.

The boss of No. 4 mill wanted me back and offered me \$1.45 a day. I went, of course. One day, another overseer tried to get me, and when I spoke of leaving, Hamilton, boss of No. 4, wouldn't hear of it. To keep me, he offered me extra pay if I would do the work of a sickly operative who



had to loaf at times, and more extra pay if I wanted to take the place of a third hand once in a while. I accepted, did my own work besides and, as long as the arrangement lasted, I got \$2 a day and a little more. I was finally given a regular job as third hand, quite a promotion for a French Canadian at the time. In 1881, I was made second hand and, in 1901, overseer in No. 1 spinning mill. It included No. 2, where I had such a hard time getting a small job twenty-six years before.

It was a big event when I was appointed overseer of the 1 and 8 spinning mills. There was to be a vacancy very shortly. I knew about it and, being convinced that no one would say a good word for me, I decided to speak for myself. I wasn't bashful any more. So, one day, I asked the super if he wouldn't give me the chance. He was so surprised that he couldn't speak for a long time, or so it seemed to me. He was looking at me as if he had been struck by thunder and lightning. What! A Frenchman had the crust to think he could be an overseer! That was something unheard of, absolutely shocking. And the super was shocked, I'm telling you. When he recovered enough to speak, he told me he'd think it over, turned his back on me and walked off. He was certainly upset.

The next day, he came to me and, still with a doubting expression spread all over his face, said he'd try me for six months. But I didn't want six months, I answered back. I wasn't going to clog up that spinning department. Either I was the man for the job, I said, or I wasn't. If I was, it wouldn't take six months to find it out. If I wasn't, I'd get out in a hurry. No six months for me. One month, that's all I wanted to show what I could do. The super seemed to be wondering again but answered it was all right with him just as I said. So I became the over-seer of No. 1 Spinning where I had made my shaky debut in 1875.

That was another step ahead for the French Canadians, wasn't it? But this time, it was an awful scandal. The sad news didn't take long to spread. Americans and Irish were mad clean through. They looked at me and spoke to me only when they were strictly obliged to, but as far as friendship was concerned, there was no more, you bet. I, a Frenchman, had jumped over the heads of others who thought themselves the only ones entitled to the job of overseer; here was a sin that could not be forgiven, and what was the world coming to, anyway?

My disappointed former friends had another shock of the same kind two years later when Theophile Marchand--we called him Tofil--was named overseer of weaving, and he was included with me in their hate. Tofil, who had been a first class weaver, was then a first class loomfixer, a big job in those days. His promotion, like mine, became the talk of "Milltown" and was a terrible scandal.

Later, those who were afraid of us got used to these things and took them in a better spirit, for several other French Canadian textile workers got well deserved promotions. Theophile Marchand, better known as John, was one of my own second hands, and I recommended him. He was a boss just three days, then he came back to his old job with me, after telling the superintendent that he'd be happier and healthier that way. 'An overseer's job has too many worries,' he said. 'The first thing you know, I'd be loafing because I was sick, and I can't afford to do that, because I have quite a family to support.' And so, my friend Tofil had the distinction



of being the first French Canadian, perhaps the first one of any nationality group, to refuse an overseer's job.

Others who didn't worry were a Mr. Lalime who was made a superintendent of weaving; Frank Houde who came with me to the Coolidge mill as a second hand and went later to No. 1 spinning mill as an overseer; Wilfred Lemay, one of my sons, who was second hand for the one who took my place as boss of old No. 1 when I was transferred to the Coolidge in May, 1910. Then there was Domicile Nolet, superintendent of carding at the Stark Mills, and a M. Blais, overseer of spinning for the same company, when Amoskeag bought Stark in 1922. They stayed as bosses for the Amoskeag until it shut down for good. M. Nolet became overseer for the Pacific Mills who opened a plant here a few years ago in a part of old Amoskeag. Pacific moved to Dover this year, Domicile followed and is still there.

An overseer has a good chance to get even with those who hate him and have been mean to him and his people, but such a thought didn't come to my mind. As soon as I had been appointed, the super came over and said to me: 'Lemay, now is the time to get rid of your first second hand. He never liked you and he's no good anyway. You are now able to discharge him and pay him back what he did to you.' 'I'm giving this man a chance to make good with me if he wants to. Besides, he's just as good as I am. I won't punish him nor anybody else that way because I have been treated meanly. Don't expect me to get rid of John until I have good reason to, and that goes for all those who work under me.' So I kept my first second hand. I recommended him to take my place in No. 1 when I was transferred to the new Coolidge mill. Again the super couldn't understand me. 'But can he do the job?' he asked. 'Sure,' I answered, even better than I can.' 'There you are again,' replied the big boss. 'Whether it's to keep a second hand I don't want or to get him the job of overseer, you insist he's a better man than you, and the man isn't a French Canadian either.' 'He doesn't have to be one of my people, Mr. Super. If he's all right, I say so, and that's justice. Go ahead and try him out and find out what a fine man he is.' The super did, the man made good and I had my revenge twice against John, a Christian's revenge. I got no credit for what I had done but wasn't disappointed. My own good luck had brought me the congratulations and good wishes of only one American official, the superintendent of the Machine shops. The others kept their grudge until the time to congratulate had passed and then made the best of a thing that couldn't be avoided."

"What schooling did you have, M. Lemay?" M. Pare asked.

"None at all when I was a boy, he replied, "and none until I had been made a second hand, and that was in 1881. I had three terms at evening school, each term beginning in October and ending sometime in March. Afterward, I took one term in a business college, again attending evening classes, of course. When I started to go to school, I already could speak English pretty well, and that was a great help to me.

When I was a young boy in Lowell, my father wanted me to attend day school, but I didn't care much for reading, writing, spelling and arithmetic. Father left home early in the morning to go to work in the sawmill, as he had to walk about a mile and a half, coming back only for supper. As soon as he was gone, I went in my turn, but not to school; I went to the mills. At night, I got a good spanking, this happening every day, but I couldn't change my ways. I wanted to work,



that's all, to do something for my parents who needed all the help they could get, with the family they had to feed and take care of. Father had to let me have my way, but he didn't like to and showed it more than once.

In general, French Canadian children living here could have had some schooling in the grammar school grades if their parents had been able to get along without the earnings of these boys and girls, but most of them couldn't afford that. The only ones who had a chance to get an education were the youngest of the children, because older brothers and sisters were in the mills, helping their parents at the time. There were even boys who went to college and became priests, doctors, lawyers, newspapermen, and girls who studied to be religious teachers thanks to the hard-earned money of textile workers in their families.

After 1870, there were enough of our children to make schools necessary for them, with lay teachers for the first ten years or so. In Manchester, Father Chevalier, who came here in May, 1871, having been the first resident parish priest from Quebec in New Hampshire, started to build St. Augustine's church in 1872 and it was opened for worship in 1873. Young women helped the pastor by teaching catechism to the children in church each Sunday. It was as late as January, 1881 that the Sisters of Jesus-Marie were brought to Manchester from Sillery, near Quebec, by the cure of St. Augustine, to teach both French and English, besides religion, which ranked first, as it does now, in the school program, to young Franco-Americans."

Immigrants from the province of Quebec settled not only in Manchester but in other New Hampshire mill centers, Great Falls (now Somersworth), Salmon Falls and Newmarket, to name only a few. In each community, they built church first of all, then a presbytere or residence for the pastor, as soon as possible a school for their children (which the children had to attend), and they finally bought a tract of land on the outskirts of the city for a cemetery. To protect their homes and families, they later organized mutual benefit or fraternal societies, the first of which was the Saint-Jean-Baptists Society, Union Saint-Pierre, Societe Saint-Augustin and Union Saint-Georges. The first of these groups and Union Saint-Pierre have ceased to exist but they lived remarkably long; Union Saint-Georges and Societe St. Augustin have joined the Association Canada-Americaine founded in 1896, I know of some St. Jean-Baptiste Societies, some started as early as 1867, that are today strong and active as independent fraternal groups.

Finally, to link themselves more closely, they had their newspapers. Some didn't live long like *Voix du Peuple*, the first one, and *Echo des Canadiens*, but *L'Avenir-National*, started as a weekly fifty years ago, is one of the important French dailies in New England. We have also two monthlies, *Echo de Notre-Dame* and *Republique* and *Canadao-Americain*, the monthly organ of Association Canado-Americaine. The church, the school, the societies and the press are what have kept Franco-Americans alive as a group. Let them all disappear, and we go into the famous American melting pot.

"From what I have already told you," M. Lemay continued, "it can be guessed that the children of Quebec immigrants, like most of their parents, had no school education when they arrived here. They had been well and religiously brought up by devout parents in their Canadian homes; their mother had taught them to pray, but they could neither read nor write. One of the exceptions was Joseph E. "Joe" Pellerin. Joe was 17 when he came to Manchester with his



folks in 1881. He had been to grammar school under religious teachers at Yamachiche where the family then lived and which was the birthplace of Joe's Canadian ancestors. He then had four years of classical studies at the seminary of Trois-Rivieres. He followed this up with two terms of business college in Manchester, attending night classes and learning bookkeeping, English and penmanship. He was a first class weaver and what did his education do to him? It took him off the looms in the early 90's and placed him in the weave room office. There he kept books, including the workers' time, for overseer Adam Graf, and marked the new cotton until 1922, at which time he was made a cloth inspector in another room. He remained there until he retired from the mills in 1930.

Joe was born in Baie-du-Fevre, near Nicolet, and is now 75 years old. He came here from Yamachiche with his father, step-mother, two brothers and sister. In the order of birth, he was the second of this family of four. His parents and sister returned to Yamachiche in 1884; one brother married and settled in Lowell, while the other, also married here, moving to Canada with his family some time later. My friend was an investigator for a local bank until 1933. He then retired and lives with his wife and unmarried daughter, Miss Germaine, in a corporation house he has occupied for the last forty years and is located at 59 West Bridge St. M. Pellerin has four children, two daughters and two sons. A son, Alfred, is an attendant in a State hospital, and the unmarried daughter is a fine pianist and the able organist of St. George's church.

Joe is a nice talker, has a wonderful memory and, with his distinguished appearance, could pass just as easily for a doctor, a lawyer or a professor as for a retired textile worker. But Joe was one of the best weavers known in his time, and that's what he's proud of. He tried his hand at politics twice. The first time, running for the City Council in 1889, he was defeated at the Ward 1 caucus by 25 votes. He tried again the following year and was elected as he had told his political enemies he would be.

Like myself, Joe says we owe our success in the mills to the fact that we were faithful, honest workers, giving our attention to what we had to do instead of losing time talking to our fellow-workers. Joe is a man of fine character, a loyal citizen who'd rather go without eating or postpone a trip to Canada than to miss a chance of voting on election days. He loves his adopted city and country in a practical way, being ever ready to serve them, yet he remains at 75 loyal to the land of his birth and to his nationality group here. He speaks English fluently while preserving his faith, his mother tongue and customs of our people. He is a very active member of St. George's parish, of parish and fraternal groups, a worker for every good cause. Yes, Joe sets a fine example for us to follow, he is a real leader among Franco-Americans in Manchester and he's a jolly good fellow."

"You wish to know about a French Canadian textile worker who was neither a boss nor an office clerk in the mills? Then let me tell you about Stanislas Gagnon. M. Gagnon is 63 years old and lives at 100 Orange St., near St. George's Church. Stanislas served the Amoskeag Manufacturing Company for 47 years, always ways in the card rooms where has done every kind of work that department offers to a textile operative. He was just twelve and a half years of age when he started to work as a mill hand, and he's still at it, a carder. He came to our city in 1888 with his mother, his grandmother on his father's side and his brothers and sisters. They lived first on Pearl Avenue, near their present residence, and Stanislaus has never moved out of that district,



though he has belonged to two parishes. Our friend now occupies a very neat tenement and lives in comfort with his wife and their unmarried daughter. A married daughter is a resident of Boston.

M. Gagnon, when he was a young man wanted his share of gold and adventure, so he left the mills to go to the Klondike where he spent three years. He returned to Manchester and worked for a while in the card room of the Amory mill. During the strike of 1922 and after the final shutdown of Amoskeag, he worked for several months at Exeter, this State, Lewiston, Me., Lawrence and Fall River, Mass., and Brattleboro, Vt., but he passed the greater part of his 47 years as a textile worker in the service of Amoskeag. He is a good hand and enjoys his work which he does faithfully and well. Everybody likes Stanislas who is a fine, good natured and good looking man, a six-footer and just a little shy, with a fair complexion, blue eyes, square shoulders and large, capable hands, all of which gives the impression that he is not a day over fifty.

For three whole days, M. Gagnon was an employee of the Stark mills. He was a boy of 13, full of fun and innocent mischief. He enjoyed himself until the third day when he got a good scolding from his boss. Stanislas liked it so little that he quit his job without giving notice and went back to Amoskeag. Like many youngsters of his day, Stanislas got his job in the textile mills by pretending to be 16. He was tall enough, but not built to look like a strong and able workman, and the bosses, though guessing that the truth was being stretched, gave him and other boys a chance.

As Stanislas was telling me one day, there were difficult moments in the lives of these young mill workers. If they happened to be loafing, they were generally out on the streets. Sometimes, a truant officer would come along and ask questions. Why weren't the boys in school? How old were they? Where did they live? Stanislas says he and his friends were in hot water all the time this third degree business lasted. They had to think up some reasonable answers in not too much time and apparently satisfied the officer, since they kept their jobs in the mills. If they had been forced to go to school, the loss of their small earnings, added together, would have made quite a difference in the family budget.

Ask any French Canadian textile worker and he will tell you how well he got along with his overseer. Stanislas Gagnon, who never was a boss, says that he never had any trouble with his, nor with his fellow-workers, and thousands of other French-Canadians say the same thing. We got along well because we never killed time, gave our attention to our jobs and turned out work that the company could sell. That is why we got the reputation of being skillful operatives who could be trusted to remain on their jobs even if the bosses weren't always around to watch them. It is for that same reason the local textile corporations sent agents to Canada and to American textile centers to bring more of those French Canadians.

Our American overseers were always fair and just to us and it is fair and just to admit it. They were fine men and knew their business. They never bothered those who did their duty. We can certainly be thankful to them for their decent treatment of us. Stanislas Gagnon tells this story to prove it.



'My second hand,' says Gagnon, 'was an Irish-American who took away some work from an Irish operative. It was extra work for me without any extra pay. At first, being a little timid, I told the second boss I'd do the work, but the more I thought it over afterward, the more convinced I was the second hand was favoring his countryman at my own expense and I refused to be anybody's goat. I went to my overseer and told him all about it. He thought I was right and told me so. He then went to the Irish assistant boss and asked him if what I had said was true. The second hand admitted it was and went on to say that I lost a lot of time talking with women operatives and killed time otherwise. Speaking louder, he continued: 'He has plenty of time to do this extra work I gave him and he's going to do it or somebody's going to get out.' To which the boss answered: 'Yes, somebody's going to get out and it won't be Gagnon. I'm keeping him, so you'd better change your mind pretty soon about that extra work you gave him, because he isn't going to do it. Think it over if you care anything for you job.' The second hand changed his mind in a hurry and the Irish operative got his work back again.

The overseer trusted Gagnon, that is why he stood by him. The company itself had much confidence in us and gave us big and important tasks to do. Not the least of these was the job of setting up the machinery and putting in operation the spinning department in the new Coolidge Mill, in 1910. We started in May. In December, the executives were told the job had been completed. They couldn't believe that it had taken only seven months, and only a personal investigation could convince them. If all those who worked with me hadn't given their full cooperation, it couldn't have been done, so the greater part of the credit belongs to them. We had set up in record time what was said to be the largest single spinning department in the world, 105,000 spindles and [?] hand on one floor, and there were also the picker-room men in the basement. Many French Canadians worked for me and my first assistant was Theophile Marchand.

It lasted nearly ten months and was the worse thing that ever happened. It was bad for the city, its merchants, tenement owners, business in general. It destroyed Amoskeag's trade and the Company, never recovering from the blow, kept going down until it had to close its doors. My sympathy, however, goes first to all the workers for they are the ones who suffered the most. They lost all their savings, went deep in debt and lived on canned beans while the hope of winning the fight was kept dangling before their eyes. They were told almost every day by the strike leaders to be patient and tighten up their belts because victory was in sight. But there was no victory, only defeat for all concerned.

As an overseer, I couldn't join their ranks in the labor union nor help them in any way, but neither could I be against them. As a boy, a young man and a middle-aged man with a family, I had worked long hours for anything but high wages. I knew what it meant to be poor, what sacrifices must be made if you want to lay something aside for a rainy day. The workers wanted more pay; I would have given them a living wage if it had been in my power to do so, every worker having a right to that. They wanted shorter hours; I would have given them a reasonable work-week if I had anything to say about it. Even as a second hand and an overseer, I never forgot my humble beginning and always considered myself a textile worker. Those strikers were textile workers too, and I was sorry for them. Yes, that strike of 1922 was really a terrible thing.

Where did we meet the girls we married? Why right here in Manchester. No, we weren't in love



before we left Canada.

We were too young to think of such things when we came to the States. Vary few had known in childhood the girls they were going to marry; so many of us, you see, came from different parishes and villages.

The young lady who became my wife in 1878 was Miss Selima Laliberte. She lived in a private home, that of her friend Miss Laurence who kept house with her two brothers and worked in the mills besides. Now Damase and Georges Laurence, Moise Verrette, and Joseph Baril and myself were intimate friends. Joe Baril's mother wasn't in good health, I had only one small room, so we spent our evenings together with the Laurences or at the home of Moise Verrette, never dreaming then that he would later be the owner of a large grocery store and meat market and twice mayor of Manchester. While visiting Georges and Damase, I became acquainted with Miss Laliberte. She was a fine, attractive girl and interested me. Soon I was going to the Laurence home mostly to see Selima, then for herself alone. We had fallen in love, we became engaged and were married by Father Chevalier in St. Augustine's church.

Joe Pellerin, once more the exception to the rule, found his wife in Canada, she was a stranger to him. He went to Yamachiche in the late summer of 1891 while on vacation after an illness. He was coaxed to take a job in a general store at Maskinonge, only a few miles away. He got the job and stayed thirteen months. His pay was five dollars a month with room and board, but it was a lucky day for him, he says, when he went to Maskinonge, for it was there he met the girl he was to make his wife.

He came back here in the spring of 1892, leaving his heart in the little Canadian village, and went to work for Adam Graf. In the fall of 1892, having decided not to wait any longer, he took the train for Maskinonge, married the girl he loved and brought her to Manchester where they have lived happily ever since.

We had family reunions, mostly on Sunday, to amuse ourselves. They were real *veillées canadiennes* and we certainly enjoyed ourselves. We sang without piano accompaniment songs of old Quebec, danced square and round dances and jigs, played games like *l'assiette tournante* [Spin the Platter] for forfeits, and played cards for the fun of it, mostly euchre, a game we learned here.

Sometimes, one sang alone; at other times, we sang in chorus. There were also *chansons a repondre a sole* with certain lines repeated in chorus by *la compagnie*, the gathering. Everybody who was asked to sing cleared his throat--that was the usual ceremony--, saying he or she had a cold, and called on the others to help him: *Vous allez m' aider bein?* What did we sing? Well, Monsieur, we sang *Vive la Canadienne* and other popular songs of the Canadian folklore; sentimental songs, and one of them--I don't remember all the words because I didn't sing much myself--began like this:

*C'est aujourd'hui la jour de mes noces,  
C'est aujourd'hui la plus beau de mes jours.  
Ah! oui, cher amant que j'aime,*



*Je suis a toi aujourd'hui pour toujours.*

I couldn't translate that in verse, but here is what it means: This is the day of my weddings the happiest day of my life; beloved, I am yours and forever.

Some were very good at singing comic songs, like Zozo in which the words are so misplaced that sense becomes nonsense, the kind that makes you laugh. I believe I remember the first verse. Here it is, and it's crazy:

*Je suis Zozo, par mes actions comiques,  
J'ai fait parler de moi pendant-z-onze ans.  
Je suis le fils de mon seul pere unique  
It pour le sur aussi bien de Mouman  
Un jour, la nuit, cette pauvre Valere  
Tomba malade, mon pere me dit: Zozo,  
Va chercher du bouillon pour ta mere  
Qu'est bien malade la-bas dans un petit pot,  
Va chercher du bouillon pour ta mere,  
Qu'est bien malade la-bas dans un petit pot.*

This part of another verse is even worse:

*Mais v'la t'y pas que ma maladresse  
Je chavirai les assiettes at les plats;  
Je fis une tache sur ma veste de graisse  
Et les culottea de ma jambe de drap....*

In the first, Zozo, the son of his only fathers is told to fetch some broth for his mother who is sick over there in a little pitcher. In what there is of the second, Zozo knocks down the dishes and spills the broth over his fat vest and the trousers of his woolen cloth leg.

Another song, this one a *chanson a repondre*, a sort of catechism and mentioned one God, two Testaments, etc. up to the ten Commandments. As he went along the singer, as we do in Alevette, repeated backwards what he had sung and finished as he had begun, with the words: *Il n'y a qu'un seul Dieu, Il n'y a qu'un seul Dieu*, which the others repeated after him in chorus.

For our round and square dances as well for jigs, the music was furnished by a fiddler who always played the same tune as long as you wanted him to--he knew no other-- and by a fellow who played the accordion but they never played together because their tune was different. We didn't care about that and we danced and had great fun. In St. Ephrem, even these home dances weren't allowed because our people believed that the devil himself was present as a cavalier wherever people danced. Stories of tragic happenings were told and made you shiver. Here, we never went to public dance halls but weren't afraid of the devil being in our homes if we conducted ourselves as decent people should.



In 1874, Father Chevalier, wishing to encourage the study of music among his parishioners and to give more prestige to the French Canadians of Manchester, called a group of young men to his home and proposed that they should start a band. The idea was quickly accepted and in a short time and after much work, we had the Fanfare Canadienne de Manchester. Instruments and uniforms were bought. At Father Chevalier's invitation, Joseph Lafricain came from Marlboro, Mass., to help in the organization of the musical group and to be its leader.

The men practiced in a small hall and were seated. There came a time when they had to learn to play while marching. So, one day, they went in carriages to the vicinity of Alsace and Amory streets where there was a park in those days but no homes. There they marched and played to their hearts' content. The Fanfare Canadienne became an institution. It paraded many times in our city and gave concerts which were well attended. It was engaged by fraternal groups and travelled as far as Quebec. There were twenty-seven members in the Fanfare called the French Military Band by the English newspapers. It was reorganized in 1882 as the City Band which ceased to exist only a few years ago. Father Chevalier's band was composed of textile workers and I played the slide trombone. I have here a list of the charter members. I'll read it off to you:

J. R. Lafricain, leader, clarinet; Solyme Daigneault, bass; Charles Blanchard, cornet; Edouard Harrington, bass; John Harrington, alto; Jean-Baptiste Blanchette, cornet; Joseph Gagaon, bass; Charles-Borromeo Boulanger, slide trombone; Napoleon Monette, cornet; Hormidas Manseau, baritone; Jules Provencher, cornet; Fred [Sansouci?], alto; Edouard Geoffroy, cornet; Joseph Marcotte, bass; Victor [?], clarinet; Victor Sansouci, cornet; Edouard Brown, fife; Cyrille Lebrun, cornet; Damase Laurence; cornet; Philippe Archambault, alto; Joseph Letendre, cornet; Philippe Lemay, slide trombone; James Manseau, snare drum; Joseph Desjardins, bass drum and cymbals; J. Champagne, bass drum. Five of them died and the band escorted them to the church and cemetery.

"It has often been said, Mr. Lemay, that the French Canadian immigrants here and in all industrial centers had much to suffer from a certain nationality group for a number of years. Please tell us something of those troublous times " said Mr. Pare'.

Those days of petty persecution, beating, rock-throwing swill-slinging and tragedy are not nice to remember, M. Lemay answered sadly. Besides, Monsieur, a big book couldn't tell all the story. Our troubles came mostly, not to say entirely, from Irish people who, it seems, were afraid that we had come here to take their jobs away from them in the mills and who tried hard to send us back to Canada by making life impossible for us in America. They wanted us to speak the English among ourselves when we only knew French and it made them mad because we didn't. They had forgotten--or didn't know-- that French Canadians had taken into their homes many orphaned children of Irish immigrants to Canada and brought them up as their own. Yes, Irish-Americans should have been our best friends over here, not our worst enemies.

It was bad enough here in 1872 and later, but it was worse in Lowell about 1864. It was impossible to get drinking water from public pumps in the daytime. Irish boys threw dirt in our pails, so we had to go at night, in the darkness and by roundabout ways.

Sundays, we went to mass at the Irish church. There was no other. Irish lads sat behind us and, with needles or pins stuck in the ends of their boots, they'd dig into us. We jumped and yelled, and other people in the church were disturbed.



We had our ears boxed by the man in charge of children. When we couldn't stand it any longer, we stopped going to church. The priest visited our homes to inquire about our absence. We told him why we stayed at home, the guilty boys got a licking and then we could attend Sunday services in peace.

My father worked in a saw-mill located almost in the center of the city. For a time, the men were obliged to work at night and the owners had to build a shack where the workers could eat their lunch without fear of being injured or killed by rocks thrown at them. The job was lit up by flaming rosin placed in large iron pans, but all around the place, it was very dark, so it was easy to hide and throw rocks or bricks and you'd never know where they came from.

Irishmen were fond of clay pipes, 'T. D. ', they were called, but they must have thought nobody else had the right to use the same kind. When they met a French Canadian smoking a clay pipe, they'd break it off between his teeth. If he'd smoke a briar pipe, they'd push it down his throat. Not liking this sort of sport, our fathers and big brothers smoked nothing but short "T. D. 'S" that couldn't be shortened any more nor pushed in.

In Manchester, it was in those parts of the city where only Irish people lived, especially what was called l'Irlande, all around Park common which was called *la commune d'Irlande*, that we found plenty of trouble. Our family was then living in the 'Squog section of West Manchester, and the shortest way to St. Augustine's church, the only French church at that time, was over Granite St. bridge, across Elm St., up Lake Avenues through the Commune d'Irlande and up Spruce St. to the corner of Beech where the church was located. Well, sir, we couldn't pass there without having our Sunday clothes ruined by filthy swill thrown at us from yards and alleys. Rocks flew also, and many of us youngsters received painful beatings from young Irish-Americans who were nearly always armed with sticks. The only way for us to save our clothes and our skins was to go to church by making a long detour and approaching St. Augustine's from the east instead of from the west as we would have naturally done if there had been no enemies on the way.

No, we didn't fight back because we were afraid of having trouble with the law. Being strangers, we didn't know how it would turn out for us. The first Greeks who came to Manchester weren't so timid. Welcomed as we had been by the Irish, they thought they hadn't come from far-off Greece to be chased away without some resistance. They paid back with interest everything they received from the residents of the district. Often they were arrested but just as soon acquitted after they had proved that they had acted in self-defense. The Irish hated Chief of police Healy for that, though he was an Irishman himself, but he was a just man and a fine chief who made Manchester the orderly city it is. Anyway, the Greeks did so well that the commune d'Irlande is now called the commune des Grecs where people may pass without being insulted or beaten up.

Some years later, French Canadian grown-ups were treated more decently. There were too many of us then and we weren't so bashful about defending ourselves. Irish boys alone remained mischievous. Armed with sticks and stones, they often chased French Canadian boys through streets and back yards, even into homes where the attacking "army" didn't always dare to follow.



But the worst blow struck at us was the killing of Jean-Baptiste Blanchette, a member of the French Band of which he was then the leader and a fine fellow if there ever was one.

On the night of September 30, 1880, Blanchette and four friends, who also belonged to the band, were talking quietly about the Fanfare and its leadership, in French, of course, on Amherst St., near the corner of Vine. The friends were Georges Laurence, Edouard Harrington, Joseph Desjardins and Frank Manseau. Blanchette, called John Blanchard by the English-speaking people, had met them at the Excelsior House, Concord St., where he owned a lager beer parlor, his other place being at 34 Amherst St. All five walked to Amherst St. where they continued their conversation. It was a little after 11 o'clock.

Three Irish young men--no need of mentioning their names--came out of another beer parlor located nearby, on the same street. They, like many others, hated to hear French spoken and called on the five "frogs" to talk United States". They rushed the French Canadians as they passed them. The three attackers were drunk. Blanchette pushed them away. One of the three came back at Jean-Baptiste who met him once more, and the assailant, either struck or pushed, fell on the sidewalk. A large, round beer bottle, containing a small quantity of hard liquor, was broken in the fall. The man was now furious. He got back to his feet, seized the upper part of the broken bottle and holding it by the neck, he threw it and it struck Blanchette on the left side of the throat. Blanchette had run into the street and there he fell. The jagged edge of the broken bottle had made a wound one inch deep and two inches long and cut the jugular vein. Blanchette was soon bathing in his blood which was coming out so fast nobody could stop the flow.

Quickly, Harrington and Laurence picked up their friend and carried him to his room over the saloon. They laid him down on the floor where another pool of blood was soon formed. There was now a wide, sticky red trail leading from the street, onto the sidewalk and the stairs and into the room. A piece of glass, the pointed end sticking out, was still in the wound. It was removed and one of Blanchette's companions held his hand over the gaping hole, trying to stop the constant flow of blood. Officer John Cassidy, later deputy chief, was patrolling his beat when a woman shouted to him from an open window that a man was dying upstairs. Officer Cassidy went to the bloody man's room then called his captain and he soon arrived on the scene with four doctors who did all they could but couldn't save the terribly wounded man. He died twenty minutes after being hit, having lost all his blood.

The news spread like wild fire around the usually quiet city. The next morning, at 7 o'clock, hundreds of French Canadians stood near the corner of Vine and Amherst Streets.

The bloody spot was still there and staring at it, they said: 'This is where three Irishmen killed Jean Blanchette last night.' The crowd was excited and you could hear a low grumbling, but there was no other demonstration. They held themselves as they had done whenever they had been made to suffer. Only this was worse and could hardly be believed. A man had been killed by a "frog" hater. Those hundreds of men could have cried as if Blanchette had been the near relative of all of them while they kept looking at that awful red spot which nobody had thought of cleaning up.



The Irish lads were arrested and locked up in cells at the police station. Two were charged with being drunk and fined, being held afterward as witnesses. The bottle-thrower who admitted throwing the top half of the beer bottle but insisted he didn't know where it landed, was accused of murder. At the January term of Superior Court, he was sentenced to five years in prison. He served his sentence and died a few months after coming out. He was only 18 years old at the time of the tragedy; his father and mother were dead and he lived here with an uncle. He had worked in the mills but had been idle for some time.

Jean-Baptiste Blanchette was 23 years of age and had come to Manchester thirteen years before. He had worked for the Amoskeag in a weave room, then in the Langdon mill. Later, though still a young man, he had saved up enough money to run two small lager beer parlors where French Canadians liked to gather and talk of the things that interested them. They had no social clubs at the time.

Blanchette wasn't married. He roomed with the family of Alexandre Boucher and boarded at 22 Concord St. His body was laid out at the home of his good friend, M. Harrington, 51 Pearl St. The funeral took place at St. Augustine's church on Sunday morning, October 2nd, at 9 o'clock. As early as 7 o'clock, there was a large crowd of French Canadians in front of the Harrington home. At half past eight the long funeral procession started its march to the church.

In front was the Fanfare Canadienne led by Joseph Lafricain its first conductor, who had come back to honor his friend John, one of the founders of the band. Then came the Societe St. Jean-Baptiste, 104 members wearing their insignia and carrying their banners, the president, Charles Robitaille, leading the imposing group. Blanchette had been voted in as a member but had not yet signed the society's constitution and by-laws, so he wasn't an active member, but the Societe turned out just the same. From 200 to 300 young men, all intimate friends of Blanchette, marched in ranks behind the hearse. There was also the French Republican Club of which John was a member. Then followed carriages in which were Blanchette's relatives. His father lived somewhere in New Hampshire but no one knew his address. Following the carriages, in the procession, were about 1,000 persons of all ages. Crowds lined the streets on the way to the church and all seemed to sympathize with the relatives who escorted the body. In a few minutes, the church was filled. Father Chevalier officiated at the high mass for the dead and gave absolution. On the casket, we could see the uniform our friend wore and the cornet he played in the band, with a crown of natural flowers made by Miss Emelie Harrington.

After the church service, the procession was formed just as it had been before and marched to St. Augustine's cemetery, in the southern end of the city, where the body was buried.

The French weekly, *Echo des Canadiens*, wrote nice things about Jean Blanchette, and that was quite natural. But the *Daily Union* calling him John Blanchard, praised him even more. In the story of the murder, it described John as a 'genial and pleasant fellow' and, in its edition of Mondays Oct. 3rd,--here is the clipping--after relating the details of the funeral, it says: 'The large number of friends of the deceased who turned out to show their respect shows plainly the esteem in which he was generally regarded. Blanchard was popular, well liked by all who knew him. It is the general opinion that he had no enemies and that he was upright in all his dealings.'



The Union called the killing a 'terrible and bloody tragedy.'

Only a few hours before Blanchette met his death, I had visited him at his room. I was terribly shocked when I heard what had happened. He was a very dear friend of mine, always cheerful, quiet, minding his own business, kind to everybody. I asked myself how anyone could have struck him down in this awful manner just because he was talking to fellow-countrymen in the language that was most natural to him, his mother tongue. I can't understand now, after almost sixty years.

That tragic episode of 1880 brought much grief to the French Canadian colony and, compared to it, the mean things that had been done to us seemed very small indeed. Feeling ran high among us, but not one of us thought of avenging our murdered friend. As always, we suffered in silence with the hope that some day, our right to live peacefully in America would be recognized. We had so much confidence in God and in this adopted country of ours. Well, the day did come. Now, the surviving French Canadian textile workers of long ago, their children, grandchildren and great-grandchildren have won the respect and esteem of their fellow-citizens. Yes, we surely have found our place in the sun of American liberty. Franco-Americans are prominent in all lines of business and many are quite successful in politics. Since 1918, Manchester has had four mayors and they were all Franco-Americans. We have distinguished doctors, lawyers, educators, judges, artists, architects, bankers and clergymen, one of these having been the third bishop of Manchester for 25 years.

To what do we owe our success? I believe we owe it to the self-sacrificing French Canadian immigrants from old Quebec, to the courage that made them refuse to accept defeat and quit when that would have seemed the natural thing to do; to the cheerfulness that carried us through our trials and tribulation and helps us old-timers to wait happily for the final bell calling us home to rest after our long, hard life in the textile mills. And perhaps the bloody death of Jean-Baptiste Blanchette, a martyr in the true sense of the word, had its share in bringing about the conditions we are enjoying today.



## Living Lore in New England

Title: Franco-American Grandmother

Writer: Victoria Langlois

Assignment: Manchester, New Hampshire

Topic: Portrait of a Franco-American Grandmother, 1938-39

Source: Library of Congress, Manuscript Division, WPA Federal Writers' Project Collection

I do not know Mrs. L. very well, but I have often come in contact with one of her granddaughters, who is married to my schoolmate's nephew. When this young woman talked about her grandmother, she seemed extremely proud of her. I could feel that there was a person who had deeply imprinted her ways of understanding life in the minds of those with whom she had lived.

I was curious about her. As I knew that she had come here when she was very young and that she is now seventy years old I thought that she would have something interesting to say about her first years in this country.

I went to see her. When I arrived at her house, she was all alone; she took me into her bedroom, where, she said, she liked to sit in the afternoon watching the sun go down.

On the small table in front of the window there are several things: a large piece of pink knitting, an old prayerbook, a rosary of blue beads on a gold chain, and a big black book.

Mrs. L. is tall and thin, and she holds herself quite straight; her face is pale and three or four deep pockmarks are visible on the dry skin of her cheeks. Behind her glasses, her dark eyes are bright and alert, as if they had kept some part of the great vitality she must have possessed in her youth.

Her lips are thin and perhaps a little distended by the artificial teeth, which seem to get on her nerves at times; but, all in all, a face that you like to watch as she listens to you, and then talks slowly, quietly, giving you the impression that she looks in a mirror which reproduces images invisible to you....

"I have lived here a little more than fifty years," she says, answering my question. "Fifty years, it is a long time, and yet, I remember what happened then as if it was yesterday."

"I would like you to tell me about it. Mrs. L-".

"Well, a few days before we began the trip to the States, I went to the village with my father. He had to see about the tickets, the transportation of the few things we were going to take with us, the purchase of new clothes for us children, the payment of bills etc..

"We went to the general store, where we could find everything we needed. I'll never forget this hour.



When my father told Mr. B- the merchant, that he had decided to leave his farm and go to the United States to make money, by working in the cotton mills with his two oldest daughters, and also the other children, as soon as they would be old enough Mr. B- seemed greatly distressed.

"Oh! no, no, don't do that, Joe. he said.

"But, Mr. B- I am a poor man. I have not enough land to make a success of agriculture; I can't buy enough cows; in fact, I cannot " venir a bout de mes affaires " (make both ends meet) if I stay here. My brother, who has gone to the States writes us that he is making money, he has four children working in the mills' }...

'Yes, yes, working in the mills, sapriste!' interrupted Mr. B-, "But, my good Joseph, think of what you will give, not only of what you will receive! You are going to make your children into slaves, spending their days behind thick, dirty walls, bound to some looms in the terrific and incessant noise. From six o' clock in the morning until six o' clock at night, they will be driven by some blind power, and then, they will fall into their beds, in some crowded rooms, in order to gather enough strength to begin over again, the next day'....

" I know! I have seen these mills, when I went for a business trip to Boston last year. I thought they were something inhuman, almost infernal...You and yours do not belong there, Joe. We are a rural race; our land is extra ordinarily fertile and should be made to produce enough for all; if the Americans want to enlarge their manufacturing industry, very well, but our people should not be ensnared by them. Nothing hurts me more, nothing makes me sadder or more utterly discouraged for our future, than to see a Canadian-a man whose ancestors have opened this soil, have tilled it, have lived on it and now sleep under it- admit that he is willing to see his children spend their lives for the profit of these capitalists who draw hard gold from sweat and blood.

"You tell me that you are poor, Joe. No, you are not poor. A man is not poor who has all the substantial food he can eat, and all the wood he can burn. That is not poverty. When you open the door of your little house every morning you put your foot onto your own land. Ever think of that, Joe? Oh! you work hard, I know; your wife works hard too; but do you imagine that you won't work just as hard down there? Here you have space, air, and all the essentials of life, a little more perhaps. Your children are not dressed like city folks, but they are kept warm in winter; they can laugh at our famous North wind when they are wrapped up to their necks in " bonne etoffe du pays " (cloth woven at home with pure wool sheared from the owner's sheep), and above all, they grow up with the sense of a simple but very real dignity. They come from honest, decent stock and every body knows it around here. The little luxuries that they might get out of their earnings will take away from them this so important felling. They will be driven like cattle; they will be "foreigners", they will be "immigrants." As a rule, an immigrant is a poor devil who leaves his country because he is sure to suffer from hunger and cold if he stays...

All the time he was speaking, Mr. B- was standing in front of my father, who was listening at the low but firm voice, absolutely unable to give an answer to this vehement surge of words.

" You Canadian farmers, are not proud enough of your profession. This goodly pride should be



taught in school mused Mr. B- after a moment of silence.

He signed deeply, then made a step forward and offered his hand to my father.

“Well, goodbye and good luck to you, Joe... and to you, Miss Marie-Anne,” said he, with a smile in his fine, dark brown eyes. “Come back soon and marry an habitant “.

“Really, this scene has stayed in my mind as one of the most vital of all my life. Who knows? Perhaps it is from that moment that the idea germinated in me that it is of the greatest importance for a human being to adapt himself so as to be an integral part of the country where he lives his days }... Well continued Mrs. L-after a moment of silence during which she had looked at the sunset, “we came here and we worked in the mills. I began at eighteen, my sister at sixteen, then my two brothers, when they were fifteen and thirteen, and last; my younger sister at fifteen. It was then the usual rule and nobody said anything against it. I realize now that it was not right, for while my sister and I were tall, had good strong bones, the three younger ones developed into puny-looking sickly adults. They are all dead now. I, the oldest, will be the last one to go.

“Every summer when the mills were so hot that it was almost impossible breathe inside them (many girls fainted every day), our parents sent my sisters and me for a visit with our uncles and aunts in Canada. I was interested in everything on the farm: chickens, ducks, calves, cute little pigs were a source of deep enjoyment for me. Oh! the thick, yellow cream, the small, sweet strawberries of the fields, the raspberries, blueberries we had there!

“I used to tease and bother my aunts to teach me how to *travailler au metier* (carpet weaving on a handloom). I brought down a spinning wheel from the attic and learned how to spin. I knitted stockings and I wove flannel and linen; of course; lace-making with a crochet or needles, didn’t keep any secret for me. I am talking about 45 years ago. At that time there were no moving pictures; no theatres, except once in a while, in fact, amusements were great events. Every year, there was a bazaar in the parish; that was our social event in the whole twelve months! That was all the out-of-the-house diversion we had! Even the courting was done in the home under the jealous eye of the girl’s mother.

“When I was twenty-two, I was married. I had not much liked to work in the mill, but I had not let myself dislike it either. Girls were meek and submissive then; they did not have much to say about the arrangement of their lives. I was glad to start doing the real and only-so I have always believed - job for a woman; to be wife and mother.”

“Had you learned to speak English during these years, Mrs. L-? “ I inquired.

“I had learned very little English. But I had always liked books, and had been quite *appliquee* in my school-work at the convent, in Canada. My young cousin was going to school here and, curiosity guiding me, I think, I learned to read in English from her. But I never could find time or I was too tired to read anything; in one word, I lived the life of a *legume* (vegetable) for almost five years.



"The first year of my married life was like a beautiful and serene recess after a hard day's work. I learned to cook and to sew a fine seam. I knitted and crocheted to my hearts content. As I was not as well as I should have been, my good husband made what he called a "big sacrifice" and sent me to Canada for a rest...but I did not rest very much, for during that month, I wove some fifty yards of *catalogne* which was cut to fit the length of the room, then sewed together (just like the old-fashioned carpeting); it covered entirely and very nicely the floor of what we were pleased to call "*le salon.*" } I was proud of myself!"

"When I came back from Manchester I suppose that I had been lonesome there or that I had hated to admit my ignorance when one of my relatives would ask curiously: 'How do you say this and that in English?' I decided to learn to speak English. I began to read the local English newspaper, then some reviews and magazines. One Saturday evening, I remember it was a soft-spring night, I ventured to go to the Public Library. You may believe it was quite difficult at first; I had to resort often to the French-English dictionary. After a while, it became clearer, easier; and what a great feeling it was to understand what people were saying, in the streets, in the stores, everywhere!"

"Then my first child was born. I awoke to many new and unknown feelings, and I felt myself literally 'taking root' here, if I may say so.

"Some time before, I had read in the dictionary this definition: '*Langue maternelle, langue du pays ou l'on est ne* ' (Maternal language, tongue of the country where one is born..) I resolved that my children would know primarily the language of this country-their own. These children born and brought up in an English-speaking country must speak English correctly and without any accent; they must be permitted and not reprimanded for speaking English at home, not only with their playmates; they must be given good English books to read, so that their vocabulary will be constantly enlarged, so that they can penetrate the soul and know the works of the greatest Americans, who have made this country the greatest of all the world.

"From now on, I looked forward; I was always proud of my French ancestry, but I 'acclimated myself..artificially'. I did not wish them to live in the past; you cannot go very far nor advance very fast if you look behind you.

"Your parents never regretted leaving Canada, Mrs. L-?"

"I don't know...there are things that you never know; my father never said that he was sorry. He had a few thousand dollars when he died. He probably would have had as much-not in money, but in property if he had worked as constantly and as hard on his farm in Canada. And the feeling of loneliness, of being a stranger, of being nothing but an obscure cog in a gigantic machine, must have put a bitter taste in his mouth.

"You know how Canadians love politics; some say they play politics "*du jour de l' an a la St Sylvestre* ' (from the first of January to the 31st of December) well, he was never naturalized. My husband was one of the first to obtain the right to vote.

"I think my mother was awfully lonely here. She never complained but...she lived her life



watching for the postman.

“...I think sometimes that I would have had quite a different life, not better, not happier, but quite different, if I had married a Canadian habitant [farmer]. But there must be a meaning to it; there is a meaning to every thing that happens in life; only we don't always understand it...”

Mrs. L- did not say any more; she looked tired and though she had been speaking in a low, calm voice, she was a little out of breath.

She touched the things on the table, put the black book, farther away, drew the rosary nearer.

She smiled at me and said:

“Now, I know I have been talking too much. You'll have to excuse me; You see old folks have a way of thinking aloud; you come to see me and I give you a page of my history. ”

“That was very interesting Mrs. L. and I cannot thank you enough”....

She laughed.

“I should be the one to say “Thank you, I think.

We who are almost out of the picture are some times pleased to realize that we are still in the background....”

“Please come again; I'll be glad to answer you questions if you think that what I have seen may be of any use to you...”



### Living Lore in New England

Title: M. Henri Lemay - French

Writer: Victoria Langlois

Assignment: The Manchester Picture

Topic: Reminiscences of M. Henri Lemay, January 10, 1939

Source: Library of Congress, Manuscript Division, WPA Federal Writers' Project Collection

M. Henri Lemay in seventy-three years old. He is in good health and was active in business until two years ago when he was ill during the entire winter. Now he was retired and has sold his interests in his jewelry store to his brother. He seemed glad to answer my questions and to tell me about "old times."

Last year he spent the winter in Florida. He says it is very beautiful but makes people feel lazy, as if they were on a perpetual vacation. Canada is too cold, he says, and Florida too warm, and he likes New Hampshire the best of all.

"When I was young," M. Lemay begins, "I wanted to be a *pilote branche*."

From my own girlhood spent in Canada I know this to be a pilot who is stationed at the head of the St. Lawrence Gulf and, as a transatlantic steamer comes in, takes the helm and guides the ship up the St. Lawrence River to Quebec and Montreal. Each man, so engaged, must follow a complete and special course in seamanship before reaching the rank of *pilote branche*. The pilots are licensed by the government and are authorized to do their work by the several [maritime?] companies of Canada.

"In the fall of 1881, I started from Deschambean on the St. Lawrence River to carry a load of hay and grain to Lake Champlain," M. Lemay continues.

"We went as far as Whitehall and then my brother, Tobie, and I decided to take the railroad train for Manchester where we know we could find work in the mills. I had no intention of staying here. Yet I remained for twenty years before I even went back to my old home for a visit."

"I was sixteen and Tobie eighteen years old when we arrived in New Hampshire. How lonesome we were at first! But soon we began to get acquainted with French-speaking people and, little by little, we became accustomed to our new surroundings."

"The Manchester population was made up of Yankees, Irish and French at the time and there were no Greeks, Jews or Poles in the city."

"Oh, yes, we went to work in the mills. They were the big source of industrial life. At first I earned seventy-five cents a day and my brother fifty cents and, though you may not believe it, we lived frugally but decently at these wages. You see we could buy good steak for twenty-five cents; chicken cost twelve cents a pound; a soup bone with much meat on it was only four cents a pound; and eggs were three dozens for a quarter of a dollar! No meat came from the west and there were four or five slaughter-houses in the outskirts of the city."



"Two or three times a week, cattle going to the Brighton stockyards were driven down Elm Street and men were hired to stand at the corners of the side streets to keep the animals in line. All the public parks and private properties on the route were surrounded with iron or wooden fences to protect them from straying cattle."

"Except for an oil lantern or a small gas light here and there, the streets were not lighted at night. I remember very well that I bought a pretty little kerosene oil lantern to carry on my arm. How bright and shiny it was! And it was very handy to go home after an evening when I *aller voir les filles* (spend an evening with the girls)," M. Lemay, with a twinkle in his very blue eyes, added.

"More than once I made a hit with this little lantern when I brought the girls home after a *soiree dansante*, where we danced the cotillion and square dances."

"Oh, yes, the parents objected more or less about letting young people go dancing. M. le Cure was very such against it; but---we arranged to go just the same! The girls told their mothers about it only the day after, you see! But no harm was done. We were not as 'excited' as the young of nowadays, but don't forget that we were hard at work from six o'clock in the morning until six o'clock at night!"

"We French people kept together and made our own good times. Every Sunday evening some five or six people assembled under one roof, living up to the old saying, *Les amis de nos amis sont nos amis*. (The friends of your friends are your friends.) They were pleasant, those meetings."

"You ask how we French were accepted in Manchester. Oh, yes, we must admit that the Yankees and Irish did not like us. No, they did not like us at all! They appeared to bitterly resent our coming here." M. Lemay laughed a bit here. "Not more than twenty years ago a good friend of mine, a genuine old Yankee with whom I have had frequent business dealings and political contacts then and whom I always see with pleasure now, said to me: 'I like you, Henry! You're a good fellow! Not exactly like the other Frenchmen I have known here! Are you sure you're pure French?' I assured him that every drop of my blood was of French extraction."

"After a few years in the mills, I began to grow dissatisfied and felt that I should learn some kind of trade. By this time my parents, two sisters and a younger brother had followed Tobie and me here. We lived in a block where there were six other French families and in our few spare hours we had a gay time together. We all worked hard but lived comfortably."

"The girls earned from fifty to seventy-five cents a day. Each had her 'best dress' made of fine wool and trimmed with bits of velvet, silk or lace for Sunday and she always managed a new hat for every other season. Girls wore very high boots then and I remember that once when I had a job in a shoe store. I sold a pair of shoes with twenty buttons to a young lady one Saturday night!"

"All the time I was looking about for a trade to follow and finally I hit upon the idea of becoming a clock-maker. That was a good move on my part for I came to like the work, and, having a flair for it, began to make a good living."



"I now became interested in politics and occupied minor posts which made me aware of the importance of civic institutions. I became a citizen in 1887 and have been active in the associations which take care of the naturalization of newcomers. Now they come no more from Canada for the government has awakened to its mistake of allowing so many French-Canadians to become citizens of the United States."

"I bought this house about thirty years ago, when Webster School was laid, a man named Martin bought several houses which had been built around there right after the Civil War and which were inhabited by veterans. He made cellars and dug wells on this street and the houses were then transported and set upon then without mishap. You can realize how old these houses are if you look at the next one on the right side.--- It is just an it was then."

"I entirely renovated the inside of my house and installed plumbing and central heating. The well in the cellar has been filled up; my wife was always afraid that I'd fall into it. The outside has been refaced in crushed stone; but is still the same old house."



## Living Lore in New England

Title: Adam Laboda, Polish Textile Worker

Writer: Clair W. Perry

Assignment: Berkshire, Massachusetts

Topic: Adam Laboda, Polish Textile Worker Paper Two, 1938-39

Source: Library of Congress, Manuscript Division, WPA Federal Writers' Project Collection

Our second visit to Adam Laboda, began at the office of the Berkshire Woolen Company in Pittsfield, where he works as an expert spinner.

We invited him to ride with us to his home in a four-tenement block on [Onota?] Street.

"Oh, I have my own car. You follow along and I'll be there," he said with a grin.

He wore rough working clothes, a fur-lined overcoat over them, his neck was grimed and plastered with black dust from the material which he had been handling. With his son, who is also employed at the mill, he got into a modern sedan parked in the mill-yard and drove rapidly home -- a distance of less than a half mile.

He met me at the back door of the tenement which he occupies, as the front doors have tight storm-doors over them and are seldom opened in winter. Removing overshoes he invited me in, through the kitchen, where his wife was serving a meal to members of the family. Four of their five children are working, the youngest, a girl of 13, attends the nearby grammar school. Two older daughters are employed as textile workers, also and another son works on the second shift of the same mill where his father is employed.

Escorted into the front room, the radio was turned on by the older son to entertain me while his father washed up. On a stand was a Polish paper (newspaper), Nova Anglica published in Chicopee, and on the front page large pictures of Thaddeus Kosciusko and Abraham Lincoln, side by side. Over a small desk against the wall hung a rich tapestry in soft browns and black, a woodland scene, with deer drinking at a pool, out over one corner of it hung a gaudy calendar advertising a Polish market. A Springfield Sunday paper lay on a stool, a phone on another and a thermostat near the kitchen door testified to modern heating apparatus.

Mr. Laboda appeared, still in working clothes but with his curly hair newly combed and face beaming. He lighted a cigarette in a holder and sat near the front window in his favorite rocking chair. In the kitchen voices could be heard, speaking Polish; the dark, good-looking wife and mother and an elderly Polish woman visitor with a kerchief over her head. The stairs to the second floor lead off the front room, for the tiny front hall is used as a coat closet. The two older daughters, home from work, soon came in to hang up their wraps. They are sturdy, buxom girls in their late 'teens or early twenties. Now and then the older son, who had visited Poland with his father, came to listen to his father's descriptions of the visit and reminded him of incidents.

"What we do for amusement when I am a boy in Poland? We played only about the yard or the barn, for we work very hard and long hours on the farm, all of us. There are so many in the family, eleven of us, and the farm is about 25 acres, your size [American]. When we play it



is mostly to play soldiers; all the boys and girls play soldiers, always, then and talk a great deal about war and battles, for then at that time where I live we are under Austrian rule, for Poland was partitioned to Austria, Russia and Germany. It was partitioned three times, in 1772, in 1777 and in 1779 and did not be free until 1918. We are taught much of the history of Poland, of its wars and its fighters and of the peasant revolts, which my father told of when the peasants armed themselves with -- what you call, sy'es (scythes) on long handles and go to fight the high ups. That is all the weapons they have and they are beaten.

"That picture of Kosciusko is with Lincoln's because their birthday is the same day, yesterday (Feb. 12) and they are both patriots much admired by Polacks. Kosciusko came to fight for America you know and when he went home he led a peasant's revolt but was beaten. There was another one in 1846 when the peasants killed about 2000 of the nobility and won the fight but it did not do so much good. We do not care much about our government because it is Austrian, that is really German when I am a boy and although the men vote they do not think it means much to them and they just vote because it is a custom. Yes, we are very proud of our country's history and we are taught it in school. You see, besides going to the grammar school I also took special work three days a week and learned German. I prepare for high school like your junior high school here and when I am twelve I go to Germany. "No, we do not have much time to play, because of school and work. We get up at 5 o'clock in morning and work 'til dark. We have only kerosene lamps, then and we work hard in daylight, all the time. In winter we children must thresh out the wheat and rye and corn in the barn.

We use a long stick with a short one tied to it with leather string; what you call it? Flail. Yes, that is it, and we hit the wheat and rye and corn on the barn floor with it and thresh it out, beginning in winter and all through it. We are not too poor but we have so big a family that we have to work hard for we raise all that we eat on the farm. Oh, we have plenty to eat of everything, of cabbage, garlic, beets, turnips, potatoes, everything, and every winter just before Christmas we kill a big hog and have meat for the rest of the winter.

"But when I am twelve my father say to me, 'Adam, you must find a job, because we are so many.' It is the custom when a Polack boy is to be married that the father gives him a share of the farm, maybe two or three acres, you see. But if he gave it to all of us he would have nothing and no one would have enough land, although it is rich land and some families live on only two or three of four acres there. Lots of poor people, oh, yes, many very poor people in Poland.

"We have many, many Jews in Poland. They do not work on the farm but they must always be selling things. They will get a big basket and buy a chicken, a duck, some corn and bread and go around from one house to another and sell it to be eaten. It is cooked already to eat and they sell it in small pieces to people. Then they go on to be merchants, always to sell and buy and sell. They do not work much and we do not care much for them but we are friendly. Never will they touch a pig, only other meat and they must be killed by a kosher butcher, too.

"Them Germans are many, too and we are friendly with them. The poor people are very nice, the Germans, and so I found them in Germany, where I went. Yes, I went all alone and I got a job with a farmer and I worked for a farmer and then as a spinner in a mill in [Nulki?], a city there. It took me two days and nights to get there by train. I was treated very well by the German people there, poor people. The high man is hard and military and looks down on all and cannot



be spoken to except by title and all that and are not nice to get along with. They are harsh and hard.

"We did not like that kind of Germans at all. All the poor ones are good people. The way it happens that the Jews were chased out of Germany is this; Hitler came along and said to a man, 'Your father was born in Poland; you belong there. Get out!' and they tried to go but they are not really citizens of Poland. They were born in Germany and we have too many Jews there now and cannot admit more, not too many, so they could not come to Poland and had to camp at the border and wait and many died and all suffered badly. It is too bad. But I say that the poor German people think Hitler is all right because they have work and food.

"I worked for two years in Germany, six months as a spinner and then go home and then we come to America, as I told you.

"The church? Oh yes, it is an important part of our life. We are Roman Catholics, all about where I lived. We have many, many feast days for the church, besides such as Christmas. Our Santa Claus is St. Nicholas but we do not make so much of it there as here.

"It is strange. There we are near the Vistula River, the biggest river, and over across it is Russia and yet we are under Austrian rule.

I used to swim across the river but Russian soldiers were there and we could not stay and had to swim right back.

"I will tell you that in the old days when my father was young the nobility were cruel. They made the poor people work on large farms of 1000 acres or more and if they did not work fast enough they would whip them with long whips until they bled. They were the same as slaves or serfs then. That is why the peasants revolted and fought with sc'yes. In 1846 they killed many of the high men and divided the land among themselves.

"Our schools were public schools; the principals are mostly men but women are also teachers. The government did not use to make you go to school as it does now.

"About my work in America. At first I work in the mill at Gilbertville, Mass. There were about 24 of us in one house. That house is still standing but has been moved. It was a company house. In one room about twice the size of this one (20x15) there were three beds and six boys slept there. We bought our own groceries and gave them to the woman who kept the house and she cooked for us. She would furnish the salt and pepper and so forth but we bought the rest and paid each \$3 a month for room and the cooking; because, you see, we could only earn about \$2.64 a week. I was a spinner, there, but when I wanted to get married I did not want to board but to have a tenement of my own and the company houses could not be bought there.

"So I came to Pittsfield where they told me I could get a job with the Berkshire Woolen, but when I got here they told me to go to Pontoosuc (Pontoosuc Woolen Mfg. Co.) as I would get a better job. Well, I could not talk English yet and I worked there one day and then the boss told me I would have to go. I did not know why. He paid me, I think, \$1.50 and I went to the Berkshire Woolen. The boss at Pontoosuc was Irish, his name was Pat Fleming. He is dead now. I



was a Polack. You see, I did not know why I was fired at first.

Two weeks later I find out. Well, I went to the Berkshire Woolen and saw the boss and asked for a job spinning. At that time, in 1910, Mr. Gillette of Westfield had died and Mr. Savery and Mr. Noonan came to take it over; they sold most of the company houses, soon. Mr. Noonan was then superintendent. He is the owner now. Well, the boss said, 'You were working at Pontoosuc?' and I told him yes and he said 'Why did you not stay; why did you get fired?' and I did not know and he said, 'We have no work now for you but maybe in two weeks on the night shift' but I needed a job then so I went to the office and went to see Mr. Noonan. I had a Polish friend who talked English for me and told Mr. Noonan I wanted a job and he asked me the same question about Pontoosuc but I did not know, but he called the boss in and told him to put me to work at once at night. So I had a job and I stayed on that job.

"As I say, after I am marry I want a tenement of my own so I buy this one from the Jew who had bought the company houses.

"That was after my visit to Poland, where I was married. I found things much changed. Yes, too much changed, but one thing I noticed, that all the boys would tip there hats and bow and I thought it was because I am an American and they know me and then I found that they are teaching them to be polite, now. They did not use to know how to be polite in the old country but they do now. They are polite to everyone and it is good. Now they must all go to school.

"Poland is a democracy, like us. They have a President but it is the, what you call it, Minister who really rules. He is about the same as a dictator and that is because Poland is afraid of war. They are afraid of enemies on all sides. I get letters from my people and at Christmas time they were much afraid of war because of Hitler. They have now military training for those of 18 to 21 but it is not a draft; it is like our own militia, here. The Polacks are great for marching and for drilling and for music such as drum corps and bands, anyway.

"Well, I found out why I am fired at Pontoosuc; it is just because I am Polack and the other, they are mostly Irish and French, do not like me. It is hard to get acquainted, you see, and then, people were cold to me because there are some Polacks who do not know how to behave. When I come here there are only eight families here and they are new and some of them are what you call bums. Bum weavers and bum spinners -- and just bums that drink too much. They are so poor that they never had money in Poland. They raised things on the farm and when they get a couple dollars here they go out to spend it and get drunk. And the Polacks are always strong and like to show how strong they are and they start throwing things and fighting, and in a boarding house a fight would start and they would break the windows and furniture and the police would have to come.

One day Judge White said in the Court that he was tired of seeing so many Polacks always in court on Monday morning and they ought to be sent back to Poland. The Polacks were to blame all right but they couldn't really help it.

"Well, that made me think and I and some others got together and we organized some societies, the Polish National Alliance and the Falcons and a Young Men's Association, but that one did not last, but the Alliance and the Falcons did. It gave the young fellows something to



do in spare time. In Poland they did not have much of any spare time but here they got paid on Saturday and wanted to do something. So we gave them something to do. We have a headquarters in the German Hall that is next to Curtin's? Hall on Peck's Road at Wahconah Street and then we built the Falcon's Hall that is called Bel-Air Hall, now, and there they have their meetings and their drum corps and things and you do not see many Polacks in court nowadays. So many are here now that there is good, don't you think? So many came to work in the textile mills and then in the G. E. (General Electric). You see, there were many mills, in 1910, five of them, but now only two or three, one small one and the G. E. is down so the Polacks have had to do other things besides, in business.

"Why, at one time at the mill, when there was a night shift on, some of the bums brought in a case of beer, into the mill and drank it.

Mr. Noonan came in at about ten-thirty and only two machines were running, one of them was mine and the rest of the spinners and weavers were sleeping. He said, 'We will shut down this night shift, this is too much' and he did.

"Well, it looked like I was out of a job but I went to see Mr. Noonan and asked for a day job, and he said 'sure,' and gave me a day job.

I have worked mostly on day work since. I worked all the time except one time when things were down, then I worked for six months at the G. E., but I did not get through at the Berkshire Woolen, even then. It was just when things was slack.

"Yes, four of my children are working, only one little one goes to school and we get along. We do not want the wife to work. We do not think it is right when a woman is a mother to go out to work from the home. It is not right for her to work out, then. In Poland the women work the same as the men. Why they will not let the men milk cows on the farm, for instance! They say that a man's hand is too hard and dirty to milk the cows and the women do it there altogether.

"We have the same kind of liquor in Poland as here but the men do not drink as much except in the cities; the farmers and their families do not have it. They cannot get money to spend on it but you see, when they get to America and make money, even only a little, they do not know what to do except to have what they call a good time and get drunk.

"I was in the court when the judge said there was too many Polacks being arrested. I was never arrested myself but I thought about that and that is why we started the societies. I am still in the Polish Alliance but not in the Falcons, that is for younger people. But these societies have helped a great deal. Polacks are better respected now."



Name \_\_\_\_\_ Date \_\_\_\_\_

## Immigrant Histories

1. Who did you read about?
2. Where did they live before emigrating to the United States of America?
3. Why did they move to this country? What drew them to America?
4. What did they miss after leaving their home country?
5. Where did they settle in the United States and why?
6. What did they do for work?
7. What did they do for fun?
8. After reading the person's story, do you think that he or she is happy with the decision to emigrate to a new country? Why or why not?
9. Did anything you read in the history surprise you? Explain.



Name \_\_\_\_\_ Date \_\_\_\_\_

## A Letter Home

Put yourself in the place of one of the people you've read about in the immigrant histories.

*What would it feel like to leave your home and move to another country in search of a better life?*

*What would you miss from your home country?*

*How would you communicate with your neighbors and co-workers who speak other languages?*

*What would you do for work?*

*What would you do for fun? How has your life changed in this new country?*

Pretend you are an immigrant living in New Hampshire in the late 1800s. Write a letter home to the members of your family explaining what is happening in your life as a newcomer to the state.



## People and Industry Along the River Sources



### Getting to Know Your Town:

[www.visitnh.gov/what-to-do/mills-and-mainstreams.aspx](http://www.visitnh.gov/what-to-do/mills-and-mainstreams.aspx)

### Mills: Machines of Industry:

A Yarn to Follow: The Dover Cotton Factory 1812-1821- Cathleen Beaudoin (Dover Public Library)

Carding- Cocheco Chats November 1921 (Dover Public Library)

Cotton Textile Industry Glossary of Terms- [www.bitwisegifts.com/glencoenc/library/doc4.com](http://www.bitwisegifts.com/glencoenc/library/doc4.com)

Drawing Frames, Their Action on the Cotton- Cocheco Chats February 1922 (Dover Public Library)

Mill by David McCauley

One Hundred Years of Cotton Manufacturing in Dover- John Scales (Dover Public Library)

Slater's Card- Cocheco Chats October 1921 (Dover Public Library)

The First Process in Cloth Manufacture- Opening- Robert B. Marnoch (Dover Public Library)

### Transportation and the Growth of a State:

Cross Grained and Wily Waters by W. Jeffrey Bolster

Railroads Coming Into Dover- Dover Public Library

Schooner history: <http://home.earthlink.net/~steveells/nantucket/mary-e-crosby.html>

Shipping in Dover- Dover Public Library

The Piscataqua River Gundalow by John P. Adams

The Schooner Bertha L. Downs by Basil Greenhill & Samuel Manning

### Children In The Mills:

Dover Public Library, Dover NH

### Women In Mills:

[www.laney.peralta.edu/Projects/.../NHMillGirls-the10hourDay.pdf](http://www.laney.peralta.edu/Projects/.../NHMillGirls-the10hourDay.pdf)

<http://www.dover.lib.nh.us/DoverHistory/millgirls.htm>

[www.philandsusantolbert.com/research/millgirl.html](http://www.philandsusantolbert.com/research/millgirl.html)

A New Order of Things: How the Textile Industry Transformed New England by Paul E. Rivard

Harriet H. Robinson, Loom and Spindle: Or Life Among the Early Mill Girls (New York, 1898)

Old Sturbridge Village documents- [www.osv.org](http://www.osv.org)

Reading Habits of the Nineteenth Century New England Mill Girls-

### In Their Own Words: Immigrant Histories:

[http://www.dover.lib.nh.us/DoverHistory/daniel\\_buckley.htm](http://www.dover.lib.nh.us/DoverHistory/daniel_buckley.htm).

Dover Public Library, Dover, NH



The Children's Museum of New Hampshire's mission is to inspire children to experience all that is in the world as an opportunity to learn. Now serving close to 130,000 people annually, it is the most visited cultural attraction in the New Hampshire. The Museum offers 19 hands-on exhibits that invite visitors to explore the wonders of music, art, math, science, literacy, New Hampshire history, and world cultures.

For 26 years, the Museum has served as a vital resource to teachers and schools throughout New Hampshire. Please feel free to provide feedback or direct questions about this curriculum guide to our Education department at (603) 742-2002.





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