Allagash Wilderness Waterway
Sample Lesson Plans

Prepared by Bruce Jacobson | FACILITATION+PLANNING
for
Allagash Wilderness Waterway Foundation
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I gratefully acknowledge the following talented educators for collaborating to prepare these sample Allagash Wilderness Waterway lesson plans. We hope these ideas further education and learning.

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The Allagash is a 92-mile river and lake system winding northward through a working spruce-fir, northern-hardwood forest. A National Wild and Scenic River, it offers one of Maine’s preeminent outdoor recreation experiences, and has become a cherished destination for canoeists, kayakers, anglers, hunters, winter adventurers, and nature enthusiasts.

The following lesson plans are offered to engage educators who wish to include Waterway topics in their curricula, either in the classroom or within Allagash Wilderness Waterway. They are just a start: please modify—and improve—these suggestions. The sample lessons were developed as part of an interpretive plan for the Waterway, presented in Storied Lands & Waters of the Allagash Wilderness Waterway: Interpretive Plan and Heritage Resource Assessment (Jacobson, 2018).

The purpose of managing the Allagash Wilderness Waterway is to “preserve, protect and develop the maximum wilderness character” of the Waterway. Waterway management promotes education when it supports this overall purpose. Specifically, chapter 6 of Storied Lands & Waters proposes the following goal for formal education.

**Formal Education** – Participants in formal education programs that utilize Waterway curriculum resources comprehend the Waterway core message.

Adolescents in formal learning environments, and the educators who work with them, are the focus of Waterway educational efforts. Young adolescents, ages 10 to 16, are favored as the target audience for a couple of reasons. They are likely candidates for expeditions in the Waterway; they respond well when actively participating in their own learning. Focusing on adolescent learners also presents the opportunity to modify resources such as lesson plans for the more self-directed learning of adults and the more hands-on learning of younger students. Young adolescents present a theoretical middle ground.

**CONSIDERING A VISIT TO THE ALLAGASH WILDERNESS WATERWAY?**

Every Allagash experience begins with a plan, and many visitors report that the planning process can be one of the best parts of the trip. The following points are essential in any successful Waterway adventure.

- *How long will we be there?* It used to be said that an Allagash experience takes seven to ten days. Indeed, a trip encompassing the 92-mile Waterway from start to finish can take that long or longer, but many visitors prefer shorter trips offering specific experiences. These
trips hinge on authorized access locations, with primary access at Chamberlain Thoroughfare Bridge, Churchill Dam, the Umsaskis Launching Area, Henderson Brook Bridge, Michaud Farm, and at the Waterway’s terminus at Twin Brook. Other authorized access points can be more challenging and interesting.

- **Do we need a guide?** Many first-time visitors wonder whether a guide is necessary for a Waterway experience, and certainly, professional guides can enhance the enjoyment of a trip and make it much more comfortable. But Waterway staff also note that first-time trippers possessing good basic camping and canoeing skills can and do have wonderful Allagash experiences, which are sometimes enhanced by the thrill of discovery. General advice: if no one in your party has ever been to the Waterway before, consider the services of a professional guide.

- **What about an outfitter?** Now that’s different. Since an Allagash experience generally starts in one location and ends in another (many miles away), plans must include provisions for linking visitors with their transportation at the end of a trip. There are many reputable outfitters who will provide this service, along with general advice for planning a trip. Need a canoe? Paddles or life jackets? Don’t be afraid to ask outfitters how they might enhance your Allagash experience through their own experiences on the river.

- **How many can come?** AWW rules strictly limit party size to 12 persons, including guides, kids, and trip leaders. This is to protect the Allagash experience for everyone, since larger groups generally make more noise and have a larger visual impact. If you arrive in a larger group, Waterway rangers can split you into smaller groups if you can show staff that each party can and will travel independently. If you link up with another party and your total number is more than 12, staff may ask you to separate in the spirit of the Waterway experience.

- **Use caution.** The Allagash Wilderness Waterway is not the place for an inexperienced person to learn canoeing or canoe-camping alone. Lack of experience and errors in judgment in this remote region can cause considerable personal discomfort, and endanger oneself and others. Immersion in cold water, for example, can be fatal in a matter of minutes. Also, it is well to remember that once you are in the Allagash Waterway, there will be no opportunity to get items you may have overlooked when packing for the trip.

Following are suggestions for using a class period to consider a visit to the Waterway. After learning about the Allagash, students will determine the best reason for visiting, and then create a persuasive piece of writing to convince others to join them on a visit. The students will discuss several key components of the Waterway before determining a reason for visiting.

Waterway Theme I—“The Waterway is a wild place set aside for all to enjoy and care for”—applies to this activity. The Speaking and Listening (SL.1) and Writing (W.1) components of English Language Arts, Maine Learning Results (Common Core) also apply.

- **SL.1 Comprehension and Collaboration** – Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade-level topics, texts, and issues, building on others’ ideas and expressing their own clearly.
• **W.1 Literacy** – Write arguments to support claims with clear reasons and relevant evidence.

By completing this activity, the student will: (a) create a persuasive piece of writing; (b) engage in collaborative discussions; and (c) develop understanding of the important components of the Allagash Wilderness Waterway.

Information regarding options for visiting the Allagash Wilderness Waterway can be found at http://maine.gov/allagash. The official visitor guide and map is at http://www.maine.gov/dacf/parksearch/PropertyGuides/PDF_GUIDE/aww-guide.pdf

**TEACHING PROCEDURE**

Students will read and learn about the variety of opportunities available for visitors to explore the Waterway. With this information each student will create a proposal for visiting the Waterway and provide supporting evidence to defend their proposal. To make this an authentic experience, the teacher may consider assigning students to small groups who would be traveling together. Each person in the group would do their own research and bring their proposal to the group with whom they would be traveling. The group would then choose one of the proposals for the trip together.

<table>
<thead>
<tr>
<th>Engagement/Hook</th>
<th>Introduce the Allagash Wilderness Waterway to the students. Next charge the students with the task of convincing others to join them on a trip to the Waterway.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>The students will learn about the opportunities available for visitors to the Waterway. When the information gathering is complete, students will create a proposal to convince their classmates to join them on the trip. This proposal will include a written piece with supporting details.</td>
</tr>
<tr>
<td>Explanation/Elaboration</td>
<td>Students will verbally present their proposals to classmates. The written plan will be turned in to the teacher.</td>
</tr>
<tr>
<td>Evaluation/Assessment</td>
<td>The evaluation will be done by peers. Did their proposal convince the group to accept their proposal? Assessment of the writing will be done by the teacher.</td>
</tr>
</tbody>
</table>

**WORKS CITED**

THE BIRCHBARK CANOE

Subject: Social Studies, Geography, and Wabanaki Studies.

Grade: Middle School (6–8).

Time Frame: 8 hours; can be broken into shorter sections, over multiple days.

Prepared by: Julia Gray.

LESSON OVERVIEW

This lesson introduces students to the Wabanaki tradition of building and using birchbark canoes. Through exploration of both the materials and processes of making a canoe, and the routes Wabanaki people have traveled by canoe, students will consider connections across time and between cultures.

Learning Objectives

The student will gain an understanding of how Wabanaki people make birchbark canoes, and why the birchbark canoe was the ideal means of travel through the area now known as the Allagash Wilderness Waterway. They will also connect the geography of Maine and neighboring Canadian provinces to Wabanaki perspectives on place and landscape, and how the Allagash is part of a much larger, interconnected landscape of Waterways.

Academic Standards

The 2007 Maine Learning Results (MLR), especially the Wabanaki (Maine Native) studies component, and the Maine statute that requires the teaching of Maine Native American history and culture in Maine’s schools (LD 291) are paired with this lesson plan.

Geography/Wabanaki Studies

**MLR-D-Geography** – Students draw on concepts and processes from geography to understand issues involving people, places, and environments in the community, Maine, the United States, and world.

**Performance Indicator 2:** Individual, Cultural, International, and Global Connections in Geography

**LD 291 Concentrated Area of Study:** Maine Native American Territories.

**Concept:** Territory
Broad Understanding: Cultures have different perspectives on land, land use, and land ownership.

Guiding Question: How did/does the environment shape Wabanaki culture?

Notes & Relevant Information: The Wabanaki have been shaped by their environment. Over thousands of years, the Wabanaki peoples developed a sustainable relationship with the land, using what they needed to conduct their daily affairs while leaving a portion for future generations. The Wabanaki learned to know and interact with their world as equals, using what they needed and taking no more.

History/Wabanaki Cultural Systems and History

MLR-E History – Students draw on concepts and processes from history to develop historical perspective and understand issues of continuity and change in the community, Maine, the United States, and world.


LD 291 Concentrated Area of Study: Cultural Systems & History.

Concept: Cultural Continuity & Change

Broad Understanding: Enduring cultures are dynamic and maintain continuity while adapting to changing political, economic, social, and physical environments.

Guiding Question: How are Wabanaki cultural practices transmitted through the generations?

Notes & Relevant Information: Intergenerational cultural practices include, but are not limited to: drumming, dance and language, basket making and other art and craft work, and sustenance activities (such as hunting and fishing).

Guiding Question: How and why have Wabanaki cultural practices changed and remained the same over time?

Notes & Relevant Information: Interaction with other cultures (including Europeans) was one factor that changed traditional Wabanaki cultural practices (cooking, food gathering, preparing clothing, etc.). For instance, European trade goods (steel hatchets, European cloth) supported traditional Wabanaki culture in ways that made life more efficient. Environmental changes have also affected Wabanaki culture.

Maine Learning Results: Social Studies

MLR-D Geography – Students draw on concepts and processes from geography to understand issues involving people, places, and environments in the community, Maine, the United States, and world.

D1. Geographic Knowledge, Concepts, Themes, and Patterns – Students understand the geography of the community, Maine, the United States, and various regions of the world and the geographic influences on life in the past, present, and future.

D1.b. Use the geographic grid and a variety of types of maps to gather geographic information.

D1.d. Describe the impact of change, including technological change, on the physical and cultural environment.
D2. Individual, Cultural, International, and Global Connections in Geography – Students understand geographic aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.

D2.b. Describe the dynamic relationship between geographic features and various cultures, including the cultures of Maine Native Americans, various historical and recent immigrant groups in the United States, and other cultures in the world.

MLR-E History – Students draw on concepts and processes from history to develop historical perspective and understand issues of continuity and change in the community, Maine, the United States, and world.

E2 Individual, Cultural, International, and Global Connections in History – Students understand historical aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.

E2.b. Identify and compare a variety of cultures through time, including comparisons of native and immigrant groups in the United States, and eastern and western societies in the world.

Waterway Interpretive Themes

Theme III – People have lived, worked, and traveled in the Maine Woods since ancient times.

Allagash Travelers Sub-theme: Waterway visitors travel routes that have been in use for a long time by Native Americans, colonials, rusticators, trappers, sports, guides, and recreational paddlers.

Materials and Resources

- Student “K-W-L” Chart; see Waterway Lesson Plans, page 67. Alternatively, you may distribute blank sheets of paper and ask students to create their own chart.
- maps of Maine, Québec, and New Brunswick.

Building birchbark canoes

  This series of short videos documents a Penobscot Nation canoe-building project.
  This is a good text companion to the videos of the Penobscot canoe project, filling in some of what is not really explained in the videos.
This documentary shows how a canoe is built the old way. César Newashish, a 67-year-old Attikamek of the Manawan Cree Reserve north of Montréal, uses only birchbark, cedar splints, spruce roots, and gum.

Note: Newashish cuts down the birch tree to harvest the bark. Wabanaki canoe builders cut their bark off a standing tree. This does not kill the tree—it will regrow bark, although the regrown bark will not be suitable for building another canoe.

  A good, detailed video documenting the process of building a birchbark canoe; some differences from Maine, but essentially the same.

Some more general background on birchbark canoes

Canoe routes
  This book is the best resource for explanations of the various canoe routes paddled by the Wabanaki, with contemporary information also included.
  Includes maps and trip planners showing the Allagash and connecting canoe routes.
  Includes map with connecting canoe route.
Learning Procedure

Engage: Birchbark Canoes.

The canoes we paddle on the Allagash Wilderness Waterway today are the descendants of the birchbark canoes built and used by Wabanaki people and related indigenous people for thousands of years.

1. Begin by distributing “K-W-L” (Know-Want to Know-Learned) charts at the beginning of the lesson. Students will fill out at the “K” and “W” sections of the chart, addressing the birchbark canoe in general, building birchbark canoes, and canoe routes.

2. Share the following information from *Storied Lands & Waters of the Allagash Wilderness Waterway* with students to establish initial context for why birchbark canoes are important on the Allagash.
   a. “The central feature of the Waterway is . . . water. Water—in rills, rapids, eddies, quiet pools, or frozen sheets—attracts most visitors, as over the millennia it has drawn others for enjoyment, sustenance, and transport. The surface of eight lakes, four ponds, and the river accounts for greater than half of the area within the [Waterway]. More than 100 brooks and streams flow down the Waterway’s small mountains and rugged ridges. One cannot visit the Allagash without experiencing water in some form” (Jacobson, 2018, p. 225).
   b. “In 2003, 79% of visitors to the AWW came to canoe its waters” (Jacobson, 2018, p. 198).
   c. The cover photo of *Storied Lands & Waters* shows a 16-foot birchbark canoe made of *winter bark* panels built by Steve Cayard. It is fastened with spruce root lashings and wooden pegs, with no metal fastenings. The ribs, planking, and gunwales are all hand-split cedar.

3. Prompt: **Why is the birchbark canoe such a perfect way to travel the Allagash?**
Explore: What is a birchbark canoe made of?

Students will begin to learn more about how birchbark canoes are built, through reading and watching video documentation of the process.

   http://gutenberg.polytechnic.edu.na/5/0/8/2/50828/50828-h/50828-h.htm

2. Identify the following materials:
   a. birchbark from the paper birch (Betula papyrifera) for the outer skin
   b. roots from the black spruce (Picea mariana) for the stitches and lashings
   c. white cedar (Thuya occidentalis) for the sheathing, ribs, gunwale, headboards, stems
   d. resin (sap/gum) from black spruce (Picea mariana) or white spruce (Picea glauca), mixed with animal fat, to seal the stitches and seams.

3. Prompts: Can you find these materials along the Allagash? Could you harvest what you would need to build a birchbark canoe in the Allagash Wilderness Waterway?
   b. Maine Forest Service’s, Forest Trees of Maine, provides a handy reference that includes not just tree ID and natural history, but also a distribution map for each species. Order a print copy or download a PDF at http://www.maine.gov/dacf/mfs/publications/handbooks_guides/forest_trees/index.html

4. If time and location permit, take a trip outdoors and identify some or all of the material used to build birchbark canoes. You could even schedule at trip on the Allagash! Collect samples if allowed and appropriate.

5. As an extension, discuss how climate change might affect the resources needed to build birchbark canoes, and how these resources can be protected in the Allagash.

Explain: How is a birchbark canoe built?

1. Students will watch the series of short videos included in the following resources. Additional resources can be found in the Materials section above.
   a. This series of short videos documents a Penobscot Nation canoe-building project; use as your primary source for this section, with the following sources if you find that additional information is needed, or if you just want to dig in a bit more. Reviving Canoe Culture. (2002). Retrieved from https://www.peabody.harvard.edu/node/2126
   b. This is a good text companion to the videos of the Penobscot canoe project, filling in some of what is not really explained in the videos. Building Birchbark Canoes: Step by Step Guide to Birchbark Canoes. (n.d.). Retrieved from http://www.native-art-in-canada.com/birchbarkcanoes.html
c. For a really detailed description of the construction methods and processes, see Chapter 3: Materials and Tools, in *Bark Canoes and Skin Boats of North America* (Adney & Chapelle, 1983). E-book version:
   http://gutenberg.polytechnic.edu/5/0/8/2/50828/50828-h/50828-h.htm

2. Students can now complete the learned column in any of their “K-W-L” lines that talk about building birchbark canoes.

3. You can dig a little deeper by asking the following questions for classroom discussion:
   a. Why is the birchbark canoe still important to the Wabanaki today?
   b. What characteristics of a birchbark canoe make it ideal for travel on Maine's rivers and lakes?
   c. If you damaged your birchbark canoe on the Allagash, what would you need to repair it?
   d. Imagine, what would it be like to portage a birchbark canoe?

The discussion of these questions should contribute to an understanding of why a birchbark canoe is well suited to travel the Allagash.

4. An optional classroom activity is to have students create model birchbark canoes using cardboard or heavyweight paper. Three patterns are illustrated on pages 30 and 31 of *Bark Canoes and Skin Boats of North America* (Adney & Chapelle, 1983). Students will have to use technology or math skills to scale the drawings up to whatever size they want to create.

**Elaborate: Canoe Routes**

The routes paddlers use today on the Allagash have been followed by generations of Wabanaki people, for thousands of years. Keep in mind that the Wabanaki who were here before the arrival of Europeans did not make roads. During the seasons of open water, the vast majority of their travel was by water, in canoes.

This activity will require several maps—some for reference and blank maps for students to plot their routes. Most of the unit can be completed using maps of Maine, but at least two of the important canoe routes extend into Canada (Québec and New Brunswick).

The map of the AWW is the best starting point.
   http://www.maine.gov/dacf/parksearch/PropertyGuides/Maps/FullSize/aww-map.pdf

1. Identify places along the Allagash where Wabanaki traveling by birchbark canoe would need to portage—both when going downriver and when going upriver. There are some differences, such as rips or rapids that can be paddled going downstream but would have to be portaged going upstream. David Cook describes *poling* as a way for some upstream travel on pages 33 to 35 in *Above the Gravel Bar*. Wabanaki people using the Allagash as part of an interconnected network would go both upstream and downstream.

2. Identify places along the Waterway where visitors camp today. Would these be good campsites for Wabanaki living and traveling on the river and lakes? Why or why not?
The web page for the Allagash Wilderness Waterway has links to detailed Google Earth content about campsites (see Materials above).

3. Map canoe routes to the following destinations. Each destination can be chosen by or assigned to a group or an individual student. Multiple destinations can be mapped by each group as time permits, and students can compare their routes—there are often multiple options.

   a. The St. Lawrence River
   b. Moosehead Lake
   c. Penobscot Bay
   d. Merrymeeting Bay
   e. Bay of Fundy

Student should be given access to Above the Gravel Bar: The Native Canoe Routes of Maine (Cook, 2007). This book is the best resource for explanations of the various canoe routes paddled by the Wabanaki, with contemporary information also included. Additional web resources to use in addition to Cook can be found in the Materials section above.

4. Discussion following this section can consider how the Allagash Wilderness Waterway has stayed the same and how it has changed since the arrival of Europeans in the Wabanaki homeland. What would a Wabanaki person living 1,000 years ago find surprising and different along this traditional travel route?

**Evaluate: Meeting Standards**

The “K-W-L” chart will act as a prior knowledge assessment to see what the students understand prior to the lesson. They will be able to track their learning by completing the “L” section of the chart after the lesson is complete.

Students and teachers can review and compare mapped canoe routes, identify success and challenges, and evaluate results as a group.

These assessments will show how the students have met the standard for the lesson.

**Extend: Wabanaki Language**

Wabanaki knowledge and perspectives are embodied in their language. Explore Passamaquoddy–Maliseet and Penobscot language related to canoes and canoe building.

**Passamaquoddy–Maliseet Language**

- **masqewuloq** (noun inanimate) – birchbark canoe.
  
  https://pmportal.org/dictionary/masqewuloq

- **masq** (noun inanimate) – birchbark.
  
  https://pmportal.org/dictionary/masq

For the many Passamaquoddy–Maliseet words connected to canoes:

https://pmportal.org/search?query=canoe
Penobscot Language

ákʷitan – canoe

ákʷitanaskʷ – (1) bark for canoe making; (2) material for canoe building.

Go to https://penobscot-dictionary.appspot.com/entry/search/ and enter “canoe” in the search bar to see the many words in the Penobscot language related to canoes/birchbark canoes.
Lombards Along the Allagash

Subject: Social Studies, History/Economics.

Grade: High School (9–12).

Time Frame: 5 days, plus a field trip. Length of the field trip depends on destination (i.e., a museum visit versus an Allagash trip).

Prepared by: Jordan Beaulier and Amanda Barker.

Lesson Overview

This lesson is best completed prior to a trip to the Allagash Wilderness Waterway. The educator will guide the students through various primary and secondary resources that explore the history and use of the Lombard log hauler in the Allagash region. The activity can be enhanced by visiting Lombards displayed at Patten Lumbermen’s Museum, Ashland Logging Museum, Maine Forest and Logging Museum (Bradley, ME), or Maine State Museum (Augusta, ME).

Learning Objectives

The student will gain an understanding of the Lombard log hauler and how it changed the history and economic value of the logging industry in the Allagash region and beyond.

Academic Standards

Maine Learning Results Social Studies

C2 Individual, Cultural, International, and Global Connections in Economics – Students understand the influences of economics on individuals and groups in the United States and the world, including Maine Native Americans.

   C2.c: Analyze wealth, poverty, resource distribution, and other economic factors of diverse cultures, including Maine and other Native Americans, various historical and recent immigrant groups in Maine and the United States, and various world cultures.

E1 Historical Knowledge, Concepts, Themes and Patterns – Student understands major eras, major enduring themes, and historic influences in United States and world history, including the roots of democratic philosophy, ideals, and institutions in the world.

   E1.a: Explain that history includes the study of the past based on the examination of a variety of primary and secondary sources and how history can help one better understand and make informed decisions about the present and future.
Waterway Interpretive Themes

Theme III – People have lived, worked, and traveled in the Maine Woods since ancient times.

A Working Forest Sub-theme: Timberland investors changed the flow of history—and Allagash waters—by floating harvested logs north to markets and then logs and pulpwood south, relying on the labor of men, draft animals, and machines.

Materials

☐ Claim-Evidence-Reasoning statement; see Waterway Lesson Plans, page 77.
☐ Student “K-W-L” Chart; see Waterway Lesson Plans, page 67. Alternatively, you may distribute blank sheets of paper and ask students to create their own charts.

Primary Sources

☐ “Steel Horses for Long Hauls” in The Northern, 1926; see Waterway Lesson Plans, page 18
☐ “The Eagle Lake Tramway” in The Northern, 1927; see Waterway Lesson Plans, page 20
☐ Memoirs of Joseph Giguere; see Waterway Lesson Plans, page 23
☐ from Maine Forest and Logging Museum:
  http://www.maineforestandloggingmuseum.org/lombard-log-hauler-resources
    ○ vintage Lombard log hauler photos
    ○ vintage Lombard log hauler movies
    ○ Lombard operating and parts manual.

Secondary Sources

☐ Lombard Log Hauler Fact Sheet; see Waterway Lesson Plans, page 140
☐ technical articles by Terence Harper:
  http://www.maineforestandloggingmuseum.org/lombard-log-hauler-resources

Teaching Procedure

The instructor will distribute “K-W-L” (Know-Want to Know-Learned) charts at the beginning of the lesson. Students will fill out at the “K” and “W” sections of the chart. The instructor will then provide students with excerpts from The Northern and the Memoirs of Joseph Giguere as primary sources. These primary sources, written at the time and by people involved with the Lombard log haulers and lumbering in the Allagash region, will provide the students an initial introduction to the machinery and era. The Giguere memoir deals with many topics about life in the Allagash region, which provides context for use of the Lombard haulers. Those sections most relevant to Lombard haulers are pages 1–2, 25–26, 37–38, and 57–58.

Students will continue to explore primary resources at the Maine Forest and Logging Museum website, Lombard Log Hauler Resources website section, where they will be instructed to watch one vintage film of a working Lombard, explore the log hauler photos and read the first six pages of the Lombard Operating and Parts Manual. Included in the vintage films is a clip of operations at Cunliffe Depot on the Allagash. The clip shows the use of a horse towboat, a boating system unique to the Allagash and St. John drainages, batteaux, the felling of trees, and operating Lombards. The photos also include Lombards from the Allagash region, including those labeled “Lacroix.”
After exploring primary resources, students will be directed to the History of Lombard Log Haulers also found at the Maine Forest and Logging Museum website under Lombard Log Hauler Resources, Technical Articles. The Technical Articles section has several relevant articles that can be utilized as secondary resources.

Students will complete a Claim-Evidence-Reasoning statement after exploring both forms of resources. A suggested question would be:

How did the use of the Lombard log hauler change the history and economics of the logging industry in the Allagash region?

A field trip to the Allagash Wilderness Waterway should occur after the classroom activities. It is suggested that a stop be made at either the Patten Lumbermen’s Museum or the Ashland Logging Museum while on the way to the Allagash. Both museums have Lombard log haulers on exhibit in open-air displays that are available at any time.

In the Waterway, the best place to view a Lombard is at Cunliffe Depot campsite, which is accessible via canoes on the Allagash River. Parts of a Lombard are also at Tramway but are less recognizable. If a trip to the Allagash is not possible, there is a clip on YouTube of an exploration to the Cunliffe Depot Lombards. Search “Cunliffe Depot Lombard Log Haulers Trip,” https://www.youtube.com/watch?v=NRj_lHGshow.

If an active timber harvest is encountered en route to the Allagash, an attempt should be made to observe the machinery operating. Many pieces of modern logging equipment have tracks which relate directly to Alvin Lombard’s patent of his log hauler. A discussion of how the development of the track continues to impact modern equipment would lead to a deeper understanding of the topics.

Preferably at a field location, the instructor should present a lecture on the use of the Lombard log haulers and the effect of mechanization of the logging industry.

Students will complete the “L” section of their “K-W-L” chart to demonstrate student growth.

Students will write an essay summarizing their learning as it relates to the identified standards.

**Engage**

The students will be engaged through the experience of traveling to the Allagash Wilderness Waterway to see the machines firsthand. This will allow the students to gain firsthand knowledge while viewing the history of the Allagash logging industry.

The primary sources will give the students an inside look into the past and they will be able to track how the economy has changed over the years.

**Explore**

The students will complete a “K-W-L” chart of their prior knowledge of the Lombard log hauler and the Allagash area logging industry. They will use the primary and secondary sources to analyze the history and use of the Lombard log hauler. Students will read these sources to gain an
understanding of the concepts. The students will explore the Maine Forest and Logging Museum website to watch a vintage video and a restoration video of their choosing to see a working Lombard in action. They will then complete a Claim-Evidence-Reasoning statement showing that they understand the concepts.

**Explain**

The instructor will conduct a lecture, preferably at a field location, about the machinery and the effect of mechanization on the local economy as well as the economy of the United States.

**Elaborate**

The students will visit a Lombard Log Hauler on their way to the Allagash Waterway (Patten Lumbermen’s Museum or Ashland Logging Museum). If possible, they will visit the remains of a Lombard log hauler at Cunliffe Depot campsite and Tramway. These field experiences will help the student gain firsthand observations to compare with what they have read. The student will be able to understand how the Lombard log hauler transformed the North Maine Woods and the lumber economy by moving from an industry based on the steam rising from the backs of horses and men, to steam-powered machinery.

**Evaluate**

- The “K-W-L” chart will act as a prior knowledge assessment to see what the students understand prior to the lesson. They will be able to track their learning by completing the “Learned” section of the chart after the lesson is complete.
- By completing the Claim-Evidence-Reasoning statement, the students will show that they have a complete understanding of the primary and secondary sources.
- The students will complete a written essay after the lesson describing how the Lombard log hauler transformed the logging industry and how it changed the economic importance of the North Maine Woods throughout time.

These assessments will show how the students have met the standard for the lesson.

**Extend**

If available, this lesson could be extended by observing an active logging job with modern equipment. The economic impact of Alvin Lombard’s patented track found on excavators, bulldozers, feller bunchers, processors, and delimiters could be explored. A discussion could be initiated concerning the economic impact of the industrialization of the workforce.
Steel Horses for Long Hauls
Tractors, Mechanics, Garages and Gasoline Enter the Spruce Woods

By HUGH DESMOND

To suppose that the lumbering and pulp-wood industries have lagged behind in the great forward march of progress would be most erroneous. Not only have we kept abreast of the times in this respect, but we have discovered and put into operation so many new ideas that we may well claim a prominent place in the ranks of inventive genius. In our own generation we have seen the cross-cut saw replace the axe as an instrument for felling trees. The snubbing machine with its series of levers and pulleys has proved a God-send in safeguarding the lives of men and horses when logging in hilly country. Steam and gasoline-boats have come to replace the old method of "winding-in" a boom of logs by means of headworks. Boom chains with rings and toggles and links wrought from heavy iron are now used to securely marry our booms instead of the cumbersome and unsafe thoreshot. Indeed, the boom chain is so universally used today that it is doubtful whether there are a dozen men among the younger employees of this company who know what a thoreshot is, or would recognize one if they saw it.

Of all the new schemes that have from time to time found a place in the lumbering game, hauling logs with tractors is the outstanding. On long hauls over iced roads the tractor has proved itself superior, but on short hauls the work can be accomplished more advantageously with horses. Horses cannot be entirely eliminated from lumber operations even in places where tractors are in use because the logs must be yarded out to the main road which is always kept well iced. Here they are loaded on sleds especially designed for the purpose, and hauled away by the tractors in trains ranging from six to twelve sled loads. A good sample of how successfully this scheme works out under favorable conditions has been shown at the East Branch Operation during the last two seasons. This winter about 30,000 cords of pulp wood have been hauled by tractor from the East Branch Operation and Grindstone Depot to Dolby Floatage. In view of this present activity it is most interesting to look back over the earlier attempts to use modern methods of transportation in the woods.

The first tractor used by the Great Northern Paper Company was a 7-ton Lombard which was purchased with the Gilbert Mills property near Millinocket in the fall of 1918. Tom Leet drove this machine during the following winter hauling pulp on Joe Sheehan's Wood Stream operation. In the spring of 1919 the company turned it in and bought two new 10-Ton Lombards. These were used more or less for snow-plow work and toting on the turnpike roads.

In the year 1919-1920, a small Monarch tractor of the caterpillar type was given a trial at Soper Brook Operation on the long haul into Harrington Lake. This little machine, though apparently sturdy and serviceable for lighter work, was not made to stand the rigors of a winter in Northern Maine. It was a great attraction for the lumberjacks, many of whom had never seen one before. It is recalled that three days were required for the trip from Greenville to Soper Brook Depot. The first day they got as far as Lily Bay. Al Edgerley, the superintendent of Soper Brook Operation, and Adrian Murphy, who was one of the timekeepers there that year, accompanied the men who were running the tractor, traveling behind with a pair of driving horses; and the story goes that Mr. Edgerley, impatient with the slow progress being made, finally got out of the pung, hitched his team behind the tractor and
walked ahead of the procession carrying a lantern to light the way after night had fallen. At last after three days of hard travel the party reached Soper Brook where the new arrival was promptly nicknamed “the go-devil.” This machine was anything but successful in hauling pulp. From the start she was a wolf on the gasoline, keeping one team busy most of the time towing it in from Ripogenus. After several attempts she finally got to the landing with two sled loads. On the go-back road it broke down and was abandoned there in a snow drift until the operation was finished. Then they dug it out and hauled it away with teams. We do not cite this incident as any reflection on the merits of the Monarch, but merely to emphasize the rapid strides in tractor development that have been made in the past seven or eight years.

In the winter of 1920-21 the use of tractors for hauling pulp was first tried out on a large scale. This was at Sandy Johnson’s operation on Caucomgomoc. Four 10-Ton Holts and one 10-Ton Lombard were engaged in the work of hauling ten thousand cords of pulpwood out of a rough country. This operation was more or less successful,—at least it was a vast improvement over the Soper Brook attempt,—but it was not the same smoothly running performance that our East Branch operation is today. It must however be borne in mind that hauling with tractors was at that time in the experimental stage and the obstacles met with then were not so easily disposed of as they are now.

Aside from the work, which has already been referred to, at Grindstone and Soldier Town during the past two years, probably the most noteworthy feat of tractor achievement, so far as this company is concerned, was at Cuxabexis Operation in the winter of 1922-23. Ed. Emmons was one of the contractors there and he had over eight thousand cords cut, most of which lay in the Telos watershed. To get this into Cuxabexis waters, a distance of four miles, most of the way up a slight grade, it was necessary to haul with tractors. Accordingly four Holts and 21 sets of sleds were put on the job. Commencing on January 24th and finishing on March 4th, a total of thirty-three working days, eight thousand eight hundred and sixty-four cords were landed without any mishap. It was afterwards stated by men in charge of the work that even this remarkable record could have been surpassed if they had been equipped with a larger number of sleds.

Woods in April
By Nathan Appleton Tefft

Snow a-clingin’ on in patches; Mouldy leaves in soggy matsu; Mother Nature lifts her latches; Buds come prardin’ in new hats, Sun a-pournin’ ‘gin th’ spruces, Gum a-smellin’ purty good.
Like t’ taste th’ sugar juices, Oozin’ out o’ maple wood.

Chickadees, a-chick-a-deein’;
Ol’ woodpecker borin’ holes;
In a thicket out o’ seein’;
Ol’ hen partridge clucks and scolds.
Crow a-holdin’ spring convention,
In th’ pasture out beyond;
Everythin’ th’et calls attention,
Kinder seems t’ be a friend.

In th’ sun on mossy ledges,
Like to stretch out on my back;
Clouds, somehow, jes’ skim the edges,
O’ th’ tall, slim hackmateck.
Hear a-sweishin’ an’ a-sweishin’,
In th’ branches o’ th’ pines;
Mother Nature, guess, a-brushin’
O’ th’ cobwebs from her signs.

Every employee of the company has heard of the Twin Lombard, and anyone whose business took him up on the Grant Farm side when it was in use probably saw it in action. As may be inferred from the name, it is a Lombard tractor with two engines under one hood, designed to give additional power. It was used for plowing, toting, and for breaking roads on Joe Sheehan’s Cooper Brook Operation. It has since been put in the machine shop at Greenville and is now being rebuilt.

The tractor has assuredly made a permanent place for itself in the evolution of lumbering. That the officials of our company recognize its value is apparent from the fact that there are now twenty-one of them in use by the Spruce Wood Department — four 10-Ton Lombards, two 5-Ton Lombards, ten 10-Ton Holts, one tank Lombard, one Lombard jitney, one 5-Ton Linn and one 10-Ton Best besides the Twin Lombard. One 10-Ton Holt has been loaned to the Winter Open Highway Commission of Bangor and the others are used for plowing, toting and hauling wood on operations where conditions are favorable to it.

In the Greenville shop, experts are now at work on the Twin Lombard, building it over and experimenting with new improvements. When all the details are perfected it is hoped to put in operation a super-tractor that will, to use the vernacular of the day, “knock ‘em cold.”

A Bear’s Teeth Story
By Ralph W. Johnson

Many years ago there was a jeweler located in Bangor who was a most ingenious man. He was capable of making things out of little or nothing. He left Bangor and located in Alaska but recently returned to his old home for a visit. While in Bangor he called upon a dentist to have some work done on his artificial teeth. The latter found the teeth unlike anything he had ever seen and questioned the man as to their origin.

The man explained that while he was located in an isolated part of Alaska his teeth gave him so much trouble that he had to extract them himself. After this he went out, killed a bear and removed his teeth. Then he made an impression by the means of spruce gum and with some aluminum and the bear’s teeth made himself a set of artificial teeth. The dentist states they were a work of art and he was unable to improve them. It goes without saying that the man had eaten the bear with the new teeth!

It doesn’t take a very large trouble to worry a small mind
The two conveyors now in use are 225 feet long and raise the pulp wood 25 feet in loading the cars.

The unloading trestle is built with a slope of six inches toward one side. Also the cars were remodelled with a floor that sloped twelve inches toward the one side of the cars which swings open from hinges at the top. Thus when this side is released, there is a tilt totaling eighteen inches, and from one-quarter to one-third of the wood pours out without labor. Then men are required with hooks and pokes to loosen the rest. About an hour is required to unload a train, which, when emptied, is pulled out to the main line by the shifter.

One of the problems that arose was the disposal of the bark that accumulated in the water beside the trestle. So much of it gathered that the pulp wood would not float away, and unloading was impossible. To solve this, a scraper was designed which the Plymouth, by means of a pulley attached to an anchor, draws out into the lake, scraping the bark before it as the engine goes up the track.

Although the Madawaska Company intends to finish the hauling of the pulp that is now at hand before winter, they expect an amount, equal to that which was to be hauled this year, to be ready next year. It is evident that the cost of installing this railroad has been great, but its value to the landowners, timber cutters, and paper companies that will buy the products carried over it is also large. Its value to these is in proportion to the amount of pulp in this section that can be transported by this route. Inasmuch as conservative estimates allow at least twenty years to be required for the cutting of pulp to be marketed in this way, it will be seen that the usefulness of the railroad in the wilderness has only begun.

The unloading trestle is built 600 feet out in Umbazookskus Lake. One side of the cars is hinged at the top to facilitate unloading.

The Eagle Lake Tramway

By O. A. HARKNESS

THE problem of transporting logs from Eagle Lake and the St. John watershed to the Penobscot waters has taxed the ingenuity of venturesome-spirited woodsmen for nearly a hundred years. The first attempt was the Lock Dam on Chamberlain Lake and the Telos Cut about 1840. The most recent is the railroad from Eagle Lake to Umbazookskus which is well described by Mr. Blodgett on page 3 of this magazine. At the editor's request, I am writing about the Eagle Lake Tramway with which I was closely associated from the time it was built until it was discontinued. The visitor to the Tramway now finds the cable, tracks, and trucks in their original position, but the...
wood has rotted and fallen. The track has grown up with young trees and resembles a hedge. The casual observer might not even notice the remains of this engineering achievement if it were not called to his attention.

In November 1901, I started working for the Eastern Manufacturing Company at South Brewer, taking charge of the construction of a steam yacht for F. W. Ayer. At that time I heard rumors of a proposed tramway that was to be built at the head of Chamberlain Lake by Marsh and Ayer. This tramway was to take logs from Eagle Lake, St. John waters, across the hill between the two lakes, into Penobscot waters, a distance of about 3000 feet. A man by the name of Fred T. Dow, of Bangor, had made a survey during the summer of 1901, and had received orders from Mr. Ayer to go ahead with the project.

After different types of tramways and conveyors were studied, it was decided on the type to use. The contract for all steel castings and cable was given to the Taylor Iron and Steel Company, High Bridge, New Jersey, now known as the Taylor-Wharton Iron and Steel Company. This concern was one of the first in the country to manufacture manganese steel castings, of which all the trucks and clamps of the tramway were made.

Nearly all of the machinery was taken across Moosehead Lake to Northeast Carry in the fall of 1901. What was left at Greenville when the lake froze in the fall was taken across the lake with teams by H. N. Bartley, Brown and Wiggin, of Patten, contracted to move the machinery from Northeast Carry to Eagle Lake. Some of the heaviest, such as boilers and the cable, being rather heavy loads to haul with the equipment used in those days, gave them more or less trouble. The cable weighed fourteen tons. The attempt was made to bring it into the woods all in one piece, rolled on two drums and mounted on skids which were hauled by horses. Below Smith's half-way camp on the West Branch it had to be cut into two sections.

Mr. Dow, with a small crew, started on the foundations for the boilers and heavy machinery on March 1, 1902. He had a small rotary saw to saw out timber which he had to run with a donkey engine, as the crank shaft on the large engine was broken on the way in, so they were hung up until late in the fall before they could use the main engine. Mr. Dow has told me that in the fall of 1902 he turned the boat, the George A. Dugan, was to be 71 ft. long, 20 ft. beam, two boilers and two engines. It was built at the Chamberlain end of the Tramway and was ready to tow logs on May 10, 1903. About April first, I had a letter from F. W. Ayer asking me to look after finishing up the tramway and putting it in condition to take care of the logs, which I did.

The following description of the tramway may be of interest. The steel cable, 1 1/2" in diameter, was 6000 ft. long, and fastened together so that it was endless and reached from Eagle Lake to Chamberlain Lake. At intervals of 10 ft. the trucks were clamped on. These trucks consisted of a steel saddle on which the log rested, and two 11" wheels which ran on steel rails 22" apart. There were two tracks, one above the other. The loaded one went on the top track and the empty one returned on the lower track. Halfway between the trucks there was a steel clamp. Both the clamp and the truck fitted into the sprocket wheel, which was 9 feet in diameter, situated at the Chamberlain end of the tramway. This sprocket wheel made nine revolutions per minute which made the log travel at the rate of 250 feet per minute. The sprocket wheel was geared to a Westinghouse Compound engine, designed especially for electric light plants. The cylinders were 12" and 24" with a 14" stroke. The engine made 255 revolutions per minute with 100 pounds of steam. Wood was used for fuel for the two boilers furnishing steam for the engine. It took a lot of power to start the machinery moving, but it rolled easily once it was in motion.

There were a lot of difficulties that had to be overcome before the tramway was ready for practical use. For instance, each of the 600 trucks and 600 clamps were fastened to the cable by four 7-8" bolts, making 4800 bolts in all. It was discovered that the threads on the

Steel trucks which ran on the 22 inch gauge track were fastened to the cable at intervals of 10 feet

Aunt Mandy, when asked why she was so constantly cheerful, replied, "Lor', chile, I jes' wear this world like a loose garment."

(Continued on Page 14)
the latter down to Castine where he killed and dressed it. The heart, liver and other entrails, he threw to the dog, and they are the long string of rocks which are there to this day. The more easterly of the Spenceer Mountains is Sabotawan, "the pack," while the other, or western, peak is Kokadjo, "the kettle."

The authority for this latter legend is John Pennowit, an Indian of the Penobscot tribe, who has passed the greater part of eighty-eight years in the woods of Maine, to whom the writer is indebted for much of the information on Indian nomenclature contained in these pages. He is probably the same man incidentally mentioned by Thoreau as John Pennyweight. The writer has no hesitation in accepting, as the more correct, his version of the story which establishes the identity of West Spenceer Mountain with the "kettle." Indeed, the shape of the Spenceers would seem to settle the matter beyond question. Kokadjo is quite round while Sabotawan is long, and its top level, the eastern end being squared off much like the end of an Indian pack.

These traditions show that the Indians were endowed with great imaginative powers and with no little poetical feeling. Mount Kineo, when seen from the southern side, looks not at all unlike an immense moose, lying or stooping with its head toward the west. The precipitous eastern cliff is a very good counterpart of the rump, while a slight elevation at the beginning of the western slope well represents the withers, and another at its foot the swelling of the nose or "mouffle." Indian imagination, however, did not stop here. The two main arms of the lake which extend north and south, one on each side of the "moose," with their numberless bays and coves, form the animal's antlers with broad blades and branching prongs. May not this be the origin of "Mooshead?"


It is not in a man's creed but in his deeds, not in his knowledge but in his wisdom, not in his power, but in his sympathy that there lies the essence of what is good and what will last in human life. —F. Yorke Powell

**The Eagle Lake Tramway**

(Continued from Page 6)

bolts were not cut down far enough to allow the nut to be tightened sufficiently. When the tramway was loaded the trucks and clamps began to slip, and each of the 4800 bolts had to be removed and run down with a hand die and replaced.

The tramway was used for six seasons. It was under my care for the entire time. We averaged about 500,000 feet, board measure, for each day operating, the day beginning at 4 A.M. and ending about 8 P.M. This tramway was always an excellent piece of machinery, and very efficient in doing the work for which it was designed. The total amount of lumber taken over the tramway was about one hundred million feet.

**A Visit to Chamberlain Farm**

(Continued from Page 7)

task of shoeing the animal. One can easily imagine the commotion attending this operation when some huge ox was shod against its will. The puffing and blowing, bellowing and struggling, which would make the sling creak and rock, was most exciting. A careful search through the piles of old iron did not reveal

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"GNPCOV"

Success comes in cans, failure in can'ts
MEMOIRS
of
JOSEPH GIGUERE
Resident of Churchill Depot
and
Tramway
1926–1946
I FOUND THESE PAGES FROM A DIARY THAT WAS KEPT BY JOSEPH GIGUERE, A MAN WHO WORKED AT THE TRAMWAY. THE WORDS ARE IN MRS. GIGUERE'S HANDWRITING BUT THE STORY IS TOLD BY MRS. GIGUERE:

Joseph Giguere
(deceased)

I am born from a family of 12 children in Canada at St. Joseph, Beauce. We were 6 boys and 6 girls. I am the seventh of the family. My father was a farmer. When I was a kid I had always in my mind trapping, fishing, and hunting, but my folks thought it was too dangerous. I myself, as I grew older I could realize my dream. I went to school and high school at the Marie in Beauce not too far from Quebec City. And at 18 years old I became a clerk in my uncle's store. After 2 years working there I get married to Jeanne Dusel from Robertsonville. We had 9 children and 8 are alive. I work for Quebec Central Railways as a brakeman. From my brother-in-law I learn the Madawaska Company was going to build a railroad 13 miles long at Tramway between Chamber Lake and Eagle Lake. I thought I am going there to work. I could satisfy my ambition. I had experience of brakeman. They put me on a locomotive that I was running. I stayed on it all summer and it was close for the winter on account of the north weather.

These jobs start in 1927. Then in October I decide to send an order for 6 dozen traps and a 30-30 to try my first move on trapping in the big woods, of Maine.

They put me on an engine and I hook behind a car full of gravel, and the company use all that to construct the railroad track of 13 miles long.

The trapping was good for the first year and gave me the courage for another year. I went back on the railroad that summer and we finished everything that summer and also the transportation of the pulp start from one lake to another. And every Sunday I spend my days in the canoe on the lakes and brooks because I was as crazy for ./
fishing as I was for trapping. I took a friend with me but I always
told him not to move in canoe because it is easy to turn upside down
and we are in the water very fast. When I was fishing there I took trout.
They called it square-tailed trout, and also toque, and in the mean-
time I study the nature and it keep me to know what I want to know
later on. Because I want to go further on trapping. I went on lakes,
bworks, and rivers, and I learn how to handle boats and canoes on the
water specially when the water was rough.

I also bring something to eat outside, build a fire, make coffee
or tea, and heat what I have. I learned to use that a lot later on
during the 20 years we stay there.

One year I met a man who want trap, too, and ask me to take him
with me. He said he want to learn that winter. I said it is correct with
me. When I meet him he had 6 foxes but, for myself, I had 9. Then we
decide to go to Range 9, Town 14. We took 14 bobcats, 16 minks, 2 otter,
27 foxes, and 35 weasels. In spring we went in Canada to sell our fur.

For 5 years I worked on the engines every summer to transport
the wood and in the winter from October 15 to January 9 I trapped be-
cause after that in the winter I worked on a tractor with lots of
sleighs behind loaded with pulpwood which we took to the lake. We haul
that wood to a conveyor to the lake. (then more)

I went in Canada to get my family when I sold my furs at Quebec
and at the same time I has some papers for my family. I had 4 children
at that time and the port of Entry was Lake frontier. The road go
at Churchill Lake 42 miles. We went by truck and in boat 16 miles to
Tremway Lake between Chamberlain Lake and Eagle Lake. The children
had with me at this time was Theresa, John Paul, . Also Rita and Charlotte,
and my wife, Jeanne, and myself, Joseph. That winter we were all to-
gether at Tremway and spent the winter there.

I start to trap again. I find a difference from the years before
because I was with my family every night. I travel on Eagle and I
took from the brooks around there. The name of the brooks I saw were
Russel Brook, Supper Brook, (poss. Soper) Snare Brook, Smith Brook, and
others at the head of Chamberlain Lake and also the head of Allagash
Lake. There we find a lot of fur animals. I couldn’t take all I want
because of lack of experience. The ice melt very late on the lake around
the end of April; sometimes around May 10. I took my boat and motor and
troll for trout and toge. I build a fire to have my hot tea because I
can’t eat without my tea. I stop near an old beaver’s house and I had
finished my meal. I came back to my boat and I heard noise like mice.
The beaver house was so old that it had just a few branches on the top.
Then I could see 3 little beavers. They are not longer than 7-8 inches
long. I took one in my hands. They were so nice and cute. I couldn’t just
look at them. It is why I took one in my hands. The mother went farther just
a little bit because she heard the noise I made with my boat.

When a female (beaver) is ready to have the baby she moves away
because the male could kill the small ones. They swim around to find
a place like some other old beaver dam, or a hole in the gravel along
the bank of a river, or a brook.

I made the trapping at Tramway Lake a winter and in January
the beaver trapping were not open that year. The company ask me to
take a tractor at Churchill to take the wood out. With my family we made
14 miles with one horse, and further they put another horse on the front
of this one because the road was too narrow. They hitch on a sleigh the
company let me have and also a man to conduct the horse. We put hay in
the bottom of the sleigh for my kids and wife and blankets on the hay.

We went 8 miles to a camp where an old man lived. His name is Jim
Clarkson, and he gave us dinner. From there we stop at another camp
called half-way. We had supper and changed sleigh and this time they put
4 horses on a double sleigh. This time we have a bigger load because
the company sent another man for food for the company.
We had 5 children that year and for the last one, no doctor around. I delivered the baby and I also delivered 3 other babies. There was no doctor for one hundred miles. I deliver 3 at the Tramway and 1 at Churchill. The last one the doctor come 5 hours after the baby was born and after examining of the mother and baby he said everything was correct. I will say my wife and baby were always in good condition and the rest of the family, too. Lots of fresh air, plenty food and lots of work. All the breads, doughnuts, cakes, pies, and can goods were made at the house. The gardens, potato fields, strawberry plants, and rhubarb were also in the family's care. The preserve and ice cream and soft drink were also made at home.

When I am at it I teach to my girls to trap and they were doing good. They were lucky too because they didn't learn by book. They learn my method and my work. Knapsack on their back, snowshoes on their feet—no weather to stop them. They took mink, muskrats, foxes, weasels, bobcats. They skin them, put them on the stretcher to gave them the right shape.

Every spring at Churchill Lake after we finish to cut ice for the ice box we had (instead of refrigerator). We buried ice in sawdust for a whole year and cut wood for the stove and pile up in shed for the year, too. We fill a big woodshed full. We also went to the sugar camp. It was a mile and a half. We took care of 250-300 maple trees. We had a sugar camp I built with my sons and we made enough sugar, syrup, and candy for our own use. My sons Jean Paul, Gabriel, Marcel and me made enough sugar for our provision from one year to another. We had a dog, Fete to pick up the sap from trees to trees. We made about 25-30 gallons of syrup. I also had mold like a little house for half pound and one of one pound. Also a book mold, a heart and star mold. I made that all with my hands and knife. When the weather was nice we used to make sugar-party for us and another family who was there. We had fun and we always kept a good souvenir.
Once in a winter season I went on my trapline at Spider Lake. I came back by pleasant Stream and I saw a track. If I guess it was a wolf track. It was not bigger than my dog who weighed 125 pounds. I heard by a fire warden he saw a wolf track on the sand at Rust Lake and I was not ready to believe that, But I change my mind after I saw that track.

One winter we had a little camp at Churchill near the conveyor where we bring pulp on about a dozen of sleighs. We put the sleighs along these conveyors and men put the pulp on a chain and the pulp went down on the lake. While the men unload the wood I run to my family who was close there. Most of the time I find my wife cut ice with an axe on the top of an old wood shed. She put that ice in a boiler to have it melt for water to wash clothes, or floors. When she was doing something else, the snow or ice melt and it didn't take too long to be ready to wash. When I saw that I find a boy and for a few dollars he filled 3 barrels and 6 pails with water three times a week. Then it was not so hard for my wife and the children.

One fall I went pick up white fish at the foot of Lock Dam, about 6-7 miles from Tramway. Every fall these fish come near to the Dam and try to go up higher. Because the Dam was closed they stayed at the foot of the Dam. When I trap there in the woods we didn't need a permit to take white fish for our traps and also eat it. It was a very good fish. The fish stay around the foot of the Dam for about 15 days to spawn.

One fall I went trapping one afternoon and I stayed late. I had picked up some fish and I started home. The big wind came up and snow start to fall just while I was ready to go up the Tramway. The waves were high it covered my boat and motor and my motor stop. When I saw that I went on the shore. I put my motor and boat on the shore and I have 3 more miles to...
so and it was terribly dark. I walk a little bit but had a hard time and no road-just walk along the shore, but I finally made it. It took me 3 whole hours to reach home.

One time two women and two men went hunting. When they were ready to come back the lake was frozen and I had to help them. They had 2 deer with them and we had to haul the canoes on the ice with the deer in them. Sometimes where we saw water we put the canoes and motor in the water and we repeat that until we reached Churchill Lake. The men and women walked on the shore until they reached the Dam and their cars. They were very glad-you could imagine.

Now I would like to talk about beaver trapping. Somebody say it is nice work if you know how to trap. But in North of Maine where I was there was lots of snow and very cold. Long days work and at night mold and skin the pelts. It is very hard to carry a pack full of traps on my back and cut holes in the ice 8-10 inches thick-sometimes more. It is hard to walk on the trail with snowshoes half of the time full of snow. All day long. Yes, it is hard doing that for two, or three months, in the winter. But it also a nice reward-knows and finds fur animals in his trap. The price of the fur is good sometimes ($60-70) for a pelt, but the last year I work there I sold the beaver for $1.00 by inches. It is the reason the beaver coat cost $150 and up when it is real fur and not imitation.

A beaver is not hard to take if a trapper knows how to put his traps. When a beaver is hungry he look for food, fresh ones like popple. When he comes to get some it happens he puts his leg in the trap and drowns in a few minutes. Put the feed and traps in cold water-cut holes first and fix everything-arm long in the water. Sometimes our arm is up to our elbow in cold water. It takes a lot of energies. We sometimes put 4-5 traps to a beaver house, depends what we find there. The law is not more than 25 feet from the beaver house. It is hard but very rewarding if the trapper has the courage to do it.
While the company was operating in the wood the priest came every month for the confession, communions and mass and also for the Christmas mass. We sang—my wife and myself—and also 2, or 3 others. We had a little organ a woman was playing. The men in the other camps in the wood came down for this occasion—about 300 men for the Christmas mass especially.

I don't want to forget something that happened to me a winter when I was trapping along the Allagash River around the 15th, or 20th of November. I saw a seagull half frozen because she didn't want away with the other ones when they left for warmer country. When I came near her she couldn't move her legs. They were half frozen. I took her and bring her in my camp. There I took cold water and put her in and after I put her in a box for 3-4 days. Also feed her. After that I didn't know too much what to do because she was alone and lost. I telephone the game warden about it because I was afraid to let her go because she could be frozen again. He told me to kill her because she could suffer again. It is too bad but I had to do it.

Another time I trapped not far from Ross Lake. I found a deer and in bad shape. He was dead. I decided to put traps on the carcass and in 4 days I had a bobcat's family—the mother and 6 small cubs.

Talking about bobcats, I like to say something else. I went fishing on Snare Brook and when I came at the outlet of the brook I saw a bobcat who was swimming. I didn't have my revolver. I forgot it at home. Then I just have to look at him. The bobcat came on the shore, shook himself, and ran for the wood. At least I had the pleasure to look at him.

Another time I went on a trip to Snare Brook and the water was very high. The snow was melting; it is why the water is so high. I took off my shoes and stockings and rolled my pants up to my knees. I cross the brook and the water was so cold I didn't feel my feet. I put back my
stockings and boots. My feet were warm after 10 minutes. In winter-
time I always wear wool stockings.

I went once to Harrow Pond and at half-way I saw a weasel cross my
trail and this animal is very curious. I had fish in my knapsack on my
back. I also had left a little trap. I fix that but I didn't have time
to do something fancy. I move back a little bit and I look without moving
and in 2 minutes she was caught in the trap. I took her out of there
and kill her, put her in my knapsack and I was ready for another one
along my road.

I remember the year we trapped at Churchill Pond. My sons, Gabriel
and John Paul and me want to go up at the head of the Thoroughfare Brook.
It was hard because we had a snowstorm - 27 inches of snow during the
night. Then we broke snow for 7-8 miles. The first day the snow was soft
and with our snowshoes we went deep down and we wait until next day to
finish our trip.

One year when the company was operating, a friend and myself had in
mind to make each a boat. We had to cut our wood and use the company
sawmill. The boats were 20 feet long, in canoe form, but much longer. They
were very good in the water and took the waves very good too. I also
repaired few canoes in canvas for the company, like take off the canvas
and put new ones and they make look like new.

When I moved to Churchill Lake, I built a camp with logs for my
family. This was the time of wood operations. In all there were 18
families when the company operated in full scale. We had fun like playing
cards, history, jokes, songs, and kinds of games. We made parties in one
house or another and sometimes the children played with us, too.
After that the company got themselves ready to haul pulp back to Churchill. But you always saw men who like to travel from one camp to another, or to cross the boundary for one reason, or another. One day I was finishing my camp and 8 men asked me to take them up the Tramway in my boat. It was December 6 and it was late in the season. It was a risk to take but for myself I was not scared. I took risk many, many times. I look behind my boat, a flat-bottom boat they called it Dore Boat, for my motor. I had an Evenrude 6 horse-power. It was late in the day when I took the men up there and the weather was very cold. At the Tramway they didn't want to walk the 18 miles left to take the car they were supposed to meet. We took the track trailer and I finally got them to the head of Chesuncook Lake. I come back from there to Tramway Lake around 12 o'clock. It was too late to go home so I decide to stay there. I slept near the stove in the cookroom until daybreak. I put wood in the stove all night long and when the day break I start my way back home. I took a very light meal and left the rest in case I need it. I made the first part of Eagle Lake and also cross Snare Brook, and when I come to the narrow part of the lake the ice was there. I broke the ice to go to Round Pond but it was also froze and in the meantime I gave a rough time to my boat. I finally land on the shore and haul my two boats and motor-put them upside down and I also hide under the boat the rest of the food I had and I knew then I had to leave all that there for the complete winter. From there to Churchill I had to walk from 17-18 miles and I also have to go around every cove and brook by the shore because the ice was not thick enough to walk on. I cross few little brooks someplace in the water up to my knees. I also cross Cliff Brook and Spider Brook. It was late then I decide to stay alone for the night. I hike wood with my hands because I didn't have an axe and I had left only 3 matches in my safety box. I pick up also all the drywood I could find around.
put that all together because with just 3 matches I didn't want to
miss the chance to start the fire. I was all wet. I took off my boots and
stockings. I made myself a little hut with branches on account of the
snow that was falling and the wind.

When daybreak came I started to walk 6 miles on Pleasant Spring
and the water was very large there, and the ice was strong enough
from 2 nights frozen but a little further it looked like it was frozen
just from one night. For precaution I pick up a dry cedar pole which
was on the shore of the lake. I was glad to find that because I didn't
have any axe with me. I had that pole under my arm and when I reached the
dead water at Pleasant Spring the ice was so thin I fell in the water.
My pole was on each side of the hole and that's what saved me. When I
fell in the water I was wearing union suit -100% wool, a sleeveless wool
sweater and another one with sleeves, a woolen shirt, wool mittens and
on the top leather mittens and everything was all wet. It seems to me I
was heavy to 200 pounds when I finally came out of there.

When I fell down in the water I tried to put my legs on the top of
the pole and first I couldn't. When I saw that I start to be discouraged
and I said, "My God, I am finished!". I start the same move again and
this time I came out and I slide slowly, inches by inches, on my pole
under me. My wet hands were glued to the ice and I moved slow until I
could reach a safe place on the shore. From there I finally could stand
up and I walked on my pole until I was sure I was safe after all.

After that I had 2 miles to walk to reach my family. All wet like
that I had to run, but in myself I figure not moving fast enough. I was
so heavy. My clothes was froze on me. When I opened the door and my wife
saw me she said, "Where did you come from like that?" I start to cry and
say "I pretty near not come back at all!"

All of a sudden my brother-in-law, my boss and my wife all put me
in bed. I put dry clothes on and had a hard drink of whiskey and I slept.
When I woke up I ate a light meal and at night I went to bed early and
after a long night rest I was as good as before—not even a cold. I was
lucky!
One winter I trapped around Churchill Lake, on Allagash River, and also Spider Lake. Also Cliff Lake and Grass Pond. In the summer when I had the chance going fishing with my family. I want to study, in the same time, the nature of fur animals, specially the mink, otter and beaver. I don't have as much chance to study the fur animals on the ground like foxes and bobcats, etc. I had to study the mink nature put for the otter, it is pretty near the same as mink. If she decide to go from one lake to another she find her way by intuition. The otter covers more territory than the mink.

As for the beaver, he is a hard worker. I look at them working very, very often. I watch them building their houses, getting food, playing. Their houses are made with branches on every side. They carried mud to put on the branches. If the winter is harder they put more mud on it.

One winter I remember I took my son, John Paul, with me at Ross Lake. We left Churchill Lake on a thin ice but we always walk around the shore, and step as far as we could. The dog was tired and stay away a bit. I always had a big sleigh dog, a German Police 125 pounds and he was a strong dog. He was a strong dog. We could load the sleigh with about 300 pounds of stuff and he could go all day long. The ice was thin then. He fell down with his load and it was impossible for him to get out of there alone. We cut poles, we put them on the ice and we took him out of there. We turned back for home and we wait a couple of days until the ice was thicker. This time we didn't have any trouble to make the trip. We built a fire along the brook and make a shelter for the night. The next day we went to Ross Lake and stay the rest of the winter, trapping until the last of February.

One fall I told my wife I want to try something new and at Churchill Dam. I put a couple traps where I thought it was good and the next morning I had a mink in each trap. From there I took time to change all my sets and in that time we had December, January, and February for trapping. I always start November 15 because before that I thought the fur was not so good. That
fall, from November 15 to December 25. I took 33 minks and pretty near all males and all were old ones, too. Of this number just 2 small ones. I believed after that I found the easier way to trap the mink because years after that if a mink came around I never miss it!

I also put few traps for otter and I always took 5-6 otters every winter. I was interested in all fur, in general, and then I had a chance to put traps for all kinds of fur.

One fall the LaCroix Company had left food for the next year for the camp and ask me if I want to look, as I was going by, if everything was in order. I went by Churchill Brock and went further by Churchill Pond and from there I cross an old road where they hauled pulp and went also by a few more brooks. I also went by the head of Snare Brook and I had also to look at another camp if the food was also in order. I slept at that camp and went to Tramway Lake the next day. The day after, I made the same route but at Snare Brook on my way back I found something new.

Mr. Bear broke windows and made a mess in the camp. It was open barrels of flour, and salt pork and molasses and boxes of macaroni and spaghetti. I didn't pick up nothing. I went to sleep and put my revolver under my pillow. I slept in very light that night looking for any sound, but nothing showed up and I left next morning after breakfast for home.

In the spring I decided to put out bear traps because we saw a few around. I put a trap near a camp where the men had work all winter. I went back the next day and the mother bear was in the trap. She had her 2 small ones with her. When they saw us they climbed 13bed in a tree.

I killed the mother and we went in the tree and take the smaller one. I made a snare with a wire to pick up them. I gave them, one by one, to my friend. He put them in a big bag and we bring them back to camp. There we put collar on them and long chains and the clerk's dog played with them. We gave them anything for food. We kept them 3 months and
some fishermen came up and we sell them.

The fishing time I sometime went at Pleasant Lake to see if we could go fishing in canoe. Sometime I walk along the brook and also in the water where the water was not too deep. I stop and look all around and not more than 100 feet from me I saw a mother bear. She didn't saw me. All of a sudden she saw me and she jump in the woods. I heard noise behind me. Her small one was in a tree behind. He also jump down and head for the wood. For his mother, I suppose. I didn't have my revolver then. I just look at it.

One fall where they killed the beef, few bears walked around—big and small. Then I decide to put traps and I took 7 bears.

One night I come back from Harrow Brook to look at my traps. I went not far from the company office. The boss's wife she ask me when she saw me if I could do something to help. She heard noise in the cans outside the shed. Then I went home for supper and took a trap. I put the trap around 8 o'clock at night. I took a chance because at dark I could have missed him. In the meantime the boss came and we talked for a few seconds and we heard a noise. Then with flashlight we saw a big bear in the trap. You could imagine he worked to come out. He was about 2-300 pounds. I had to kill him right away—not waiting next day because he could have gone away. I took my flashlight and I fire with my revolver 3 or 4 times to be sure he was dead.

Another week I caught 7 bears when I had to go on my job as fire warden. I left my trap to the handyman at Churchill. We knew some more big bears were around. One morning the man went to visit the traps and a big bear had the trap on one leg and he stand up and walk with the log that the trap was attached with. He cross the river and was ready to hide himself. The man found him and kill him.
One spring we went on the telephone wire to take off trees and branches and some other places the wire was down. We slept twice in fire warden camps they had there. The day before I come home I call up my wife and she said she had Mr. Bear company during the night in the hen house. We had 60 hens, a bull, a cow, and 2 pigs, the bear had eat 8 hens already. My daughter had a little white dog and he was barking at the bear. I guess he was tired to hear the dog barking because he run the dog home. My wife and son went to look to see what was the trouble and when they come out the bear was walking with a rooster by the leg. When he saw them he drop the rooster by my wife and son because he went by very close. My son pick up the rooster and he say, "At least this in one less he can't have for a lunch."

They went in the big barn. They saw feathers and blood. They closed and locked the door and went back to sleep until the next morning. Around dinner time the bear come out the other side of the road. My wife and my 2 small children, Guy and Andre, (nine and ten years old) look at him walking in the road and found he was fresh to walk, so sure of himself during the day. My wife told me that on the phone in the afternoon. I told her I'd be up and fix him.

When I come home I took my axe and my run. My wife told me, "Are you crazy? If you make noise around do you think he will be back if he hear that noise."
I answer, "He will come back. Wait and see."

This bear was very poor and he looked for food where he had a chance to find some. Then my small son hollered, "Dad, the bear come back slowly in the road!"

I let him come closer and I killed him with one shot. He didn't have the chance to jump in the wood.

One fall we were at the table eating our supper and a man come to my house in a hurry and told me, "Hurry, Joe, a bear came in the road." He
looked again and say," See, he just jump in the wood on the other side of
the road."

Then I took my gun and I look around for that bear. I finally saw
him and kill him. I start to skin him when I heard a noise behind me.
I saw another one a few feet behind me and I got it too.

We had a few bears around. One time my children, Rita and Charlotte, pick up a couple of pails of blueberries and put them along the road to
pick up a couple of cups of raspberries. One of my little girls put her
hands out ready to pick the berries and she saw a bear ready to take the
same berries than her. You could imagine they hit the road ready to run
home. They looked for their pails they had full of blueberries and they
were empty, by Mr. Bear. And on that subject I could tell you number and
number of bear story.

Once in August we had a phone call from Churchill, because at the
time we were living at Tramway Lake, and told us we had company there
come from Canada. My father-in-law and also my 2 brother-in-law also my 2
sister-in-law. I go get them with my boat and motor. I left about 3
o'clock and come back was very dark. When we were on the lake the big wind
start and we were 6 people and luggage in my boat and it was very hard.
I finally land my boat on a small island on Eagle Lake. It start raining
very hard. I went inside the camp to pick up drywood. I mean I took
shelves to start the fire in a boiler and I put this outside.
Then my wife, or game warden, could see us there and come to help us.
They were about 4 miles from where we were. My wife saw us and called at
the fire warden house and they said,"I like to go see with my boat and
motor and if it is your husband, I will turn my flashlight and make you
a signal twice."When the game warden was there he make the signal. From there
we took each half the load and land safely this way.
Once a man and his wife put a tent at Churchill at the end of the road near the lake. The man was doing maps for magazines and that day he took the car and went at Umsaskis Lake and Priestly Brook. When it started to be dark his wife was worried because she thought he never come back so late. She couldn't wait anymore. She start to walk and come to my house with a big knife in her hands; she said in case something happen. She want me go with her on the road to look if we could see her husband. All of a sudden after a few feet we were walking we saw a car light. It was her husband. I went back home and she went in her husband's car.

One funny incident happen. I went to look at my trap for mink, or otter at Churchill Lake about a mile from there. I had my big dog, Pete. It was the habit to put him off my sleigh but that time I didn't. That day the sky was clear and sunny. It was a very nice and quiet day, and all of a sudden I saw something running along the wood. The dog saw it too, as fast as me, and he run after it. He make this thing go into an old beaver house out of water. We could pretty near see all inside of that beaver house. That animal try to going inside of that old abandoned beaver house and could just half of himself. Then I went and I found out what it was. I took his leg and haul him out of there. It was a nice mink. I put my other hand on his head because I was afraid he could bite me. But I took a chance just the same. After I kill the mink and I rush to show that to my family because I knew they will be as glad as me to have this mink without a trap.

One time I remember I went fishing with one son, Marcel, at McKlusky Brook. We heard a noise not far from where we were. We went to see what it was, and we saw a female otter playing with her small one. We looked at them playing for awhile. Then we took the little one alive to show it to the rest of the family and bring it back. I took pretty near all sort of small ones to show to my family but always bring them back where they came from.
One thing I don't want to forget during the last war when the ration was on the gasoline the sports didn't come up so much fishing and hunting. The chief fire warden ask me with my oldest son, Paul, also some other men to work for him. We went. We were 6 men together. We took care of the telephone line, put it in good condition. We always start by April 1st and stay all summer on it. That first year I worked for him in August they had a big fire at Soper Lake by lightning. We all went there but another fire come someplace else. The chief went there and put me at the Soper on to conduct it. I went down to hire more men for that fire. The rain was pouring hard and the thunder was very high too. When the lightning came I could see by the head of the trees, where I was. My wife was at the shore with a lantern because she was afraid I could go down through the dam with my boat. I appreciate that. She come at the lake and run for the children at home. My boss called her and asked her if I was home. She said, "No, not yet." She told him she was in a hurry to go back to the lake to look for me. He told her, "Don't let yourself be wet like that." He also told her his truck was there along the shore. "Go in and put the light on and this way you will have 2 lights instead of one." She did that and I came to the shore safe. I guess I could have done with the light of her lantern but take longer. This time it was safer and shorter.

He was known as "Wild Man of the Allagash"

One year we were hunting a man who came from Canada. He was running because he didn't want to be draft for the army. He stayed in the wood all winter long. The trappers saw him once in awhile here and there. I mean man track, but the trappers didn't look at it too close because they thought it was another trapper. But this man was hungry and looked for food from one camp to another. He finally found a place where there was two sportsmen and a guide and a third one was fishing not far from the camp after supper. The guide had finished wash dishes and come outside to throw out dish water. The other man thought the guide was alone.
From the bushes he fired and kill that poor guide. The one who was fishing and the 2 other men in the camp call at Bangor, Maine to report that and give the bad news to the family and ask help to find the killer. There a chief supervisor in no time round up 50 men and 2 planes and also 2 dogs. The dogs come from Hartford, Connecticut. One plane was handy and ready for the doctor at Tramway Lake. All game warden and fire warden were called to search for it. Myself, too, I took a man with me who don’t know the woods. Our order was fire first at him and talk after I mean the one who could have the luck to find him and we had also the order to fire in the air once, wait 2-3 seconds, and fire in the air again 3 times.

He was around us but nobody had the luck to see him for a couple of days. He traveled during the night because he knew we were in the woods in daytime to look for him. One night he reach a camp and want to know if somebody was there. He fired in the window and 2 searchers were there sleeping. I imagine they were scared. They finally reach the teleph-ne and call their chief to give him the news at Tramway. They told to the chief, "Don’t call us because my friend and me hide under a bed. The killer fire in the window here!"

When the killer saw somebody at the camp he look for another place because he was very hungry. The plane cane near a camp and the pilot stop there to have a rest and left his coat and food. The pilot intend to sleep there that night. He saw somebody was there a few minutes before by what he saw--eggs shells all over the floor and had opercan beans and ate. He also took shells in a box for his gun. From there he went for Musquacook but in daytime he thought he was more safe. Further 2 men had a rest near a tree and they heard a noise and saw the killer coming because everybody had his complete description. He had his gun ready to kill again if he had the chance. I guess. They let him go by a few steps and then they told him, "Hey, stop!"

The killer put his gun but the men didn’t take a chance. They shoot
him above the knees and he fell on the ground. It was a big shot. The
gun was a 300 Savage. The men ran for him to be sure they have him. They
didn't want to kill him, if possible. They gave the signal in the air.
They put him on a stretcher and took him to the shore at Lake kusquacook.
The plane came and pick him up. The doctor was there too. They gave him
the first aid. Then he could go to the hospital at Greenville Lake.
Myself and another man were half mile where they found the killer. We
all went back to report to our chief and they took all of us in our
family by plane. For the killer, he died at the hospital. He had suffer
too much of hunger and misery to survive. God have pity on him!

I like to think about this. I believe it was in 1938. I had trans-
portation by plane with all my stuff except a small stove I want put in
there at Ross Lake. But the plane had a big load and besides I didn't need my
canoe for awhile. Then I decide to put the stove in the canoe and all the
rest of the stuff. I went until Sebemsecook Stream. I slept there near
the dam and I went until at the head of the lake-8 miles to cross.
I had a too big load but I took a chance. The wind blew up too much
before I came to my destination. Then I went to the shore and I had just
500 feet to do before I'll be there. The water get in my canoe. Every-
thing was wet, but I saved all my stuff. I was not very comfortable you
could imagine.

Another winter with my 2 sons, Paul and Gabriel, we decided to trap
Township 9 range 14 from Churchill Lake. The pilot took us there with
his plane and it was a small plane. The pilot made 3 trips. I ask him to
stop at Russel Pond not far from the camp where I had to go, about 10
minutes. Before the pilot left I asked him to come get us back the day
before Christmas because we wanted to be with the family for Christmas.

We had a nice catch of fur and the pilot came for us. He kept his
promise. The day after New Year's he came back to take us at Churchill
Pond. Branches and brooks were open there for beaver trapping and we stayed there until March. The plane came back at the end of trapping season to get us, my sons and myself, and furs and stuff.

One season in fall I was trapping on the Thoroughfare. I had a nice trap line on this brook. I had in mind to put a big bait there. Then few days after that I killed a pig and bring a piece of the pig gut and put a trap-number 4. I went the next day. I found in my trap one eagle—a golden one. I couldn't take him out of there without killing him. I took him home the same night. I called the game warden to report it. He offered me to take care of this eagle. Now I don't know but they told me he is supposed to be at Augusta, Maine. His wings measured 7 feet 7 inches and his legs were as big as my wrists. He is supposed to be in the museum. I killed him with a little 22.

I remember once about a hawk. I had a camp near Churchill Pond to trap and a hawk was there and when he start his noise we were sure to have a snowstorm the next day. Once in February he make noise during the night and we have the worst snowstorm—23 inches of snow. We had my son, Marcel and me to look at our traps. We made just 3 miles that day and we come back at our camp. And in February the snow is heavy. The next day we had a chance to start again and reach my 2 other sons, Paul and Gabriel in another camp. They were fixing beavers, also skin them. That gave them a chance to catch up on their work. We took 22 beavers that week. In all that winter, me and my three sons, we took 76 beavers. Also 35 minks and 4 otters. Also 30 weasels and 5 bobcats.

This time I recall something about an owl. I camp on the shore at Churchill Pond.

I remember the winter in 1939. It was the nicest winter we ever had for a long time since I was in the woods. The ice on the lakes and rivers were 4-6 inches thick and clear like glass. I was trapping at Ross Lake—
real name is Chemquabamticook. It is the higher place in that region. Windy every day year round. It was the year I saw so many trouts in all my life. They were quiet in the sand at the bottom of the water. I also saw trouts by the thousand. They looked to put their eggs in safety. We could see that at different places. The ice was so clear. I also saw beavers swimming under the ice. It was the only winter we had like that.

I also remember something—the time I had a cow and a bull. I cut my hay at Tramway Lake, 15 miles from where I lived. It was the only place I could cut hay. I took the hay on a raft of 30 feet long and 12 feet large. I put 3 tons of hay on this raft. One day when we took hay down to Churchill and bring back food to Tramway, one of my friend let me have an old motor to try it. Well, I take mine in case of accident. But on the way the gas pipe broke down. The fire run on the motor and on the boat where was my son, Paul, and myself. We were in the middle of the lake. Imagine being in the middle of the water and the fire caught on the boat and motor. I had a pole and I try to take off the motor from the boat, but took our shirt and finally kill the fire. On the shore were a bunch of students. They were on a fishing trip. They saw us in this situation and in a hurry they put in a canoe in the water and they come to help us. Everything finish, we thank them and hook our raft full of hay and went home safe that time.

Another time something happen to my second son, Gabriel. We had company and the men want to go fishing. I was working then and I couldn't go. My second son took them at Cliff Lake. They left the boat and motor at Churchill and took the trail for 2 miles long to be at Cliff Lake. At night they walked again to reach the boat. The big wind came up when they were fishing and the boat was not far enough on the shore. Then the wave shake the boat on the rock and it was a big hole on the front of the boat as big as my fist. They didn't have nothing to plug that hole. My son, Gabriel, took off his stockings and plug the hole and this way he bring back his men to the water were glad.
One summer I was on fire warden job, a bunch of school boys with two guides came fishing. They all came by truck and want to go fishing in deep water in Snare Brook on Eagle Lake. They were few boys and they need two boats and ask my second son, Gabriel, to go with them to guide them. Then my son took two boats, one behind the other. When they reach the place to fish, they stop and the second boat hit the first one, a and the motor come out and drop in the lake in 80 feet of water. The boys' guide were as sad as my son. They didn't fish that day. They finally came back at Churchill. We return back with rope and long hook to try to fish the motor out but without success. We had to forget it.

Another time I remember we went at Clear Lake to repair the telephone wire, and about 2 miles in the mountains we met three moose. They stopped and look and they didn't want us to go by. We didn't have any gun, just our small axe. We stayed there about ten minutes. All of a sudden they decided to go. We were not mad to look at them going. We walk and came to a camp. We slept there. The next morning we had to go to the end of the line, for about 12 miles, and about halfway we saw the wire was broke for about a mile long. It was by the moose. It is why that wire was in bad condition.

Something else, we had the priest visit once a month in summer. We had confession at night and a little sermon, too. The next morning was communion and mass and the priest visit the few families left there. Sometime I took him with me to take some trout. He was very glad.

When the LaCroix Company had finished to operate for good, all camps for choppers and lumbermen were closed. Before the road closed for the winter, in October, with my wife we went at 70 miles from Churchill and we made two trips. The first one was to have food for the animals for 7 months, and the second for the family groceries, medicines and clothes also for 7 months.
MY wife cooked breads with Fleichmann(yeast). She used a pound a month. She divide what she need by portion, wrap it and froze it. The pastry and all were made at home. Soft drink, ice cream, wine, beer. My wife needed sewing, knitting thread and wool for mittens and stockings and hooked rugs. Also braided rugs. I also made a big garden with the rest of the family like tomatoes, green peas, carrots, string beans, beets, cabbage, cucumbers, lettuce, and onions. For preserve, strawberries, raspberries, blueberries and rhubarb. We also put a lot of food in cans because we didn’t have the correct place to take care of that. We also canned meat. I killed a bull and a couple of pigs and about 20 roosters for meat and also a deer on top of that. The children were all young and in fresh air they all eat plenty.

I remember one summer a man from Florida want to open a place for sport. He had two men to help him. He asked me if I could take the men to feed them and a place to sleep. One day they stayed at his camp and the next at our camp. One summer my sister-in-law come to help my wife for the summer and the rest of the family we were 11 at the table. Well, we had to fix a pretty good size meal and beside the 2 other men, all of a sudden three trucks from Greenville, Maine bring food and stuffs for the sport camp at Chamberlain Farm. These men didn’t have nothing to eat since they start their trip because they were anxious to go back in a hurry and it was a long trip. They stopped at my place and asked me if they could have supper. They were nine men. They had a good supper and besides 11 from my family and the 2 other men, that day was a lot of food going by. But it didn’t show much because we had lots of food.

The road was closed for 7 months. The post office was at 16 miles and the first store at 42 miles. The mail in the winter came by plane every 4, or 5 weeks until the road was open in May.
When the company had its operation there at Churchill, (LaCroix) there were 24 families at Churchill Lake and we made parties, playing cards, and made games, and jokes and histories. We all enjoy ourselves.

One fall I had 2 little snowshoes for my last 2 boys, Guy and Andre. They were hand-made. I knew the boys will have fun to use them in the wood around where we lived to put traps for weasels. Like the older ones, they had their snowshoes and skis. They had nice spots to ski and with the other families there, they had plenty of fun.

One fall I was ready to move for trapping. The Fish and Game plane came in to plant wild rice on ponds for ducks and they stayed with me overnight at Churchill. The next day they went at Clear Lake for rice for ducks also. They took my picture because I was ready to go trapping at Ross Lake.

Another thing I remember one of my girls, Rita, tamed 2 bulls like a horse and she carried water in summer and plowed the road and haul water too in winter. In springtime we cut our wood with my sons help and the girls carried wood and blocks of ice. We put it aside and covered it with sawdust for all year round. We used it in our icebox. We didn't have frigidaire. It was not much known in these years. After we opened the sugar camp with the help of the girls and the boys. We made syrup and sugar, etc. and we never forget I each time we made sugar we made special treat for the kids. To pick up the sap we used the bull and when it was impossible, we used Pete, the dog. When the day finish we all came back home all tired but also glad we made a good day's work.

In the first years when I start to trap mink, the law was until October 15 until the last of February. When we hauled wood with the tractors and the brooks were near the road, like
Leadbetter, I had a trap about 100 feet from the cookroom and also in another place in the outlet of Spider Lake and Grass Pond. I put trap in all these place and I took minks. One day I was putting a mink pelt on a streacher and the game warden came all of a sudden. He say, "Well, Joe, you took more mink. I can tell you something now. We watch you for a long time. We thought you bought them, but we were wrong and we want to ask you something. Joe, please don't you tell nobody the way you trap fur, especially mink, because if few men know the same as you, all the mink will be gone in couple of years. I know your boys and girls know the something, too, but tell them not to talk."

In the summer I went fishing on the Allagash in the dead water. And there was a little brook running his water toward Allagash. If I want a mess of trout for supper I was sure to go there and take my limit. And not far from there I saw a tree fallen in the water. All of a sudden I saw a mink. I stopped to fish and another mink came, too, and both start to play and plunge for little fish. I looked at them for about 15 minutes. They also feed on crawfish and clams.

The company had finish its wood operation and the next day I decide to take my family to 15 miles lower at Churchill Lake. I built a camp and in the same year I also built a boat and bought a another motor. I decide to take my guiding license and take care of the one who like to come up fishing. I received lot and lots of letters. Then my oldest girl and my wife answer and then date them. One group left at night and I took another one in the morning all summer long. But the second year I had to refuse some sports because I didn't have time to furnish to take them all fishing. And finally I had to take my 2 sons and another man, too. I had demand from Vermont, New York, Massachusetts and also Florida.

Once a party from New York, two men and two women come up to fish with flies. One of the women, she didn't know how to fish.
We left Churchill and went at Umsaskis Lake, eight miles further. From there we went at Chemquabanticook Stream and to Harvey Brook where we tried our luck and no one of them knew about what kind of fly you have to use. I told them the one, the Royal Coachman, it was the best one for that day. We fish there about 25 minutes and we had our limits. At the time the limit was 15 pounds each and the woman never took a fish in her life before. She had a chance to hook a trout about 5 pounds, a squaretail trout. You could imagine the excitement in the boat. I hollerred at her, "Let go the trout until she'll be too tired to fight, then you could land her easier in the boat!"

One day the president of the company came to me with 2 Japanese and asked me to go fishing with them. I took them on a brook to show them something they never saw before. These Japanese were in business for the wood. I mean buy wood from the company to ship to their country. I took them fishing to Soper Brook, the best place for fishing for trouts at that time of the year. We fished a little bit then put the tent up. We made beds with branches of fir trees. We light a fire for supper. After the darkness came up we went inside the tent and talked awhile and went to sleep. The next morning we had breakfast and fished again. When they had their limit, we pick up all their stuff and went back at Churchill. They were very glad from their trip.

Another time the president of the company ask me to take care of a banker from New York. They were 2 men. They took their limit, and after that I had to take them 60 miles in boat at Allagash Inn. We slept there and the next day I come back but I stop to sleep at Cunliffe Depot. The next day I come back to my family.
I also like to talk about what we were doing in spring after our work finish and also our sugar camp close until we return to take our work on the telephone wire and wait for our road to be open. We try to take the life easy a little bit. The daytime we fix things around our camp and at night we play cards and listen to radio. In winter my wife and my two oldest girls, Theresa and Rita, knit woolen stockings and mittens and hook rugs and also braid rugs and embroidery lots of things. We didn't have school at Christmas time. I had to send the kids in Canada and boarded them there. Two boys, Gabriel and Marcel, and two girls, Rita and Charlotte, at a time, for three years at convent and college. After, two boys alone, Gabriel and Marcel, for Christmas and Easter vacations came by plane and the mail came in the same time. Also a boy, Marcel, and the last girls, Charlotte went at Lake Frontier to and also stayed there and come by plane, too.

One time when the pilot took my kids home, he land at the Dam at Churchill. The pilot was in a hurry to go back before dark I look at him go but he made a quarter of a mile and come back to the landing. He told me his gas was frozen. He came at my house to call Clayton Lake to have a small plane with equipment for his frozen plane. The next day when they worked at that I went with the pilot at my trapping camp. I had a full bag of breads to drop about seven to eight breads. We made a circle around my camp to drop the bread bag in the snow. The next day we found 12 inches of snow. We didn't find it too much snow on the top of it. I had flour. I spend 150 pounds of flour I cooked in biscuits. And for our can goods, onions and potatoes, we put that in the water. We didn't want it frozen. We bring our meat cooked already besides deer and dry beans. I made them in a small oven I fixed in the stove pipe and I am ready to say I had a better result than electric stove today.

I come back to the bag of bread. It was at the end of February and we had just a week to finish our trapping and go
back home and no more bread and no more flour. We start looking for that bag of bread. It was under the snow since two months ago. About 10 feet from a brook my son saw fox tracks. He went and look around and the tracks went directly for the bread but the foxes didn't touch nothing. The breads were good and still frozen and we had enough until we come back home.

One time we had pigs. We kept them in a small pigpen down the road. It was late enough. My wife and children heard noise around there before dark. They decided to see what was that. They light the lantern and they went there. They saw a bear jumping for the woods. Everytime the pigs smells, I mean sniff around, the bear put his paw on them. They had all their back full of blood, but Mr. Bear never had a chance to come back. Two days after he was in a trap I put for him.

One day I ask my wife if she wants to cook small potatoes for pigs in a big cast iron pot outside. She start the fire and keep to put wood until the potatoes were cooked. It was the time of deer hunting and I was with three men I told my wife, "Don't let the dog out after supper in case he could be angry with the people in deer season." It was because when some thing was around he always protect it. My wife was outside with one of my sons, Gabriel. They carried the potatoes to a big wooden tub and I mixed mash with the potatoes for a week. It was a big help because they didn't have to do it for two, or three days.

During the time they carried the potatoes to the tub my wife heard noise. She ask my son, "Did you let the dog out?"

He said, "No!" When they heard more noise and saw the dog sleeping in the front of the stove. They return to finish their work and saw the noise come from outside. The next day at daytime they looked around and it was a bear come for a visit. Two, or three days after, he come back and was walking on his hind legs and close to the house. He tried to have a can of beaver oil that I put aside to rub my leather boots, etc.
This can was hard to get for Mr. Bear to reach. I heard the noise. I took my gun and shot at him. I don't know if I kill him but he never come back.

One thing I want to say before I forgot it. Maybe somebody think it is fun trapping and hunting. You could enjoy it like I had. I think I had it in my blood since I was a young kid, but I found out a little difference. I mean it was also very hard and very rough. In winter the trees were full of heavy snow. I have to take my axe and cut the branches and I had the snow all over me. I mean all over my neck! I had to make a trail to go to the place where I want to put my trap. But, hard or not, I enjoy it very much and I want to trap until I could not do it anymore.

The reason I came out of the big woods, my legs couldn't take it anymore. And also my shoulder. I still have THE BIG lumps on my shoulder that I will carry the rest of my life. After 2 years on the farm I rest enough so I feel pretty well now. But when the trapping season opens up I'm still trapping around Lewiston and Auburn, Maine. I am going fishing, too, in summertime. I enjoy it but this summer I expect to go back to Churchill Lake to see the old country again on a fishing trip. After all the years I stayed in the woods, I mean we were there all the family for 20 years. The boys and girls start to like to come out to see the world. For myself, my legs was not too much good anymore—walking too much—but it was in my blood, and nobody could stop me guiding and hunting and fishing, and trapping. I bought a farm in Maine, not to farm but to stay on it. I trapped a little bit around here every winter, not so much fur as in the woods, but at least I have the pleasure to trap a little bit. Right now I bought more traps and a little boat. I expect, with luck, to take a little bit more fur this year if not too many trappers around.
As long as I am in it, I am always thinking about something serious about the hunting season. It is disgusting the way the accidents happen. I spent 20 years in the big wild country and I had my guiding license. I never heard a hunting accident around where I was. For myself, I am scared right now to go hunting. I am still going but I am trying to find a place where there is not too many hunters. With all the advertising about the rules about hunting, it don't seem to do anything. Many times I was in the woods and I hear noise was coming toward me but I never cock my gun before I see what it was. Seems to me some people don't put it through their head it could be anything. It could be a bear or a deer or a man. You never know. There are too many hunters who are trigger-happy.

Something should be done; but for me I don't care if a hunter is dressed up blue-green, or red. No matter what color you have, you have to look to be sure of what you shoot at. I know I had a fun experience myself. One time I was walking slow. I was not too far from my camp. I heard a big noise close to me.

What I done, I put my hand on my revolver. I didn't pull my revolver out of my holster. I wait to look. You know it was a boy, fifteen years old. He saw me coming down the trail. He hid himself and was making a noise and breaking a few dead twigs trying to scare me. So he come out of his hiding place in a pile of brush. I told the boy right there, "You know you are lucky it was me." I told, "Don't do that to anybody because you could get killed." There should be a severe law so it would not happen so often.

I like to mention something. I also never forgot my camp was at 4th Russell and I was on the trail of my traps all day long. It was dark around 7 o'clock and all of a sudden I heard a noise like the fight of wild animals. I decide not to look for it because it was too late and dark that night. Then the next day I went early to look what it was. About a mile from my camp I saw a lot of hairs and blood all over the snow. Two bobcats had a fight. I think they have a big fight by the look of things all around.
I also like to say something funny. A friend of me, and my family, Jim Clarkson, (He is dead now.) he had the telephone in his camp at 9-14. One day he went visiting his line to repair it. He bring his lunch and put his tools and lunch bag in his basket. He also put his false teeth in paper towel in his lunch bag because he put his teeth in just when he eats. When he came back later on his basket was all turn up and his lunch bag was gone. Also his false teeth—you can imagine! He follow the track and he found empty bags and his teeth further. He was glad but we teased him very much on that.

One day Jim Clarkson came to see me and ask me to show him my method for trapping the mink and otter. I knew he don't spread this to nobody. Then I decide to show him how to do it. It was late in the season but the winter after was very good for him because he knew how to do it the right way.

One day I left home to pick up traps on Pleasant Stream and it was the coldest night I ever saw. It was 65 below zero and I was well-dressed for the cold weather. I had moccasin. When I hit the lake on my way back at the edge of the wood I built a fire to warm my feet. After I was all warmed up I went back home and glad because I never saw a weather like it for that winter, at least.

Also the last year we were there the boys, Paul and Gabriel went to get the traps at Snare Brook and the snow was in the woods but the ice was just out. I mean all melt on the lake. They took my boat and motor and went across the lake until 4, or 5 miles on the brook on account of the waves. They walked 3, or 4, miles to reach the camp where was the traps. They made 2 trips to carry everything. They also built 2 rafts to reach the boat and motor. When the raft reached an obstacle, like log, or beaver house, they fell in the icy water. It happen 2, or 3, times until they reach the boat and rushed for home and had a hot supper. Glad to be back.
Once I ask Theresa, one of my daughters, to look at my traps along the Big Eddy and she found one otter. She set the trap back and bring the fur animal home. I skin it myself for him but she was very thrill to bring that home you could imagine.

Another time I was trapping around Tramway, head of Chamberlain Lake and Russell Stream and Snare Brook and part of Soper Brook. Then the Snare Brook was too far from Tramway. Then I ask the game warden if I could use his camp. He gave me the permission. One night I heard a noise like a baby crying. So I went to look what it was. I look all around and didn't find anything. I went back inside of the camp and I heard the noise again. So I went out again with my flashlight and I spot in a tree a porcupine.

In 1946 we left what we had too much load to take on the plane like traps, bedding, rest of food, etc. We took specially our fur out and the rest stay in the camp. My wife and me come out with one car, a Ford 1942. It was pretty near new. One man has to come out for sickness and he call me and ask me if I want to buy his car. He didn't have license and registration. It was just in woods and he took this car just once in awhile. This car was more than in good condition. I bought it. I have to go by plane for Caribou, Maine to have my plate. Funny thing the ice was out but just clear on one side. Then the plane could land there. We took a chance because we were afraid the wind. The ice could move this side. I came out with the plate of the car as far as Waterville and one of my friend meet me there where I called him. He was Chief of Police and me and my wife stay 2 days at his house and he come with me to have my driving license. In the same time I want to look for a place. I mean a small farm. I always like a farm. My sons and daughters stay up at Churchill. During that time my two sons, Paul and Gabriel, went to Thoroughfare to pick up the stuff who was there. It was snow in the woods, first part of May, and the ice melt pretty late around there.
(More on early years)

So finally I go there in January of 1926. The tractor was hauling stuff from Lake Frontiere to Clayton. Some tractor was hauling railroad cars. They put wheel of the car on one sleigh. The rest of whole car was on another special sled for that.

So they were waiting for a new tractor, number 10, for me to help the others to haul the rest of the stuff, meaning all the rails and locomotive to build the railroad. And also all the food for the next summer, meaning sugar, flour, raisins, etc. They swamped a road from Clayton to Tramway in winter. It is located between Eagle and the head of Chamberlain Lake. In summer they build a road from Lake Frontiere to Clayton Lake. The road was rough and at St. John they didn't have a bridge yet. We had a ferry boat. I was supposed that spring to see my family in Canada but they asked me if I could stay and take inventory of the warehouse they had at Clayton Lake, also at the office and at the storehouse. After I went in Canada for a couple of weeks in my family. We were all glad and happy together. When I came back we rode in company trucks from Lake Frontiere to Clayton. From there to Churchill they just start to build the gravel road and I put my pack sack on the wagon. Four horses hitch on it and they were toting some food up at Churchill. We walked the 16 miles. From here we took the boat from Churchill Dam up to Eagle Lake where Tramway is. Where the big operation was ready to start to build the railroad. We put the steamshovel together to start the job. My brother-in-law was there. He was mechanic man. He design flatcars so they can load pretty fast.

I was running one small locomotive. We stayed all summer there and stop in fall. During that time I try my luck on trapping. It was my first year, lots of furs all around, but couldn't take them all because I was a novice in that. Also it was my first year in the big woods. I was alone. In springtime I went back on my job and we finish the railroad that year. We start haul pulp on the car. They had 2 crude oil engines to turn the chain and was loading 2 cars of wood at once.
I haul 14 cars on tracks for 13 miles. The first year we haul 65000 cords of wood. We haul about like that for 5 years. We used to start the mechanic job to repair the machines, like steam engine. I was not a mechanic man but we have a real good one in person of my brother-in-law, Emile Labbe. He come around to check our job once in awhile to see if we were doing the right thing. He was also electric man and was able to do lots of everythings-the one of the best we could find in that field. He also patent the cars to open all in one side to drop the wood in the lake. It took about 182 cords of wood in 20 minutes. They used to cut logs and pulp in mid-summer and had to be hauled on tractor in winter. Those tractor were always on repair because they had to put too much weight. Finally Emile Labbe, he watches them so close, he said they could be improve. And he did. Instead of having winter lag, he put a winter one and a summer one. So this way they didn't chew all the ice and they could haul heavier loads. During that time trapping start October 15 and close, for me, January 11 because they want me back on the tractor.

One winter Guy was 9 years old and Marcel was 12 years old. They ask me to go see a beaver house at Harrow Lake 'bout 5-6 miles from the house. I told them, "Go if you like," but they also want to take Andre with them. I told them he was too young-just 8 years old- and also too cold. He was better around the house. They put their snowshoes on and left. They found a beaver in the trap. Too heavy to bring it home so they skin it and bring it better after that. but they had their lunch and a teapot. They put loose tea and water in the pot and gave so much attention at their beaver they forgot their tea. They empty it on the snow. It was so strong it stain the snow. They went without tea that day.
One year I decide to send my fur at Sears Roebuck at Philadelphia. I always had a good price for it and that year I received a nice letter with a check reward of $7.00 and also a certificate and that was that.

That same winter I want to see what my sons were doing and bring them some food by the same way in case they became short. I was trapping with my son, Marcel and took him to see his two brothers. During the night we had a big snowstorm, 27 inches of snow and we had to go to Snare Pond. We wait in camp to see the weather. We finally decide to go out and break a trail for a few miles and be back and finish it the next day. We found 8 beavers that day only. We stay at their camp that day to sleep there altogether and I made a batch of biscuits that morning for all of us. You could imagine but they all could make nice and good biscuits. After washing the dishes we come back at our camp.

I like to mention something the last winter we stayed there. Rita and the other kids were playing Hide-and-Seek. All of a sudden Rita hide behind the house. She was running and fell and her arm hit a little twig. Blood came out, she rush home. I fix that and a couple days after, at school she had pain. The teacher took out a little piece of wood from that small hole in her arm and 2, or 3, more days I call a doctor. He look at it and fix it and fix it and say nothing there. Everything is OK. A week after she show me that aND I took a pair of pliers and take a small piece of wood out and also a third piece come out. I was as much doctor as he was, I guess.

I called once the plane from Caribou to take my stuff over to Churchill Pond. I told the pilot to circle over Thoroughfare Brook to see one of those branches because one of them seem to me the end of that branches was coming towards my camp. Because if I go over the mountain and hit the brook it was too far. It took 24 hours to go back and forth. So one day I decide to follow the brook and go right up to the end, me and Marcel, my son. It was three o’clock in the afternoon in January. I know Priestly Mountain was at my left and the brook was at my right. So I tried to reach my camp through the wood, in
the thick wood, to reach the camp. Finally we reach the camp about
50 feet from our camp. I thought it was good without a compass. I spot
the trail the next day and it save me 10 hours walking. From there we
had just to go there in 40 minutes. Thanks God I never was lost in
those trails. I cut few like that.

On delivering a baby:

When my wife start in pain she call me and I put water on the wood
c bottleneck to have it boil and be sure of that, and stay with her until
the baby was born. After I tie the cord near the baby’s stomach and cut
it near the knot I made, and help my wife with the rest(afterbirth?).
I burn it in the stove and be sure it is all burn. Wash my wife good,
fix her bed clean and nice. Then she could be comfortable and after that
I took care of the baby. As soon as he was born I wrap him in a wool
blanket right away until I was ready to take care of him. Myself, when
I was alone wash him very well and clean and dress him, and put him
in a little bed we fix for him before he is born. Everything always
came out OK. Both my wife, and the baby, were always in good shape
and I was proud of myself. I also have the rest of my family in good
health.

One spring my last son, Andre, at the time was 5 years old. He went
with his brothers and sisters just to look them to swim. He had on
a little yellow suit and yellow socks, brown cap, and brown shoes.
First thing he was so interested to look at the others he didn’t saw
the bags of sand slip under his feet. He slide in the water, sit in
the water, covered him completely. The two boys saw the bubble. They
rush to him and pull him out of there safe. We were all glad.

One year, I mean the last year we stay there, the boys didn’t want
to go anymore to school. Then I said,"Okay. You won"t stay." Then I
asked Paul, my oldest son to take Gabriel with him and myself, I took
Marcel with me and we all trapped. I send PAUL AND Gabby to Snare
Brook. They could also trap a couple branch around there and, with
Marcel, I took care of the rest. I send a plane on Russel Stream to
bring them stuff, food and the rest. So the next day they left on snowshoes from Churchill to Snare Brook and fix up the camp to stay there. No windows. They took burlap bag and put them in the windows for the night and set up the little tin stove for the night. It was a very cold night, the last part of December. They lay down on one old door near the stove. They start to sleep and all of a sudden Gabriel woke up because his pants was on fire. Too close from the stove. You could imagine he run for outside and roll himself in the snow and kill the fire. Went in the morning at three miles, get their stuff and was glad to change pants. If they were short on food they could come see Marcel and me.

One year I decide to send my fur to Sears Roebuck at Philadelphia. I always had a good price for it and that year I received a nice letter with a check reward for $5.00 and also a certificate and that year was 1934 and the date was 26 December. It is a nice souvenir to look at. I was very proud of it.

The year of 1945 we had the worst snowstorm in the year. My two sons, Paul and Gabriel, were building a small log cabin for trapping and all of a sudden the food came low and they decided to come down home to take some. The heavy snow start in morning. They thought the snow will stop but, no, it still falling late. Finally they decide to come home. They left in the afternoon. No flashlight. No snowshoes. We had 30 inches of snow. When they reached home it was 12:00 at night. We heard a knock at the door. I open the door and there was my 2 sons tired and hungry and all wet by the storm. The next day they took their snowshoes and food and found their tent down on the ground by the weight of the snow. They shovel it and put the tent up again for a couple days until there camp was ready to use. You think they were glad when everything was all finished!

I used to go by Jim Clarkson camp once in awhile. He make the best biscuits that I ever ate. He was one of the top and I learn from him to cook mine. Maybe they were not so good, but not too bad, too. One night, early in June, he was sitting outside of his camp and was watch-
But in the fall, when we stop, I said to myself I like to stay here and trap the fur-bearing animals. So the nearest store, for traps, was in Greenville, or Bangor, so I send an order for 9, or 10, dozen trap different sizes. As soon as the traps arrived, it was the last part of October, I hit for what they call Russell Pond. About where I was from Tramway to Russell Pond, it was 8 miles. On the Russell Stream of ¼ mile from 1st Russell, there was an old camp in there. So I fix up the camp a little and haul the provisions on my back from Tramway to Russell and I spent the winter in there. I didn't get too much. That was my first fall and winter trapping. I got 10 mink, 29 weasels, 22 foxes, and 11 bobcat. For the first winter I thought it was pretty good, but I knew a good experienced trapper would do more than that because the fur-bearing animals were pretty thick in there.

So in the spring I went down in Canada for awhile to see my family. The next summer I went back in the big wood again on my job brakeman. That summer we finish the railroad and haul 65 thousand cord of wood to be dump on Umsaskis Lake and in the fall everything stop again until the next spring. So I trap again that fall. The more I trapped the more I was liking the big wild woods. I done it for 4 falls and winter and 4 summers was working for the railroad. So I decide to go down to Quebec to get the visa for the whole family. So in December, 1929, here I was with my family in the big woods.

I was working on the railroad in the summer and trapping in the fall and from January I was hauling pulpwood with a tractor, a 10-ton Lombard, about 10 miles back from the shore of Churchill Lake. I stayed with the company 6 summers and I trap in the winter. But the company closed after 6 years. In the same time the Fish and Game Department from Augusta, Maine open a few towns to trap beaver and so the company was gone. I took my guiding license on here. I was guiding fishermen from everywhere in the United States and Canada. They used to come up by the old private road in the woods, 42 miles to reach Churchill Lake. The second summer I had twice as many fishermen as I had the previous year. In 1932, the Madawaska Company had some big buildings at what they call the Tramway and the boss came to me and ask if I could take care of his building up to Tramway while I was trapping. I told him yes so I had to change my plan for my trapline. When the lake was open water I could travel with my boat and motor. After it was frozen I
had to go around the woods about 25 miles from Churchill Lake to Tramway and I used to stop overnight on Snare Brook. The company had a building full of equipment and food, bedding and the equipment to make the drive on the brook in the springtime.

One night when I reach the camp I found a broken window so I unlock the door and found a mess in the building. A barrel of flour all tore down and a barrel of lard all on the floor. I knew Mr. Bear had been in the camp so I didn't make any fire that night. I was afraid the smoke scared them away. I ate a cold lunch and I made my bed just before dark and did not make any light either. So I put my revolver under my pillow and I didn't sleep too much that night. It is not because I was scare, I was watching and listening all night. Nothing come. So the next morning I hit the trail for Churchill Lake.

In 1932 I decide to learn the nature of the water animal like mink, beaver and otter. In 15 years I learn about their habits, how they feed, and how they play, and where they go to have their small ones. I learned that when I was fishing alone in my boat. I remember one summer I watched 2 mink play and they were feeding at the same time. I watched them for 2 hours solid and the same time that gave me an idea about how to trap them and otter and beaver. Just the same I know their habits from A to Z.

The next fall I try different set for mink and otter than first year. I got 33 mink in 6 weeks. Of course, we had then from the 16th October to the last of February, but they change the law. We get only a month now, November. I was getting them so well. About 7 years after that a game warden came to me and I was skinning another mink. He told me, "Joe, we know now that you're getting them alright," he says, "but we been checking you for quite awhile. But", he says, "we know how you're trapping them. But", he says, "Joe, do me a favor, will you? Please keep your mouth shut and keep your secret to yourself because," he says, "if we had 10 trappers like you in the state of Maine we wouldn't sell any more trapping licenses. In 10 years from now it wouldn't be anything left."

I used to get 6, or 7, otter every year and beaver, 50, or 55, every year except the last year. In 1945 I got 76. It was my record.
I had some years pretty tough. The snow was deep and it was cold. If I remember right just a week before Christmas it was 60 below zero. I was camping out on Pleasant Stream. It was dark and the wind was blowing pretty hard when I hit the lake. I had about 2 miles to go. I couldn't make it. I made for the shore in the woods and built a fire. My feet were freezing on the snowshoes and I was wearing 2 pair of socks, 100% pure wool from Canada, and a pair of sheepskins and what they call "mucklucks" made by Indians.

In October I thought I would get a bear. The company were butchering beef. A little ways in the woods they used to throw the head, the legs, and the inside. I thought it was a good place to set a bear trap so I set 2 traps. I was anxious the next morning to look if I found 2 bears. I got a medium size one. I reset the trap and in a week I got 7 bears. So I quit that fall about the bears. In the next spring, in about April, I set another trap for bear. The next day I went back and found a she-bear in the trap and 2 cubs near her side. When they saw me they climb a big tall spruce, so I shot the mother with my 7.68 revolver. I went back to the camp and got another fellow with me. We went back at the big tall spruce and here they were right on the top of that spruce. We had some haywire with us and climbed the spruce with a snare. I had made it with the haywire. We got both of them, put them in an empty bag, and brought them to my camp. I keep them alive tied up to a post. Kept them for 2 months and finally 2 sports came along and they bought them.

So about the bear again. I was working for the forestry service as firewarden. I was on Allagash River with a canoe and we were gone for 4 days coming back at Long Lake dam. I call my wife to let her know we were safe at Long Lake and she told me she had a visitor last night. A bear went in the small henhouse. I had about 25 hens and she told me she heard a noise and she got up and call my oldest son. So he got up and got his revolver but in the same time he was afraid to go to the henhouse. So my wife was holding the flashlight and the boy was so afraid he was walking behind his mother. When they open the shed door she threw the light toward the hen and saw the bear making for the wood.
I told her on the telephone I would be there the next day around 3 in the afternoon. So then I was home. I went to the henhouse and there were about 10, or 11 hens missing and feathers and blood all over the place. So I come back to the house. I grab my old 30 Winchester. My wife says,"No use to take your rifle if you are going to set a trap." I said I was taking it in case. I took bear trap, got ready to set the trap. The kids was playing around the camp and one of my kids says, "Hi Dad. The bear is coming on the gravel road toward us." So I run to the corner of my camp and I plug him about 1 inch above the eye. He went flat on his belly dead. So I didn't have to set the trap.

One night I was coming from my trapline. The boss wife stop me and she told me,"I am alone. My husband is away for a couple of days. He might be back tonight, but I heard an awful noise. There is a bear around my shed because this morning I look in the barrel where I throw my swill. It was upside down." She said,"I am scared." She ask me to set a trap. I said,"It's kinda late, but I will go home, have my supper. I will be back with my flashlight and the bear trap. So I set the trap not too far from her house and coming back her husband just arrive home. So when he saw me he come out,"Won't you come in, Joe?". I said it was kinda late so we keep talking outside for 5, or 10 minutes. We heard a noise and that noise was coming from where I set the trap. I told the boss,"Let's go towards the trap. I bet that's the bear." We were running in the trail with one flashlight and when we came close he was afraid. He turned back with the flashlight and here I was alone in the dark with my revolver in my hand. So I decided to let him have it in the dark. I had an automatic and I fired 7 shots. I hit 3 times. So I went back to the boss camp and says,"Come on. I bet you that bear is dead." So he came and sure he was dead. So coming back with the bear the boss wife come out and look at the bear and she said,"I'm sure glad that you get him so maybe we can sleep tonight."
**Student “K-W-L” Chart**

Name ________________________  Topic ________________________  Date _____________

“K” – Write down words, terms, or phrases you associate with the topic.

“W” – Choose an idea from the “K” column; what would you like to learn about this topic or idea? Phrase your thoughts as questions.

“L” – Enter any answers to your “W” column questions or anything you found especially interesting.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>What I Know</td>
<td>What I Want to Know</td>
<td>What I Learned</td>
</tr>
</tbody>
</table>

---
**EXAMPLE**

Following is an example of a completed “K-W-L” chart that students might complete if they were reading a text about gravity.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>It keeps us from floating around.</td>
<td>What is gravity?</td>
<td>Gravity is the force that pulls objects towards Earth.</td>
</tr>
<tr>
<td>It makes things fall.</td>
<td>Why is there less gravity on earth?</td>
<td>The amount of gravity there is depends on the masses of the objects involved. The moon is a lot less massive than the Earth, so there is less gravity on the moon than there is on earth.</td>
</tr>
<tr>
<td>There is less gravity on the moon.</td>
<td>How did Newton discover gravity?</td>
<td>Air resistance determines how fast something will fall to the ground.</td>
</tr>
<tr>
<td>Isaac Newton discovered gravity.</td>
<td>What determines how fast something will fall to the ground? <em>(teacher question)</em></td>
<td></td>
</tr>
</tbody>
</table>

Note: The students’ question about Newton was not answered in the text. Students should be encouraged to consult with other sources to find out the answer to this question.

**Life in Allagash Waters**

**Subject:** Living Environment/Life Science.

**Grade:** High School (9–12).

**Time Frame:** Approximately 6 hours. Activity should be broken into 1-hour increments at four different Waterway sites, and allow 2 hours for data graphing, interpretation, and presentation.

**Prepared by:** Amanda Barker.

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**Lesson Overview**

This activity allows students to explore the biotic and abiotic components of aquatic ecosystems that are within Allagash Wilderness Waterway. Students will work in pairs or small groups to collect samples from four different aquatic ecosystems. Students will use the data collected at each site to make conclusions about aquatic biodiversity and how changes in the environment affect biodiversity.

**Learning Objectives**

The student will (a) practice and demonstrate proper specimen gathering and documentation procedures; (b) graph and interpret data; and (c) form a conclusion about how environmental conditions affect biodiversity.

**Academic Standards**

The Maine Learning Results (MLR) and Next Generation Science (Next Gen) standards both apply to this lesson.

**Maine Learning Results**

**HS Science and Technology E1:** Biodiversity – Students describe and analyze the evidence for relatedness among and within diverse populations of organisms and the importance of biodiversity.

**E1d:** Analyze the effects of changes in biodiversity and predict possible consequences.
Next Generation Science Standards

HS-LS4-5 Biological Evolution: Unity and Diversity – Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Waterway Interpretive Theme

Theme II – Flowing waters sustain wild life throughout the Waterway

Life Support Sub-theme: Plants and animals depend on life-giving water flowing in Waterway soils, streams, wetlands, ponds and lakes, and the Allagash River.

Materials Needed

☐ waders or hip boots (optional)  ☐ light-colored tray
☐ meter stick  ☐ dip net or fine kitchen strainer
☐ Secchi disc on calibrated line  ☐ electronic thermometer probe
☐ pH meter  ☐ hand lens
☐ orange bobber  ☐ plastic containers with lids (~10 per group)
☐ 50m tape measure  ☐ Rite-in-Rain paper
☐ thermometer  ☐ clipboards
☐ 6-inch pipettes  ☐ graph paper
☐ plastic spoons or soft forceps  ☐ pencils
☐ stopwatch
☐ Site Characteristics Data Sheet; see Waterway Lesson Plans, page 74.
☐ Next Generation Science Standards Rubric; see Waterway Lesson Plans, page 76.
☐ Conclusions: Claim-Evidence-Reasoning Model; see Waterway Lesson Plans, page 77.
☐ Student Lab Guide; see Waterway Lesson Plans, page 78.
☐ Delorme Maine Fishing Depths Maps Atlas

Prerequisite Knowledge/Skills

This is a high-school-level activity where it is expected that students understand that ecosystems are made of both biotic and abiotic factors. Prior use of a dichotomous key is expected.

Teaching Procedure

Engage

1. While in a campsite, tap the students’ prior knowledge by initiating a discussion on ecosystems, particularly if the ecosystems students are familiar with differ significantly from what you are experiencing on the Allagash Waterway. Guide students to create a working definition of the term ecosystem. Further guide them to define the differences between an aquatic ecosystem and terrestrial ecosystem.

2. Explore a section of shore from your campsite. Ask the students to describe differences between the various abiotic factors that they observe as you explore.
3. Ask the students to describe differences between the various biotic factors that they observe as you explore.

Extension

An excellent resource for determining specific ecosystem types is *Natural landscapes of Maine: A Guide To Natural Communities And Ecosystems* by Susan Gawler and Andrew Cutko. Students could practice identifying ecosystems around their campsite.

Explore

This section is broken into three components to be completed at four different field location sites. You will need to make four copies each of Data Sheets 1 and 2. It is recommended that these copies are made on Rite-in-the-Rain paper and kept on clipboards. Alternatively, students could be provided Rite-in-the-Rain notebooks and create their own forms and tables to record their data.

1. Determine site characteristics at four different sites.

   It is recommended that students select four differing sites. These can be predetermined prior to your trip. One site should be directly in front of a used campsite. Suggestions for site selection include fast-moving water (such as a small, rocky-bottomed stream or section of fast-moving river) and slow-moving water (a muddy-bottomed cove area, the deep part of a lake or pond, a deadwater section of river) or a continuum of sites from a headwater stream, through a muddy cove, into a lake, and then in front of a campsite.

   a. Determine the acreage and depth of lake or pond sites or the average width and depth of a river or stream. Acreage and depth of lake or pond sites are best researched prior to the field exercise. Search “Lake Survey Maps’ on Maine Department of Inland Fisheries and Wildlife website or consult a Delorme Maine Fishing Depths Maps Atlas (may be out of print).

   b. Measure air and water temperature

   c. Measure transparency

   d. Determine stream or river velocity and discharge

   e. Measure chemical characteristics as applicable. It is encouraged that at least pH is measured at the surface for all sites; pH is included on Data Sheet 1. Other chemical characteristics that could be sampled include Dissolved Oxygen, CO₂, total dissolved solids, Nitrate (NO₃), Phosphate (PO₄³⁻), and Sulfate (SO₃²⁻).

   Allagash lakes are deep with Eagle Lake plunging to 124 feet and Chamberlain going even deeper to 154 feet. Testing at regular intervals with the equipment available in high school labs quickly becomes impossible. Use your discretion given the constraints of the equipment you have available to determine what makes sense for your students to test and to what depth. A data sheet has not been included for chemical characteristics, as it is anticipated that there will be significant variation between what each group is able to test.

2. Collect invertebrates at each site following the procedure explained in the Student Lab Guide.

3. Identify and enumerate the invertebrates at each site.
Download and print copies of the Macroinvertebrate key, available at Stroud Water Research Center (https://stroudcenter.org/macros/key/) or through West Virginia Department of Environmental Protection (http://dep.wv.gov/WWE/getinvolved/sos/Documents/MacroID/DichotomousKey.pdf). Many other keys are also available online. Any eastern U.S. key will bring students to the correct groupings. If you have prep time available before your trip, it is useful to review dichotomous key use.

**Explain**

In this phase, students will collate their data into graphs. Once individual pair tables are completed, the group should come together to compare data and compile one master graph showing all data in terms of relative abundance and dominance.

Students should be given a reasonable allotment of time to discuss and come to a conclusion of **why their data changes between sites**.

**Elaborate**

After students have processed their data and come to the conclusion that a change in ecosystem directly affects species diversity and composition, the teacher should guide the discussion to how environmental conditions may impact biodiversity. This works particularly well if there is a marked difference in biodiversity in front of a campsite.

Questions that could facilitate the elaboration of data may include the following.

- Which shows the highest/lowest community richness? Why?
- Which shows the highest/lowest community dominance? Why?
- Which shows the highest/lowest diversity? Why?
- Was the site stratified by temperature? Density? Chemical factors? Why?
- Which was the most productive, i.e., which supported the most photosynthesis? Why?
- **How might this affect the organisms? Why?**
  
  (The teacher may want to utilize this question to guide students to the three impacts that environmental change may have based on NGSS Standard HS-LS4-5.)

**Evaluate**

It is encouraged that evaluation occur through written student responses in Claim-Evidence-Reasoning format that are scored using one of the included rubrics. It is expected that students support their claims with direct inclusion of the data collected in the field.

The recommended prompt is:

**Propose a claim, based on the evaluation of your evidence, regarding how an environmental change along the Allagash could cause the increase in numbers of individuals of some species, the emergence of new species over time, or the extinction of other species.**
**ADDITIONAL RESOURCES**


http://www.maine.gov/dacf/parks/docs/aww_nh.pdf
SITE CHARACTERISTICS DATA SHEET

LESSON: LIFE IN ALLAGASH WATERS

Site Number: ___________________ Site Name: _______________________________

Date: ________________________ Team Members: ____________________________

General Location: _________________________________________________________

County: ________________________ Time: ________________________________

GPS Location: N ______________ W ___________________

Sky Conditions: _______________ Bottom Substrate: _________________________

Air Temp (°C): _______________ Transparency: ____________________________

Vegetation: ___________________ pH: ______________

Max. Depth (pond): ____________ meters

Thermocline depth: ____________ meters. Stratified: yes ( ) no ( )

Surface Water Temp (°C): ________ Color: _______________________________

Stream Width (m): 1_______ 2_______ 3_______ 4_______ 5_______

Stream Depth (m): 1_______ 2_______ 3_______ 4_______ 5_______

Stream Cross Section (m): _____Ave. Width: _____ Ave. Depth: _______

Velocity of Flow (distance = 10 m) Trials in seconds:
1_______ 2_______ 3_______ 4_______ 5_______

Average: _______________________ seconds. Average:_____________ meters/second

Discharge Rate (average cross section x average velocity): __________________ m3/sec.
### Life in Allagash Waters, Site Characteristics Data Sheet

<table>
<thead>
<tr>
<th>Type of Organism</th>
<th>Number You Collected</th>
<th>Class Totals</th>
<th>Relative Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<td>10</td>
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<td>12</td>
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<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson: Life in Allagash Waters

Grade Level: High School

Topic: Unity and Diversity

NGSS Standard: HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (a) increases in the number of individuals of some species, (b) the emergence of new species over time, and (c) the extinction of other species.

Practice: Engaging in Argument

Crosscutting Concept: Cause & Effect

<table>
<thead>
<tr>
<th>Complete Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>I can propose a claim regarding how an environmental change could cause: 1) increases in the number of individuals of some species, 2) the emergence of new species over time, and/or 3) the extinction of other species, and I can support my claim with scientific evidence.</td>
</tr>
<tr>
<td>3.0</td>
<td>I can make a claim regarding how an environmental change could cause: 1) increases in the number of individuals of some species, 2) the emergence of new species over time, and/or 3) the extinction of other species, I can use scientific reasoning to evaluate the evidence.</td>
</tr>
<tr>
<td>2.0</td>
<td>I can describe environmental conditions that could cause: 1) increases in the number of individuals of some species, 2) the emergence of new species over time, and/or 3) the extinction of other species.</td>
</tr>
<tr>
<td>1.0</td>
<td>I can give examples of environmental conditions that could cause a population to change.</td>
</tr>
<tr>
<td>0.0</td>
<td>I cannot explain how or why a change in the environment could cause a population to change.</td>
</tr>
</tbody>
</table>
## Conclusions: Claim-Evidence-Reasoning Model

### Lesson: Life in Allagash Waters

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Claim</strong></td>
<td>Claim is complete and stands alone, includes qualitative or quantitative content</td>
<td>Claim is accurate, fully thought out, is an answer to the prompt</td>
<td>Claim relates to prompt, no new information provided</td>
<td>Claim is unrelated to prompt</td>
</tr>
<tr>
<td><strong>Evidence</strong></td>
<td>More than 2 pieces of evidence and facts with data provided.</td>
<td>2 pieces of evidence or facts with data provided.</td>
<td>1 piece of evidence or fact, no data provided</td>
<td>Evidence is unrelated to the prompt or doesn’t support the claim</td>
</tr>
<tr>
<td><strong>Reasoning</strong></td>
<td>Links claim and evidence using scientific principles or provides a deeper understanding</td>
<td>Links claim and evidence using details and/or scientific principles</td>
<td>Refers to claim and evidence, but is missing details or a clear connection</td>
<td>No reasoning provided or unrelated to the prompt</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>Demonstrates a strong understanding, incorporates data and/or facts, and is in own words.</td>
<td>Demonstrates a good understanding, may incorporate some data or facts, is in own words</td>
<td>Demonstrates very little understanding, does not incorporate data details or facts, wording is not own</td>
<td>Demonstrates a poor understanding of the concept, if any.</td>
</tr>
</tbody>
</table>
Welcome to the watery world of the Allagash Wilderness Waterway. As you see around you, there is an array of life utilizing the plentiful natural resources found in the Waterway, from algae to pine trees, birds to butterflies, moose to mice, and fish to flies. Some of the most diverse and amazing life occurs below the surface of the water as tiny macroinvertebrates. This activity is intended to help you explore the biotic and abiotic components of aquatic ecosystems along the Allagash Wilderness Waterway. You will work in pairs or small groups to collect samples from four different aquatic sites in at least two different ecosystems.

You will record your data on a different data sheet for each site. You will then use the data that is collected at each site to make conclusions about the aquatic biodiversity of the Allagash and how changes in the environment impact biodiversity.

**Engage**

Your teacher will lead you in a discussion about the components of ecosystems. After establishing what an ecosystem is, explore the shoreline in front of your campsite. Identify biotic and abiotic factors that you see in the various ecosystems you observe.

**Explore**

*Part 1: Determine Site Characteristics*

A. **Dimensions**

Determine the area of the water body and its depth. Record results on Data Sheet 1.

Lake, Pond, or Cove Site:
Determine acreage and depth based on the procedure provided by your teacher. This may occur prior to your trip.

Stream or River Site:
You will take measurements to determine the average width and average depth of a designated site. Sites must be at least 5 meters long and a minimum of 5 meters apart; farther is better particularly if the bottom is silty.

Use a tape measure to measure the width of the stream at five points within your site to determine the average width.

Select one of the five horizontal transects across the stream. Use a meter stick to measure the depth at five equally spaced points across the transect. Average these five measurements and record the measurements and an average depth on Data Sheet 1.
Multiply average width by average depth to determine average cross section. Record this on Data Sheet 1.

B. Temperature: Measure air and water temperature.
Use a thermometer to record the temperature of the air at all sites.

All temperatures must be measured in the shade, so, if your site is a sunny one, hold your hand over the thermometer bulb as you record temperatures. Air temperature must be measured with a dry thermometer bulb.

River or Stream Sites: Record only one water temperature.

Lake, Pond, or Cove Sites: Record temperatures from the surface to the bottom at 0.5m intervals or as directed by your teacher.

C. Transparency: Determine how clear the water is.
For sites where the bottom can be viewed from the surface, measure and record the maximum depth visible using a meter stick or tape.

Other sites where you can’t see the bottom from the surface: Use a Secchi disc to determine transparency. On a line marked at least in 0.5m units, lower the disc over the shady side of a canoe. When the disc just disappears, record the depth. Lower the disc slightly and then retrieve it slowly. When you can first see it reappear, record that depth. The Secchi disc reading of transparency is the average of these two readings. Record the transparency on Data Sheet 1 under site characteristics.

D. Stream Velocity and Discharge Rate (streams only): Determine how much water is moving past a point and at what rate.
Wade into the stream, 10m apart (one upstream and one downstream). The upstream student will hold the stopwatch and an orange bobber. On “GO,” the upstream student tosses the bobber slightly upstream from themselves. As the bobber passes them, they start the stopwatch. When the bobber passes the downstream student, that student shouts “STOP,” and the upstream student stops the stopwatch. Repeat 5 times. Record the time, in seconds, for each of trials on Data Sheet 1. Take an average of the 5 measurements, and record the average in the space provided.

Calculate the average stream velocity in m/sec by dividing the average time by 10m.

Calculate the discharge rate in m3/sec. by multiplying the average stream velocity by the average cross section.

E. Chemical Composition: As instructed by your teacher, determine the pH of the water. Record your results on Data Sheet 1.

Stream and River Sites: Measure once.
Pond and Lake Sites: Measure at the surface and at the bottom to determine if the water is stratified. When taking samples near the bottom, take care not to include mud or other sediments in your water sample.

Part 2: Collecting Invertebrates
A. Prepare Sampling Basin
Put about 2 to 4 cm of clear water in a light-colored basin and all your plastic containers. The water is put in the pan to allow any organisms to swim or crawl free of the debris and become more visible to you.

B. Lake or Pond
From the shore, reach out with the net and pull it toward you through the water, gently scraping along the bottom and through any plants. Several sweeps with the net should be made before emptying it into the pan, and any large plant pieces should be rinsed in the pan and removed for ease in sorting. Avoid large globs of mud—it is too difficult to sort through.

C. Stream or River
Wade into the current with your net and place the net on the bottom with the opening facing upstream. Estimate an area of stream bottom approximately one foot square in front of the net and kick with your feet to disturb the bottom, allowing the current to carry dislodged organism into the net. Alternatively, you may use your hands to turn over rocks on the bottom and wipe them clean of attached organisms. Keep sampling for a standard period of time—30 sec. to 1 min.

If the stream is flowing very slowly or the bottom is vegetated or muddy, use the collecting technique for ponds above.

D. Sorting
Sort out the all invertebrates from the material in the pan. Use forceps for the larger creatures and the pipette for the smallest. Keep only invertebrates greater than 1mm in length.

Place each different kind of invertebrate you find into a different container: swimming beetles can be lumped in one container, worms in another, insect larvae with cases of plant material in another, etc. Don’t crowd too many in one container. Get another container if necessary.

Avoid picking out the largest creatures first; go from one end of the pan to other systematically until it is empty then go get another net full.

E. Life Support
All vertebrates (fish, frogs, tadpoles, salamanders, amphibian egg masses, etc.) must be returned to the water.
Part 3: Identification
In this part, you will be using a dichotomous key to identify the invertebrates you’ve collected, and making a count of each type. You will then calculate various indices used to describe the ecological community.

A. Use the dichotomous key provided to key the organisms you’ve collected.

B. You do not need to key out every single individual invertebrate from each container. You should be satisfied that all the organisms in a container will key out to the same thing, even if they look slightly different.

C. If you can’t determine what an organism is using the key, place it in the other category.

D. Record your final results in the ENUMERATION TABLE.

Explain
After you and your partner have completed your table, pool your data with the class. You will use these pooled data to make dominance-diversity curves.

A. Determine diversity by calculating the relative abundance of each type of organism: number of individuals of a species \( \times \frac{100}{\text{total number collected}} = \text{relative abundance} \).

B. Rank the types of organisms from most abundant to least abundant for your class data.

C. Use the pooled class data to graph the relative abundance vs. organism type.

D. Compare diversity curves among the different sites sampled by the class. Use the terms community richness and community dominance in your discussion.

   Community richness (number of different types of organisms) is related to the length of the resulting curve.

   Community dominance (number of individuals of each type of organism) is expressed by the steepness of the curve. A steep, short curve indicates a community with high dominance and low richness (= low diversity); a gentle, long curve indicates a community with low dominance and high richness (= high diversity).

   Why does your data change between sites?

Elaborate
You have defined what an ecosystem is. You have collected real data and made conclusions about the biodiversity present in specific ecosystem.

Continue your discussion with a focus on how environmental conditions may impact biodiversity based on the change you have observed between ecosystems.
Evaluate

Now, put together all of the concepts you have explored into a Claim-Evidence-Reasoning statement. Support your claim with the data that you have recorded, graphed and interpreted.

Propose a claim, based on the evaluation of your evidence, regarding how an environmental change along the Allagash could cause the increase in numbers of individuals of some species, the emergence of new species over time, or the extinction of other species.
Spheres of the Allagash Wilderness Waterway

Subject: Earth Science.

Grade: Middle School (6–8).

Time Frame: Approximately 5 hours; 1 hour per site evaluation plus an additional hour to complete the overall evaluation.

Prepared by: Amanda Barker.

Overview

In this lesson, students conduct site evaluations that use water as the primary example of a substance moving between the four major spheres of the Earth: biosphere, atmosphere, hydrosphere, and lithosphere or geosphere. This lesson is composed of four mini-lessons for each sphere, with a different site evaluation for each sphere. It is at the instructor’s discretion, depending on the composition of the group, as to when and how to conduct the evaluations. The assessment included is a comprehensive Claim—Evidence—Reasoning statement to link all four spheres together. The site evaluations do not need to be done in a specific order.

Learning Objective

The student will be able to identify and understand how the four major spheres of the Earth’s systems interact within the Allagash Wilderness Waterway.

Academic Standards

This lesson plan supports Maine Learning Results (MLR) and Next Generation Science (Next Gen) standards.

Maine Learning Results

D2 Earth – Students describe the various cycles, physical and biological forces and processes, position in space, energy transformations, and human actions that affect the short-term and long-term changes to the Earth.

D2b. Describe Earth Systems—biosphere, atmosphere, hydrosphere, and lithosphere—and cycles and interactions within them (including water moving among and between them, rocks forming and transforming, and weather formation).
Next Gen

ESS2 A Earth Materials and Systems – All Earth processes are the result of energy flowing and matter cycling within and among the planet’s systems. This energy is derived from the sun and Earth’s hot interior. The energy that flows and matter that cycles produces chemical and physical changes in Earth’s materials and living organisms.

ESS2.C The Roles of Water in Earth’s Surface Processes – Water continuously cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, and crystallization, and precipitation as well as downhill flows on land.

Waterway Interpretive Themes

Theme II – Flowing waters shape the land and sustain wild life throughout the Waterway.

Materials

- pencils
- binders or folders
- clipboards
- metric rulers
- Data Sheets, see Waterway Lesson Plans pages 92–100.
- Copy onto Rite-in-the-Rain paper and keep in a binder or folder as students will need the data to complete the Final Assessment worksheet.
- Final Assessment worksheet; see Waterway Lesson Plans, page 101.

Biosphere

- Natural Landscapes of Maine (Maine Natural Areas or web printout)
- Forest Trees of Maine (Maine Forest Service or web printout)
- Tom Kavanagh’s Pocket Naturalist Guide series: Maine Birds; Maine Wildlife; Maine Trees and Wildflowers; Bugs and Slugs; and Animal Tracks
- Critters of Maine Pocket Guide (Wildlife Forever)
- Biosphere Data Sheet; see Waterway Lesson Plans, pages 92–93

Atmosphere

- balloon and dry eraser markers
- pH strips
- sling psychrometer (or similar device for measuring RH)
- rain gauge
- cloud charts
- Atmosphere Data Sheet; see Waterway Lesson Plans, pages 94–95

Hydrosphere

- pH strips
- glass jar (pint)
- thermometer
- Hydrosphere Data Sheet; see Waterway Lesson Plans, pages 96–98

Lithosphere or Geosphere

- masking tape or sharpie marker
- spoons
- soil thermometer
- Biosphere Data Sheet; see Waterway Lesson Plans, pages 99–100
- NRCS guide to soil texture

(https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054311)
Prerequisite Knowledge/Skills

Basic knowledge of the water cycle and the four major Earth spheres (biosphere, atmosphere, hydrosphere, and lithosphere or geosphere) is expected.

TEACHING PROCEDURE

Biosphere Mini-Lesson

In this mini-lesson, students define and explore the biosphere and how water connects the biosphere to the atmosphere, hydrosphere, and lithosphere/geosphere. Students will identify different plants and animals around their campsite. Using a dichotomous key, they will determine in which type of land cover classification their campsite is located.

1. Engagement/Hook

At your campsite, have your students spread out in pairs. Allow 15 minutes for students to identify as many living things as possible around them.

At the end of the activity, gather back and discuss what they found. Construct a definition of the biosphere based on their observations of living things. Remind them that the biosphere contains all living things and things that were living at one time.

Discuss how water affects the plants and animals they observed.

2. Exploration

In the exploration, students will use a land classification key to determine the type of land cover for the area they explored. A very good key is in Natural Landscapes of Maine by Susan Gawler and Andrew Cutko. Alternatively, a Natural Community Classification Key is available online through the Maine Natural Areas Program and can be printed out prior to an Allagash visit (http://www.maine.gov/dacf/mnap/features/communitykey.htm).

A key to the forest trees of Maine should also be available as the Natural Community key is based heavily on tree types. Forest Trees of Maine (Maine Forest Service) is an excellent key and is also available online to print out prior to a trip at https://www.maine.gov/dacf/mfs/publications/handbooks_guides/forest_trees/pdf/Introduction.pdf

The A Pocket Naturalist Guide folding pocket guides by Tom Kavanagh are very useful. The guides include Maine Birds, Maine Wildlife, Maine Trees and Wildflowers, Bugs and Slugs, and Animal Tracks. A Flower Finder by May Theilgaard Watts is also useful.

3. Explanation

After groups have determined what land cover type their site is classified, gather them back together to discuss how water affects land cover. Discuss other land cover types that you have observed on your Allagash trip. Have you seen wetlands? Have you seen very dry spots such as red pine stands (Telos Lake)? If you have a copy of Natural Landscapes of Maine, how much does the presence of water appear in the land cover description?
Lastly, how does the presence of water in the Allagash drainage affect the local biosphere? Has the presence of the Waterway led to unique land cover types that support unique plants and animals?

4. Elaboration
Complete a biosphere scavenger hunt. Find or take pictures of the following:

- ✔ 3 different types of tracks
- ✔ 2 types of scat
- ✔ 1 feather
- ✔ 1 bone
- ✔ 2 animal homes
- ✔ 4 different insects
- ✔ 4 different plants
- ✔ 2 types of lichens
- ✔ 2 types of fungus
- ✔ 1 spiderweb
- ✔ 1 butterfly
- ✔ 3 types of leaves
- ✔ 1 amphibian

5. Evaluation/Assessment
The evaluation for this activity is a combination of all of the four mini-lessons. Students should work towards building a response for the following.

Using the evidence and data that you have collected about the biosphere, atmosphere, hydrosphere, and lithosphere:

- Define and describe the major characteristics of the biosphere, atmosphere, hydrosphere and lithosphere along the Allagash Wilderness Waterway.
- Explain, using graphics based on your site evaluations, how water moves between the four major spheres of the Earth’s systems and sustains life within the Allagash Wilderness Waterway.

Atmosphere Mini-Lesson
In this mini-lesson, students define and explore the atmosphere. By gathering data about two to four variables, students will make conclusions about the amount of water in the atmosphere. They will discuss how the amount of water present helps determine the climate and weather of the area. They will also discuss how the water in the atmosphere helps connect the four spheres together.

1. Engagement/Hook
Blow up and tie a balloon. Roughly draw on Earth’s continents on the wide end, then draw on the five layers of the atmosphere with assistance from your students. While not to scale, you can make the layers roughly comparable. Ask your students to provide examples of things that occur or exist in each level. Have them draw their example in the appropriate layer.

Ask, why we are interested in the water in the atmosphere? How do we measure the amount of water in the atmosphere?

2. Exploration
Review data collection procedure.
**Air Temperature:**
Temperature should be recorded in Celsius (C).

**Rainfall**
If rain is expected, set up a rain gauge. Rainfall is also measured by the rangers at Chamberlain Bridge and Churchill Dam. Determine how much rain you received.

If rainfall is not expected, monthly rainfall reports can be printed out prior to your trip by searching Clayton Lake, ME at https://www.wunderground.com/weather/us/me/clayton-lake and clicking on the “History” tab. You can select which month you would like to search.

**pH of the Rainfall**
Dip a pH strip into the water and pull it out immediately. Don’t let it soak, it will become mush. Compare the color on the strip with the chart provided with your strips.

Data can also be searched at the Maine Department of Environmental Protection Bureau of Air Quality Online Data Services. Select either ME00 – Caribou Airport or ME09 Greenville. (http://www.maine.gov/dep/air/air_quality/ar_step01.php)

**Relative Humidity**
Follow the directions for the psychrometer that you are using. Generally, a psychrometer will have a dry bulb without a wick and a wet bulb with a wick that you will need to moisten. Record the dry bulb temperature. Then whirl the psychrometer for at least 2 minutes at about two revolutions per second. Check the wet bulb temperature at 2 minutes and then at 3 to make sure the temperature has stopped moving and is as low as possible. Use the chart or slide provided with your psychrometer to determine the relative humidity. An electronic measurement device is perfectly acceptable to use.

**Clouds**
Instruct students to observe the clouds that they see. Determine what type of clouds they are observing and how transparent they are. Determine how much of the sky is covered by clouds. It’s highly recommended to use an identification aid such as at https://scool.larc.nasa.gov/printables-guides-CloudChart.html available at NASA or https://gewa.gsfc.nasa.gov/clubs/sailing/IMAGES/MISCELLANEOUS/CloudChart.pdf available at NOAA. Both of these aids have cloud type, cover and opacity guides.

3. **Explanation**
Gather together to discuss the results using good science words and quantitative and qualitative data. Determine whether you have observed climate or weather. As you discuss the results, remind students that their observations are specific for today only and therefore constitute weather. Climate is a long-term average. How would a long-term average be determined?

Are there clues in the biosphere and hydrosphere that lead the group to a hypothesis about the Allagash’s long-term climate?
4. **Elaboration**
Consider making this data collection a daily activity while on your trip.

5. **Evaluation/Assessment**
The evaluation for this activity is a combination of all of the four mini-lessons. Students should work toward building a response for the following:

Using the evidence and data that you have collected about the biosphere, atmosphere, hydrosphere, and lithosphere:

- Define and describe the major characteristics of the biosphere, atmosphere, hydrosphere, and lithosphere along the Allagash Wilderness Waterway.
- Explain, using graphics based on your site evaluations, how water moves between the four major spheres of the Earth’s systems and sustains life along the Allagash Wilderness Waterway.

**Hydrosphere Mini-Lesson**
In this mini-lesson, students define and explore the hydrosphere. By gathering data about three variables, students will make conclusions about the water quality of the Allagash. They will further discuss how the waters of the Allagash are part of the water cycle and part of a larger watershed moving water from northern Maine as a tributary into the St. John River and then the Atlantic Ocean at St. John, New Brunswick.

1. **Engagement/Hook**
Have your students get comfortable in pairs at a spot next to the water and distribute a Hydrosphere Data Sheet.

Ask them to identify and observe the hydrosphere around them.

In their pairs, have them create a mind map of as many parts of the hydrosphere as they can remember.

Review what the hydrosphere is through group discussion.

Have the students add the water cycle onto their concept map.

Review the water cycle through group discussion.

Have students observe the water again. Direct them to look for clues to what the water quality may be.

Discuss what water quality is, why it’s important, and how to determine the quality of the water. The rest of the activity will focus on determining the water quality is of the site where you are.

2. **Exploration**
Review the data collection procedure.
Water Temperature
The thermometer should be held in the water at least 6 centimeters deep for 2 minutes.

Temperature should be recorded in Celsius (C).

pH
Dip a pH strip into the water and pull it out immediately. Don’t let it soak, it will become mush.

Compare the color on the strip with the chart provided with your strips.

Transparency
Fill the glass jar up with water. Be careful not to stir around any sediments.

Hold the jar up in front of your partner’s face to determine the transparency.

3. Explanation
When all groups are done with their data collection, gather together and discuss the results.

Encourage the use of *good science words* including qualitative and quantitative data to discuss the water quality of the site that was examined.

Consider what other factors (such as plant and animal life) might give clues to water quality.

Discuss how water quality on the Allagash can be affected. Examples of this might include forestry operations, roads, lead sinkers on fishing tackle, and air pollution. Explain to students that the Maine Center for Disease Control and Prevent recommends that anyone over the age of eight eat only two fish meals per month of any fish caught in Maine waters due to mercury that settles in Maine waters as a result of air pollution from coal-burning plants and other sources of pollution in the Midwest ([http://www.maine.gov/dhhs/mecdc/environmental-health/eohp/fish/2kfca.htm](http://www.maine.gov/dhhs/mecdc/environmental-health/eohp/fish/2kfca.htm) search Maine Freshwater Fish Safe Eating Guidelines). This guideline is also found in the Maine Fishing Law book. Emphasize that water quality cannot be determined by eye and often is monitored several different ways.

4. Elaboration
After determining what the water quality is at the site you are examining, discuss the greater impact of the water quality of the Allagash Wilderness Waterway.

Consider using the following guiding questions:

- Why is it important to monitor water quality?
- How would you expect the water quality to differ between rivers and lakes? Why?
- How is water from the Allagash part of the water cycle? Think about where sources of mercury pollution come from. How does it get to the Allagash region?
- Where do the Allagash waters go to? How do you think the water quality of the Allagash influences the water quality of the St. John River?
- How do you think the presence of dams affects water quality?
5. Evaluation/Assessment
The evaluation for this activity is a combination of all of the four mini-lessons. Students should work toward building a response for the following.

Using the evidence and data that you have collected about the biosphere, atmosphere, hydrosphere, and lithosphere:

- Define and describe the major characteristics of the biosphere, atmosphere, hydrosphere and lithosphere along the Allagash Waterway.
- Explain, using graphics based on your site evaluations, how water moves between the four major spheres of the Earth’s systems and sustains life along the Allagash Waterway.

Lithosphere Mini-Lesson
In this mini-lesson, students define and explore the lithosphere. By gathering data about soils, students will make conclusions about how water interacts with the lithosphere in the Allagash and leads to changes in the biosphere.

This activity requires at least 6 hours, 24 if possible.

1. Engagement/Hook
Gather the group and lead a short discussion on how they think water will interact with the lithosphere. By this point, they should have a good grasp of water rotating and influencing all Earth system spheres. They should be able to connect that the moisture content of the soil is a factor in determining what species can thrive on a site.

2. Exploration
Divide students into pairs and give each pair a glass jar from the hydrosphere activity. Position your first pair at the shoreline and space pairs out by whatever distance makes sense based on the campsite you are at and the number of students you have. Avoid having pairs go through the campsite proper. Have them responsibly collect about 1 cup of soil from their location. They can use a spoon to help scoop the soil. Remind them that the soil will need to be returned to the spot that they got it from. If there is sod at their location, remove the sod and set it aside and take soil from under where the sod came from.

At each location, have students take a soil temperature measurement.

Using their hands, determine the consistency of the soil. Is it loose or does it pack together? Does it break apart easily or stay stuck together? Can you roll it into a ball? Does it appear to have a lot of organic material in it? Is it moist? What color is it?

Use the NRCS Guide to Texture by Feel or a similar resource (https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054311) to estimate what the sand, silt, and clay content is. Plot the soil type on the Guide.

Wet the soil to a mud consistency. Place a mark on the jar as to the soil level.

Fill the jar to the top with water and put on the lid. Shake the jar vigorously.
Set the jar on the table and let it settle.

After 1 minute, record where the soil level is. This is the sand component of the soil.

Let the jars sit for 6 hours. Mark where the soil level is. This is the silt component of the soil.

If possible, let the jar sit overnight and mark where the soil level is in the morning. If you don’t have time, estimate the amount of clay based on where the original mark of saturated soil was.

Determine the percent of sand, silt, and clay based on the total height of the settled material (or original height if necessary). Determine if there is any organic material floating on the top. Is it a significant amount? What does the presence of organics at a site imply about the site?

Compare the calculated percentages of sand, silt, and clay to the estimated percentages and plot the soil type on the NRCS Guide to Texture by Feel.

Return the soil to where it was taken from. Follow Leave No Trace principles and replace any sod or displaced organic material. Make it looks like you were never there.

3. Explanation
When all groups are done with their data collection, gather together and discuss the results.

Encourage the use of **good science words** including qualitative and quantitative data to discuss the water quality of the site that was examined.

Return to the Engage questions. Does the data show a difference in soil composition of the different sites? Does the presence of water in the lithosphere create differences in the biosphere?

4. Elaboration
Download a copy of “State Soil – Chesuncook” from the NRCS Maine Soils website (https://www.nrcs.usda.gov/wps/portal/nrcs/main/me/soils/)

The Chesuncook soil series is found throughout the Allagash region. Read the description of the soil and how it impacts what crops are grown on it. Does this description make sense with what you are seeing on the Allagash? Has the lithosphere impacted the biosphere?

5. Evaluation/Assessment
The evaluation for this activity is a combination of all of the four mini-lessons. Students should work toward building a response for the following:

Using the evidence and data that you have collected about the biosphere, atmosphere, hydrosphere and lithosphere:

Define and describe the major characteristics of the biosphere, atmosphere, hydrosphere, and lithosphere along the Allagash Wilderness Waterway.

Explain, using graphics based on your site evaluations, how water moves between the four major spheres of the Earth’s systems and sustains life along the Allagash Wilderness Waterway.
**Biosphere Data Sheet**

**Lesson: Spheres of the Allagash**

**Guiding Questions**

How does the presence of water in the Allagash drainage affect the local biosphere?

Has the presence of the Waterway led to unique land cover types that support unique plants and animals?

**Engage**

Write down all the living things that you see:

**Explore**

Determine what land cover your site is:

List plant and animal species that you have identified:

Describe your site:
**EXPLAIN**

Explain your reasoning in answering the guiding questions:
# Atmosphere Data Sheet

**Lesson: Spheres of the Allagash**

**Guiding Questions:**
How does the amount of water present help determine the climate and weather of the area?

How does the water in the atmosphere help connect the four spheres together?

**Engage**
What is the atmosphere?

How does the atmosphere influence the Allagash Waterway?

**Explore**
Record your data about the atmosphere:

<table>
<thead>
<tr>
<th>Air Temp</th>
<th>Rainfall in Cm</th>
<th>pH of Rainfall</th>
<th>Relative Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of Clouds</th>
<th>Cloud Transparency</th>
<th>% Cloud Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EXPLAIN:

Is this data a record of climate or weather? Why?

Explain your reasoning in responding to the guiding questions:
GUIDING QUESTION:
How can the quality of the hydrosphere on the Allagash be impacted?

ENGAGE
Identify all the parts of the hydrosphere that you can see:

Create a mind map of the hydrosphere:

What clues about the condition of the hydrosphere can you observe?
**EXPLORE**

<table>
<thead>
<tr>
<th>Water Temp</th>
<th>Water pH</th>
<th>Transparency</th>
</tr>
</thead>
</table>

TRANSPARENT, SOMEWHAT TRANSPARENT, NOT TRANSPARENT

TRANSPARENT = you can easily see your partner through the water
SOMewhat TRANSPARENT = it’s murky, but you can still make out all their features
NOT TRANSPARENT = you can’t see them or can’t make out all of their features

How would you describe the water quality of your site?
EXPLAIN

Explain your reasoning in responding to the guiding question:
GUIDING QUESTION:
How does the presence of water in the lithosphere create differences in the biosphere?

ENGAGE
What species are thriving at your site?

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Measurement from Bottom in Cm</th>
<th>Layer Depth</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Measurement (moistened)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>1 Minute</td>
<td></td>
<td></td>
<td>% SAND</td>
</tr>
<tr>
<td>6 Hours</td>
<td></td>
<td></td>
<td>% SILT</td>
</tr>
<tr>
<td>24 Hours</td>
<td></td>
<td></td>
<td>% CLAY</td>
</tr>
</tbody>
</table>

*It is possible that the final measurement will be different than the initial. If it is significantly different, adjust the initial to match the final.

What is your soil texture?
EXPLAIN

Explain your reasoning in responding to the guiding question:
Final Assessment: Spheres

Lesson: Spheres of the Allagash

Using the evidence and data that you have collected about the biosphere, atmosphere, hydrosphere, and lithosphere:

- Define and describe the major characteristics of the biosphere, atmosphere, hydrosphere, and lithosphere along the Allagash Wilderness Waterway.
- Explain, using graphics based on your site evaluations, how water moves between the four major spheres of the Earth’s systems and sustains life along the Allagash Waterway.
River Stewards: Sharing Stories

Subject: Social Studies, Geography, and Wabanaki Studies.

Grade: Middle School (6–8).

Time Frame: 4 hours.

Prepared by: Julia Gray.

LESSON OVERVIEW

This lesson uses the Maliseet story of Aglebe’m, the Monstrous Frog to engage students with creative ways to share messages about river stewardship and resource protection. They will compare an example of Wabanaki oral tradition with contemporary Wabanaki messages about stewardship and resource protection, and will then develop their own creative messaging tool to address resource stewardship in the Allagash Wilderness Waterway.

The central feature of the Waterway is . . . water. Water—in rills, rapids, eddies, quiet pools, or frozen sheets—attracts most visitors, as over the millennia it has drawn others for enjoyment, sustenance, and transport. The surface of eight lakes, four ponds, and the river accounts for greater than half of the area within the [Waterway]. More than 100 brooks and streams flow down the Waterway’s small mountains and rugged ridges. One cannot visit the Allagash without experiencing water in some form (Jacobson, 2018, p. 225).

Learning Objectives

The student will gain an understanding of a variety of ways to communicate messages of stewardship and resource protection, and will have the opportunity to create their own message. This understanding will be informed by Wabanaki history, knowledge, and perspectives.

Academic Standards

The 2007 Maine Learning Results (MLR) Social Studies, History, and Geography content standards are applicable to this lesson plan. The lesson especially correlates with the Wabanaki (Maine Native) studies MLR component, and the Maine statute that requires the teaching of Maine Native American history and culture in Maine’s schools (LD 291).
**Geography/Wabanaki Territory**

**MLR D: Geography** – Students draw on concepts and processes from geography to understand issues involving people, places, and environments in the community, Maine, the United States, and world.

*Performance Indicator 2* – Individual, Cultural, International, and Global Connections in Geography

**LD 291 Concentrated Area of Study:** Maine Native American Territories

**Concept:** Territory

**Broad Understanding:** Cultures have different perspectives on land, land use, and land ownership.

**Guiding Question:** How did/does the environment shape Wabanaki culture?

**Notes & Relevant Information:** The Wabanaki have been shaped by their environment. Over thousands of years, the Wabanaki peoples developed a sustainable relationship with the land, using what they needed to conduct their daily affairs while leaving a portion for future generations. The Wabanaki learned to know and interact with their world as equals, using what they needed and taking no more.

**History / Wabanaki Cultural Systems & History**

**MLR E: History** – Students draw on concepts and processes from history to develop historical perspective and understand issues of continuity and change in the community, Maine, the United States, and world.

*Performance Indicator 2* – Individual, Cultural, International, and Global Connections in History

**LD 291 Concentrated Area of Study: Cultural Systems & History**

**Concept:** Cultural Continuity & Change

**Broad Understanding:** Enduring cultures are dynamic and maintain continuity while adapting to changing political, economic, social, and physical environments.

**Guiding Question:** How are Wabanaki cultural practices transmitted through the generations?

**Notes & Relevant Information:** Intergenerational cultural practices include, but are not limited to: drumming, dance and language, basket making and other art and craft work, sustenance activities (such as hunting and fishing).

**Guiding Question:** How and why have Wabanaki cultural practices changed and remained the same over time?

**Notes & Relevant Information:** Interaction with other cultures (including Europeans) was one factor that changed traditional Wabanaki cultural practices (cooking, food gathering, preparing clothing, etc.). For instance, European trade goods (steel hatchets, European cloth) supported traditional Wabanaki culture in ways that made life more efficient. Environmental changes have also affected Wabanaki culture.
Maine Learning Results: Social Studies

A1 Researching and Developing Positions on Current Social Studies Issues – Students research, select, and present a position on a current social studies issue by proposing and revising research questions, and locating and selecting information from multiple and varied sources.

A2 Making Decisions Using Social Studies Knowledge and Skills – Students make individual and collaborative decisions on matters related to social studies using relevant information and research and discussion skills.

A3 Taking Action Using Social Studies Knowledge and Skills - Students select, plan, and implement a civic action or service-learning project based on a school, community, or State asset or need, and analyze the project’s effectiveness and civic contribution.

D1 Geographic Knowledge, Concepts, Themes, and Patterns – Students understand the geography of the community, Maine, the United States, and various regions of the world and the geographic influences on life in the past, present, and future.

D2 Individual, Cultural, International, and Global Connections in Geography – Students understand geographic aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.

E2 Individual, Cultural, International, and Global Connections in History – Students understand historical aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.

Waterway Interpretive Themes and Goals

Theme I – The Waterway is a wild place set aside for all to enjoy and care for.

A Wild Place Sub-theme: A ribbon of now wild lands and waters, earlier transformed by logging, winds through the Maine Woods.

Theme II – Flowing waters sustain wild life throughout the Waterway.

Life Support Sub-theme: Plants and animals depend on life-giving water flowing in Waterway soils, streams, wetlands, ponds and lakes, and the Allagash River.

Resource Protection Goal – Important scenic, natural, and heritage Waterway resources are safeguarded for the future.

Stewardship Ethic Goal – Visitors form intellectual and emotional connections with the Allagash Wilderness Waterway that result in volunteer and philanthropic support.

Materials

☐ Aglebe’m, the Monstrous Frog; a Maliseet Story, adapted from Dozay’s Koluskap of the Wabanaki, told by Gabe Paul, in “Malecite Tales,” by Frank G. Speck, 1917–480-481. (p. 108)


☐ Houlton Band of Maliseet Indians: Natural Resources.
  http://www.maliseets.com/natural_resources.htm

☐ Houlton Band of Maliseet Indians Natural Resources Newsletters.
  http://www.maliseets.com/newsletter.htm


**TEACHING PROCEDURE**

**Engage**

Students will begin by reading and listening to the Maliseet story of Aglebe’m, the Monstrous Frog.

After reading/listening to the story, discuss the question.

- What are the messages being conveyed by the story of Aglebe’m?

This oral tradition, or story, is one way that the Wabanaki and other Indigenous people communicate important lessons and values.

Depending on prior knowledge, the teacher may want to share this additional information with the students:

- Wolastoq (Beautiful River) is the Maliseet name for the St. John River, and the Allagash River is part of the St. John River system that extends from the Maine Woods to St. John, New Brunswick. The Maliseet call themselves Wolastoqiyik, the people of the beautiful river.
- The Houlton Band of Maliseet Indians’ current land holdings are centered on the Meduxnekeag River, another tributary to the St. John River. They are deeply involved in caring for the river and its natural resources.

**Explore**

Students will next spend time browsing and reading content from contemporary Maliseet sources on stewardship and resource protection from the Houlton Band of Maliseet Indians and the Maliseet Nation Conservation Council.

Some questions to guide discussion:

- What are the messages about stewardship and resource protection that are being communicated by both of these organizations?
- How are they similar to the messages in the Monstrous Frog story?
- How are they different from the messages in the Monstrous Frog story?
- Which type of messaging do you find most informative? Most interesting? Easiest to understand?
- What was your emotional response to any of the messages?
- What personal connection did you make in any of the messages?
The following questions can be used to address specific elements of Wabanaki Studies standards:

- How did/does the environment shape Wabanaki culture?
- How are Wabanaki cultural practices transmitted through the generations?
- How and why have Wabanaki cultural practices changed and remained the same over time?

These three sources together represent various ways the Maliseet people in the past and present have communicated about stewardship and resource protection.

**Explain**

The teacher will then share with the students stewardship concepts that have been prioritized in the Allagash Wilderness Waterway interpretive plan (Jacobson, 2018):

- Important scenic, natural, and heritage Waterway resources are safeguarded for the future.
- Inappropriate visitor use can negatively affect important resources of the Waterway. For instance, erosion from foot traffic and looting can damage heritage resources such as significant archaeological sites. Inattention or deliberate vandalism might also harm heritage resources.
- Natural resources, processes, systems, and values are vulnerable to visitor use. For example, disturbance can stress rare or endangered species such as over-wintering bats, leading to their demise. Misguided actions by visitors can degrade water quality in the streams, lakes, and the river itself or “the fish and wildlife resources found within the Waterway [which] are part of the core Allagash experience” (BPL, 2012, p. 126).
- Visitors form intellectual and emotional connections with the Allagash Wilderness Waterway that result in volunteer and philanthropic support.
- The Allagash is a wild place where flowing waters reflect centuries of life, work, and travel in Maine’s North Woods; it is a place set aside for all.
- Plants and animals depend on life-giving water flowing in Waterway soils, streams, wetlands, ponds and lakes, and the Allagash River.

**Elaborate**

Using chapter 6, Table 6, of the *Storied Lands & Waters* document, students will select a prominent landscape feature in the Allagash about which to create their own stewardship and resource protection message.

As individuals or in small groups, students will choose a format for communicating their message. This might be a story like the one of the Monstrous Frog. It might be an article for a newsletter. Or perhaps they create a poster to be shared with Waterway visitors at the Churchill Depot interpretive center.

Students will then research and develop their choice of message and format, and then share it back with the full class. *Storied Lands & Waters* is an excellent source for their research—it elaborates on the various features listed in chapter 6, Table 6.
Evaluate

The resulting story, article, or poster will be evaluated by the teacher to determine if the message has been effectively communicated. It will also be evaluated for writing skills and accuracy.

Student responses to the work of their peers can be a valuable added evaluation for this lesson. Did they learn something new? Did they have an emotional response? Did they make a personal connection to the message of stewardship and resource protection?

Extend

*Understanding Traditional Ecological Knowledge:* an essential part of resource protection and stewardship

Familiarize students with the concept of Traditional Ecological Knowledge (TEK). Add content to the promotional material created by the students that incorporates the concept.

Maliseet Nation Conservation Council Traditional Knowledge Program:
https://www.maliseetnationconservation.ca/traditional-knowledge-program

Traditional Ecological Knowledge, U.S. Fish & Wildlife Service:
https://www.fws.gov/nativeamerican/traditional-knowledge.html

Traditional Ecological Knowledge, National Park Service:
https://www.nps.gov/subjects/tek/index.htm

*Wabanaki Languages*

Wabanaki knowledge and perspectives are embodied in their language. Explore Passamaquoddy-Maliseet and Penobscot language around the priority messages from the AWW. Incorporate Wabanaki language into student messages.

**Passamaquoddy-Maliseet Language**

Sip – (noun inanimate) river

More about this word and its various forms: https://pmportal.org/dictionary/sip

Wolastoq – (noun inanimate) St. John River (Maine, Québec, New Brunswick)

Wolastokuk – (noun locative) on or along St. John River; in Maliseet territory; in Aroostook County, Maine

**Penobscot Language:**

áłantakʷ – freshwater stream, river

walakéskʷihtakʷ – 1) bark stream, 2) Allagash River

To find more Penobscot words, visit the Penobscot Dictionary at https://penobscot-dictionary.appspot.com/entry/search/
AGLEBE’M, THE MONSTROUS FROG;
A MALISEET STORY

LESSON: RIVER STEWARDS—SHARING STORIES

A long time ago, Aglebe’m, a monstrous frog, kept back all the water in the world so that the rivers stopped flowing and the lakes dried up and people everywhere began dying of thirst.

The people sent a messenger to Aglebe’m asking him to give the people water, but he refused. He gave the messenger only a small drink from the water in which he washed, not even enough to satisfy the thirst of one.

At last, a great man was sent to Aglebe’m to convince him to release the water for the people. Aglebe’m refused, saying that he needed it all to lie in. The messenger then cut down a tree so that it fell on the monster and killed him.

The body of the tree became the Wolastoq, the branches became the tributaries of the river, and the leaves became the ponds at the head of these streams.

The Wolastoq people (the Maliseet) now live along the river and its tributaries.

**Prominent Features of the Allagash**

LESSONS: RIVER STEWARDS—SHARING STORIES; EXPLORING ALLAGASH WATERSHEDS WITH MAPS

Following is part of chapter 6 from *Storied Lands & Waters of the Allagash Wilderness Waterway* by Bruce Jacobson (2018) that briefly describes the prominent features of the Allagash, both natural and cultural. Other parts of *Storied Lands & Waters* provide more details about heritage resources found in the Allagash watershed.

Heritage resources include buildings and other structures, roads and trails, material objects, manuscripts, archaeological features, photographs, folklore, natural settings, and more. They (a) are more than 50 years old, (b) have association with a historical event, activity, or person, (c) are representative of a type, (d) have other cultural and aesthetic values of note, or (e) possess information important in prehistory or history.

Natural resources include (a) physical resources such as water, air, soils, topographic features, geologic features, paleontological resources, and natural soundscapes and clear skies, during day and night; (b) physical processes such as weather, erosion, cave formation, and wildland fire; (c) biological resources such as native plants, animals, and communities; (d) biological processes such as photosynthesis, succession, and evolution ecosystems; and (e) highly valued associated characteristics such as scenic views.

**Interpretive Opportunities**

Some Waterway resources automatically pique visitors’ interest. Allagash Falls, Locomotives No. 1 and No. 2, and moose are prime examples. When visitors see, hear, touch, or otherwise experience something, they are more likely to pay attention to Waterway communication associated with their experience. Allagash places, objects, animals, plants, and other features provide tangible, sensory opportunities to share Waterway meanings, especially intangible concepts such as “wildness.” They provide our best interpretive opportunities because visitors are already curious and attentive!

The remainder of chapter 6 presents prominent tangible resources likely to capture visitors’ attention. We identified them by talking with Waterway visitors and staff, reviewing BPL’s Waterway visitor guide and map (2016b), consulting other publications and websites, and considering results of a 2003 visitor survey (Daigle, 2005).

Table 6 presents a longer list of human-worked and naturally occurring features, some distinctive resources, that embody hundreds of centuries of history. Some are not specifically categorized as “prominent features,” yet they also support the interpretive program. Together these features comprise four Waterway landscapes, as discussed in...
chapter 5. As a reminder, they are the Indigenous Landscape and three heritage landscapes: Logging and Forest Management, Sporting Camps, and Moosetowner. Features listed in Table 6 are either (a) distinctive, (b) likely to capture an uninformed visitor’s attention, or (c) both distinctive and noteworthy.

See chapters 4 and 5 for the rationale behind identifying distinctive heritage resources. One or more government agencies have recognized the natural resources noted as distinctive in Table 6; for instance, National Park Service, U.S. Fish & Wildlife Service, Maine Department of Inland Fisheries and Wildlife, Maine Natural Areas Program, or other agencies that report on distinctive resources, such as Maine Geological Survey. See Appendix C for more details.

In summary, the most prominent Allagash Wilderness Waterway features are:

- Allagash Falls
- Allagash Lake
- Bald Eagles
- Chamberlain Farm
- Chase Rapids and Allagash River
- Churchill Depot
- Cunliffe Depot
- Dams
- Fire Towers
- Fish
- Forested Shores
- Katahdin Views
- Little Allagash Falls
- Michaud Farm
- Moir farm and Taylor Camp
- Moose
- Railroad Trestle
- Sporting Camps
- Stars
- Tramway and Locomotives
- Umsaskis
- Water
- Wind/Weather
Table 6. Features of the Allagash

<table>
<thead>
<tr>
<th>Prominent Features</th>
<th>Distinctive Resources</th>
<th>Heritage Landscapes</th>
<th>Sporting Camps</th>
<th>Logging and Forest Management</th>
<th>Moosetowner</th>
</tr>
</thead>
<tbody>
<tr>
<td>★ Allagash River.</td>
<td>N</td>
<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ Wind/weather.</td>
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<tr>
<td>★ Allagash Falls.</td>
<td>N</td>
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<tr>
<td>Allagash Falls Portage Trail.</td>
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<tr>
<td>★ Stars/night sky.</td>
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<tr>
<td>★ Moir Farmhouse ruin.</td>
<td>H</td>
<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ Taylor Camp building and sporting camp site.</td>
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<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ Fish, including Native Eastern Brook Trout.</td>
<td>N</td>
<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ Michaud Farm depot site.</td>
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<tr>
<td>★ Bald Eagles and other birds.</td>
<td>N</td>
<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ Cunliffe Depot site and Remains of Lombard log haulers.</td>
<td>H</td>
<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ McKeel Stone (grave memorial).</td>
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<tr>
<td>Canada lynx.</td>
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<td>★ Round Pond Mtn. fire tower.</td>
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<tr>
<td>Round Pond</td>
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<tr>
<td>★ Jalbert’s Sporting Camps (Windy Point, Halfway Camp, and Whittaker Brook).</td>
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<td>▲ ▲ ▲ ▲</td>
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<tr>
<td>★ Forested/undeveloped shores.</td>
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<tr>
<td>McNally’s Ross Stream Camps (privately owned).</td>
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<tr>
<td>★ Long Lake Dam site.</td>
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<tr>
<td>★ Umsaskis Lake.</td>
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<tr>
<td>★ Umsaskis Meadows.</td>
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<tr>
<td>★ Moose and other mammals.</td>
<td></td>
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<tr>
<td>Clayton Lake boarding house and depot (privately owned).</td>
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<td>▲ ▲ ▲ ▲</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>★ Chase Rapids (Class II).</td>
<td></td>
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<tr>
<td>Watson Dump Wagon at Ashland Logging Museum.</td>
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<tr>
<td>★ Churchill Dam/Churchill Depot.</td>
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</tr>
</tbody>
</table>
**Prominent Features** (★) – tangible Allagash resources that have captured visitors’ attention, thus offering interpretive opportunities.

**Distinctive Resources** – features with heritage (H) or natural (N) resource distinction.

**Allagash Landscapes** – as correlated with features (▲).
Allagash Falls

“The roar from Allagash Falls extends a quarter mile upriver” (Collins, 2001). Dropping some 30 feet, the roaring white torrent of the Allagash River has impressed and impeded river travelers for generations. It is the place of an ancient portage. A metal ring secured in the sandstone on the portage attests to the work of hauling laden boats around the falls in the 1800s. Fishing or swimming is common in the pools at the base of the falls. See Figure 86.

Allagash Falls is a distinctive natural resource (see Appendix C); Allagash Falls Portage Trail is a distinctive heritage resource discussed in chapters 3 and 5.

Allagash Lake and Little Allagash Falls

Allagash Lake is a world unto itself. It has a rugged beauty and peace not found at some other lakes in the Waterway. Motorized watercraft, aircraft, snowmobiles, and ice shacks are prohibited. There is also a sense of accomplishment in being on Allagash Lake because it’s not easily accessed. The cold water averages 35 feet deep, with the deepest point being 98 feet, and covers 4,360 acres. A former logging dam is at its outlet (Figure 31).

Allagash Stream flows 6 miles from Allagash Lake to Chamberlain Lake, pausing at Little Round Pond. At the outlet of the pond, the stream drops 20 feet over Seboomook slate forming Little Allagash Falls, including a 12-foot cascade. The falls and stream banks show evidence of glaciation in grooves and general shaping of the slate. In total, the stream drops 93 feet over its run, passing over several ledges below the falls.

Allagash Lake and Little Round Pond (Eagle Lake TWP) are distinctive natural resources (see Appendix C).

Bald Eagles

Eagles are memorable features of Allagash visits: “I always see dozens of eagles on each trip; 25 on my last trip, including 1 golden” (K. Hill, pers. comm., May 18, 2017). Bald eagle sightings were reported by 76% of 2003 visitors. In addition, great blue herons, osprey, loons, herons, jays, and other birds are part of the Allagash experience. Dean and Sheila Bennett list 86 common bird species in their natural history guide to the Waterway (1994).

Bald and golden eagles are distinctive natural resources (see Appendix C and Figure 87).


**Chamberlain Farm**

David Pingree and his partner Eben S. Coe established this farm and supply depot in 1846 to support their logging operations. It served as headquarters for construction of the tramway between Eagle and Chamberlain lakes and of Lock dam. Winter haul roads connected it to the south and east. Thoreau visited the farm and camped on the shore in 1857. One building from that era survives, known as Farm Camp.

Farm Camp (Figure 27) and the remains of H. W. Marsh (Figure 69) are distinctive heritage resources at the Chamberlain Farm site, described in chapters 3 and 5.

**Chase Rapids and Allagash River**

The Allagash River begins just below Churchill–1998 dam, at Chase Rapids, and drops 300 feet as it flows 68 miles to the St. John River. Lakes, channels, and fluctuating flows change the river’s character along the way. Vegetation and wildlife vary in its waters and along its shores where some structures are visible. West Twin Brook, one of many streams entering the river, is at the Waterway’s northern boundary 6 miles shy of the St. John.

Within the first mile of a churning 3-mile stretch of Chase Rapids, standing waves of 3 to 5 feet are frequently present. The rapids extend 9 miles from Churchill–1998 dam to Umsaskis. Some experienced paddlers run the whitewater. Others use the 1.5-mile portage trail, while still others hitch a ride to below the rapids. Whatever the mode of travel, Chase Rapids is a signature feature for those paddling this section of the Waterway.

Allagash River and Chase Rapids are distinctive natural resources (see Appendix C).
Churchill Depot

Between 1926 and 1938, Churchill Depot was a supply and administrative hub for Édouard “King” Lacroix’s Allagash lumbering operations. About 20 families lived permanently in the depot’s village, which had houses, a church, English and French schools, and maintenance facilities. A boarding house and storehouse remain; see chapter 3 for descriptions of these two important Waterway buildings.

BPL has built a Waterway manager’s residence, a ranger cabin, a maintenance building, campsites, a canoe landing, and privies. In 1997–98, BPL built a new “Churchill Dam” (Figure 30). The Storehouse is a repository for objects, described in chapter 3, retrieved from the Allagash watershed. Collectively, the objects draw the attention of visitors.

The Boarding House (Figure 22), Storehouse (Figure 26), dedication plaque (Figure 38), and a batteau at Churchill Depot (Figure 67) are distinctive heritage resources. See chapters 3 and 5 for details about each.

Cunliffe Depot

William Cunliffe settled on a high bank above the Allagash River in the late 1800s, 2 miles upriver from Michaud Farm, where he ran his logging operation until the 1930s.
The depot housed the men and animals that worked in the woods throughout the fall and winter seasons. No historic structures remain. Cunliffe Depot campsite is located here. The remains of two Lombard log haulers are located at Cunliffe Depot, one steam- and one gasoline-powered.

Steam-powered Lombard haulers revolutionized woods work by freeing thousands of horses from the dangerous work of hauling sleds full of logs over snow and ice. The mechanized haulers had skis on the front and were powered by rear tracks, which was an innovation. Alvin Lombard went into full production in 1903 and began offering gasoline-powered machines in 1915. (Some Lombard remains are also at the former Churchill Depot machine shop location and in off-site collections.)

Joe McKeel, who worked at Cunliffe, was buried in two barrels near the river, his grave being subsequently moved. A memorial stone stands on the old Inn Road between Cunliffe Depot and Ramsay Ledges campsites. (The latter is the only Waterway site where RV camping is allowed, spring to fall.) The stone—and McKeel himself—stands for a common man who worked in the 1800s logging industry. Visitors leave coins at his stone as tokens of remembrance (Figure 88).

The McKeel stone and Lombard log hauler remains are distinctive heritage resources.

**Dams**

The site of the former wooden Long Lake Dam is located at the north end of Harvey Pond. Built by the St. John Lumber Company in 1907, it merged Harvey Pond and Long Lake. Its purpose was to aid log driving in late spring and early summer. It also carried
the California Road. The dam was discontinued in the 1920s, and only some log cribbing remains (Figure 89). The nearby shore is the location of the Long Lake Dam campsite.

In 1841, landowners at Telos and Webster lakes dammed Chamberlain Lake’s outlet. In 1846, Eben S. Coe built another dam below it to create a lock for transferring logs upstream from Eagle Lake to Chamberlain Lake. Few vestiges remain of the lower dam (called “Lock Dam” when built). The timber crib structure of the last dam at Chamberlain Lake outlet (Chamberlain–1841) is buried under the earthen dike of Lock–1962 dam (Figure 32). Lock Dam campsite and Lock Dam Camp are adjacent.

A dam at Telos Lake worked in conjunction with Chamberlain Dam to drive logs through Webster Stream to Webster Lake, on their way to Bangor. Telos Cut, a canal 10–15 feet wide and 1–6 feet deep, fed water and logs to Telos dam. All was in place by the fall of 1841, part of a scheme to redirect the natural northerly flow of water. Telos Landing campsite offers access to Telos–1981 dam (Figure 34).

Lock–1962, Chamberlain–1841, and Telos–1981 dams are distinctive heritage resources discussed in chapters 3 and 5.
Fire Towers

There are two fire towers in the Allagash watershed. A tower was installed atop Round Pond Mountain in 1946. In 1993, the steel tower was replaced (by helicopter) and a plywood observation platform installed. Visitors reach the 60-foot tower (Figure 90), located on BPL’s Round Pond Public Reserved Land, via a 2.4-mile trail from the shore of the pond. The platform offers sweeping views of the surrounding working forest. BPL posts the tower prohibiting public access.

A log tower was built on Allagash Mountain in 1916, with the current 27-foot steel tower installed in 1924. The cab remains, and is accessible to the public. It is located on BPL’s Chamberlain Lake Public Reserved Land. Allagash Mountain Trail leads 0.75 mile from the ranger station on the lake to the tower. Availability of the historic alidade panorama map, depicting the view from that tower, enriches the interpretive potential of Allagash Mountain tower. See Figures 14, 29, and 46.

Allagash Mountain Fire Tower is a distinctive heritage resource discussed in chapter 5.

Forested Shores

The Waterway remains part of the Maine Woods where boreal spruce-fir meets the northern hardwood transition forest, with pockets of bog, swamp, and floodplain forests. This biological complex is home to myriad organisms of the northern temperate zone. Thoreau and others have taken note of three old-growth stands near the shores of

Figure 91. Eastern brook trout (Salvelinus fontinalis). (n.d., photo courtesy of U.S. Fish and Wildlife Service)
the watercourse that punctuate the “wildness” of the Waterway. Passing forested shores on water or ice shapes the Allagash experience.

Chamberlain Lake Ecological Reserve, including old growth and other forest types, is a distinctive natural resource, described in chapter 2.

Fish

Brook trout, lake trout, lake whitefish, and burbot (cusk) are fish native to Maine present in Allagash waters. Brook trout (Figure 91) thrive in the cool waters of the Allagash watershed, though found throughout Maine. Fewer, and especially non-native, fish species compete with or prey on them in the Waterway. Lake trout, lake whitefish, and cusk are confined to the clear, deep, well-oxygenated waters of the larger lakes in the Waterway, which attract eagles, ospreys, loons, and gulls, in addition to human anglers.

The native eastern brook trout is a distinctive natural resource (see Appendix C).

Katahdin Views

“I could see down the lake to a range of mountains, including Mt. Katahdin. . . . How many others, I wondered, had sat in this same spot, mesmerized by this panoramic view?” (D. B. Bennett, 2001, p. 5) The southern lakes and summits in the Waterway offer scenic views of iconic Mount Katahdin and Baxter State Park. Mountains visible within the Allagash watershed also contribute to the scenic beauty of the Waterway.
Michaud Farm

J. T. Michaud grew grain and vegetables to support his lumber operation here in the early 1900s. Michaud ran a store for as many as 13 families who lived in the area. In the 1920s and ‘30s, Michaud Farm was a fully operating supply depot. Little evidence of past use remains on the land surface today. Joseph McKeel worked at the farm for a time (see Cunliffe Depot heading). The site is accessible by vehicle, where there is a circa-1968 ranger station (Figure 16), parking area, and campground.

Moir Farm and Taylor Camp

One of the earliest farms along the Allagash was established about 1838 above Allagash Falls. A group including two Diamond family sisters made their way from New Brunswick. Other family members followed; agriculture continued into the 20th century when a small settlement developed. Today many in the town of Allagash trace their heritage to the Moir and Diamond families. A farmhouse ruin survives, probably built by George Moir (and Lucinda Diamond) around the turn of the 20th century (Figure 18).

Henry Taylor and his wife Alice built and ran a sporting camp on the shore of the river at the Moir farm from the 1930s to 1970s. There were three camp buildings: Main Lodge, West Camp, and Middle Camp. One structure now serves as an interpretive resource (Figure 93).

Moir Farmhouse ruin is a distinctive heritage resource described in detail in chapter 3; also see chapter 5.

Moose

“It is difficult to explain, but when you paddle up close to a giant bull moose and actually hear the water running off his antlers when he picks his head up out of the water, while
feeding on water plants—that is something very special” (LaRoche, 2011). Moose sightings were reported by 91% of visitors in 2003. Viewing wildlife is a major feature of a trip on the Allagash. More than 30 other mammal species, including Canada lynx, are present in the area (S. Bennett & Bennett, 1994).

Moose and Canada lynx are distinctive natural resources in the Waterway (see Appendix C).

**Railroad Trestle**

During the winter of 1926–27, Lacroix’s Madawaska Company constructed a 13-mile railroad to move pulpwood. It ran from the Eagle Lake side of Tramway south to Umbazooksus Lake (later extended 5 miles to Chesuncook Lake). The road included a 1,500-foot-long wooden trestle across the northern end of Chamberlain Lake, near Allagash Stream, supported by stone piers. Ruins of the Trestle remain (Figure 37).

Eagle Lake & West Branch Trestle remains at Allagash Stream and the mainline tracks are distinctive heritage resources, see chapters 3 and 5.

**Sporting Camps**

Willard Jalbert Sr., who is often referred to as “The Old Guide,” built a camp on the east side of Round Pond (T13 R12) in 1941. After the Waterway was established, BPL leased several subsequent Jalbert camps at Halfway, Windy Point (Figure 20), and Whittaker Brook back to the family; the current operator is a registered Maine Guide and granddaughter of “The Old Guide.” There are now 10 camps, and associated structures.

Al “Nuge” and Lila-Beatrice “Patty” Nugent began building sporting camps in 1936 on the shore of Chamberlain Lake, about 3 miles east of Chamberlain Farm. They hosted
deer hunters that first year. In 1952, the Nugents purchased Heart O’ Maine Sporting Camps located at the farm. Private individuals lease the camps at these two locations from BPL. A single building remains at the Chamberlain Farm site, known as Farm Camp (Figure 27).

Jalbert’s and Nugent’s sporting camps are distinctive heritage resources described in chapters 3 and 5.

**Stars**

“Imagine standing out on the ice on a calm, frigid, moonless February night, seeing only by light originating from a myriad of stars above, illuminating a silhouette of the unbroken forest on the horizon” (Johnson, 2016). A starry night sky is part of the historic fabric on the Allagash: Visitors today see essentially the same sky as Wabanaki travelers thousands of years ago. Wildlife and many natural processes depend on the night sky and darkness.

**Tramway and Locomotives**

A log-conveying system operated between Eagle and Chamberlain lakes, 1903–07. Small dollies or trucks attached to a steel cable, powered by a steam engine, traveled two levels of rails. Logs loaded at Eagle rode the upper level to Chamberlain (3,000 feet), and then empty trucks returned on the lower rails. A portion of the tramway, shown in Figure 35, was reconstructed for interpretive purposes. Also, see Figures 57 and 58.

Tramway includes the Eagle Lake & West Branch railroad’s eastern terminus (1926–1933). Two standard-gauge locomotives rest where they were abandoned upon the railroad’s demise. The six- and eight-wheeler dominate the site, as shown in Figure 64.
Distinctive heritage resources of the National Register Tramway District include Locomotives No. 1 and No. 2 with their tenders, tracks, switches, and 40 pulp-car remains; and the tramway power plant, powertrain (gears and cable), rails, trucks, and other components described in chapters 3 and 5. A portion of the district is included in the Chamberlain Ecological Reserve (a.k.a. Bear Mountain), a distinctive natural resource described in chapter 2.

Umsaskis

Umsaskis Meadows is a wetland just below Allagash River’s Chase Rapids, which has fed sediment to the marsh for centuries. In summer wild rice, rushes, sedges, and grasses grow here providing cover and food for herons, ducks, and other birds in its maze of channels, islands, oxbows, and small pools. It’s common to see bald eagles working the Meadows. Meadows campsite is located nearby. Chisolm Brook campsite overlooks the Meadows and offers a peaceful evening paddle.

**ALLAGASH WATER**

Water in all its forms . . . mud-puddles on the road, streams flowing from cedar swamps under bridges, quick water just deep enough to float our boats, green canopy giving way to big sky, tufted grassy hummocks and weathered snags as the inlet opens to the lake, distant shores, eagle overhead, a northwest wind in our faces.

Water as driving rain, pock-marking the roiling waters, water from the ancient springs captured in our water bottles, drunk raw to quench a thirst, infused with the silt of ground coffee to wake us, a few crystal drops to enliven the bourbon as the campfire fades, dew on morning grass and cupped in unfolding blossoms, drops on feathers of the loon breaching the quiet surface of the lake after a long dive, water streaming as the moose lifts her head and chews long chains of submerged vegetation.

Water as fog clinging to the lake before the sun warms, water as clouds that highlight the setting sun.

Water as blood where the black-fly has rasped a tiny wound on my neck.

Water flowing, swirling, splashing the bow. When asked for a word to describe the drops falling from the paddle when you lift it clear of the river, a Scottish friend named it “oar-play.”

Tiny whirlpools trailing a deep paddle-stroke, water as a friendly “V”, allowing entry and the other, urging the paddler to go around—water as standing wave, bow wave, water as eddy. Water as the whispers of the river as you sleep on its shore.

— Ron Beard (pers. comm., May 21, 2017)
Figure 96: Allagash watershed prior to 1841 dam construction, with 48 sub-basins, and Waterway One-Mile Zone. (2017, produced by James W. Sewall Company)
Sometimes pronounced “Am-zaz-cuss” or “Umm-sass-kiss,” this 4-mile-long lake lies nearly midway north-to-south in the Waterway, bordered by steep ledges and Ledges campsite. Umsaskis, Long Lake, and Harvey Pond are considered separate yet they easily flow into one another and paddlers frequently pass through all three lakes in the course of one day. For those who portage around Chase Rapids, Umsaskis Lake is a little over 3 miles downstream of the Bissonette Bridge site.

**Water**

The central feature of the Waterway is . . . water. Water—in rills, rapids, eddies, quiet pools, or frozen sheets—attracts most visitors, as over the millennia it has drawn others for enjoyment, sustenance, and transport. The surface of eight lakes, four ponds, and the river accounts for greater than half of the area within the One-Mile Zone. More than 100 brooks and streams flow down the Waterway’s small mountains and rugged ridges. One cannot visit the Allagash without experiencing water in some form.

Figure 96 shows the land that was drained by the Allagash River prior to 1841, which is the geographic focus of the interpretive plan. The area includes some lands that now drain south to East Branch Penobscot River, due to dam construction, and lands north of West Twin Brook, extending to the St. John River. (The watershed encompasses 7,100 more acres than the heritage resource **Part Two** study area, shown in Figure 1.) The flow of waters into, within, and from the 948,000-acre watershed is fundamental to understanding Allagash-related travel, work, recreation, and natural systems over time.

**Wind/Weather**

All who travel the watercourse are aware of the weather—especially sudden winds on the lakes. “Wind is the bane of canoeists” (Gilpatrick, 2004, p. 62). Wind and accompanying waves frequently delay the start of planned trips. “After a day or two you become super-sensitive to any change in the weather: wind direction, approaching clouds, increasing humidity, whatever” (Grant, 2010). Perhaps the question posed most frequently to rangers by Waterway travelers is, “What’s the weather forecast?”
FOOD WEB IN ALLAGASH WATERS

Subject: Living Environment/Life Science.

Grade: Middle School (6–8).

Time Frame: Approximately 3 hours, which includes observation time.

Prepared by: Amanda Barker.

LESSON OVERVIEW

This activity allows students to explore the interaction of the biotic and abiotic components of aquatic ecosystems that are within Allagash Wilderness Waterway. Students will research several common Allagash species prior to an Allagash trip. While on a Waterway trip, they will observe common mergansers and make conclusions about aquatic and terrestrial ecosystems.

Learning Objectives

The student will (a) practice research methods; (b) record observation data; and (c) form a conclusion about energy flow in aquatic and terrestrial ecosystems.

Educational Standards

Both Maine Learning Results (MLR) and Next Generation Science Standards (Next Gen) apply to this lesson.

Maine Learning Results

MS-E2 Science and Technology: Ecosystems – Students examine how the characteristics of the physical, non-living (abiotic) environment, the types and behaviors of living (biotic) organisms, and the flow of matter and energy affect organisms and the ecosystem of which they are part.

E2c: Describe the source and flow of energy in the two major food webs, terrestrial and aquatic.

Next Generation Science Standards

MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
**Waterway Interpretive Theme/Sub-Theme**

**Theme II** – Flowing waters sustain wild life throughout the Waterway

**Life Support Sub-Theme:** Plants and animals depend on life-giving water flowing in Waterway soils, streams, wetlands, ponds and lakes, and the Allagash River.

**Materials/Supplies Needed**

- stopwatch
- clipboards
- colored and regular pencils
- binoculars
- Food Web Research Resources handout; see Waterway Lesson Plans, see page 129
- Allagash Food Web Diagram handout, see page 131
- Allagash Food Web Diagram Rubric handout, see page 132

**Prerequisite Knowledge/Skills**

Students should have a basic understanding of ecosystems including that the Sun’s energy powers all food webs.

**Teaching Procedure**

**Engage**

1. Prior to a Waterway trip, students will research species they may encounter while on the Allagash Wilderness Waterway. In particular, students will focus on common mergansers, a type of diving duck that is frequently observed along the Waterway. There are other species of waterfowl including other ducks, Canada geese, and loons that are present on the Waterway but often not as commonly seen.

2. As part of their research, refer students to the Research Resources handout. Have them research the common merganser and create a guide to common duck behavior. While their observations will focus on mergansers, many duck behaviors are relatively similar between species (head bobs, tail wagging, mothers running across the water as a diversion). Their guides should include sketches of courtship displays, aggression displays, food-seeking habits, and preening. They should understand why mergansers dive and what they are looking for when they dive. Additional sites about Maine mussels and fish have been included on the Sources list.

3. Students will create a data record sheet as part of their guidebook for duck behavior. Most likely they will observe swimming, looking for food, diving, preening, head bobbing, and fluffing feathers. If students are observing a hen or hens, with chicks, they should also hear low quacking from the mother. If threatened, students may observe the hen distracting attention away from the chicks. If this happens on its own, that’s okay but they should not approach a flock to force seeing a behavior.
Explore

While on an Allagash trip, each student will observe mergansers for at least 5 minutes. Mergansers are very common on the Waterway, particularly flocks of chicks with one or two hens, but they are not predictable. Students should be prepared to complete this activity any time the opportunity arises. Their guides should be kept accessible.

Students should document as many behaviors as they can on the data sheet that they have created. They should place tick marks in the corresponding data sheet to get a sense of what behavior was the predominant behavior.

Explain

After the students have made their observations, discuss what each of them observed. As a group, what did they see? What were they doing? Why were they doing it?

Guide the discussion to how the merganser is interacting within the ecosystem. What parts of the biotic community is the merganser utilizing? What parts of the abiotic community is the Merganser utilizing? How does the merganser bridge between a terrestrial ecosystem and an aquatic ecosystem? Using the merganser as an example, how does energy flow between terrestrial and aquatic ecosystems? What source of energy is the base of the ecosystem?

Elaborate

Observe another animal while on an Allagash trip and include it in the final activity. Animals that also bridge between aquatic and terrestrial ecosystems include Canada geese, herons, beavers, and moose.

Evaluate

The evaluation for this activity is the creation of a detailed food web with the common merganser as the center. The food web should clearly show the aquatic food web and the terrestrial food web interacting together. Abiotic factors could be rocks and water. Students should include a key on their food web with different-colored arrows for terrestrial ecosystems and aquatic ecosystems.
FOOD WEB RESEARCH RESOURCES

LESSON: FOOD WEB IN ALLAGASH WATERS

INTERNET SITES ABOUT BIRD BEHAVIOR

Audubon: Guide to North American Birds
http://www.audubon.org/field-guide/bird/common-merganser

The Cornell Lab: All About Birds
https://www.allaboutbirds.org/guide/common_merganser

The Cornell Lab: How to recognize duck courtship displays
https://www.allaboutbirds.org/what-to-watch-for-duck-courtship-video/

Ducks Unlimited: The Curious Lives of Sea Ducks

Ducks Unlimited: Diving Ducks: Into the Deep
http://www.ducks.org/conservation/waterfowl-research-science/diving-ducks-into-the-deep/page2

Ducks Unlimited: Understanding Waterfowl: Drakes and Ganders
http://www.ducks.org/conservation/waterfowl-research-science/understanding-waterfowl-drakes-and-ganders

Macaulay Library (photos, videos, audio)
https://search.macaulaylibrary.org/catalog?taxonCode=commer&mediaType=p&q=Common%20Merganser%20Mergus%20merganser

Handbook of Waterfowl Behavior: Tribe Mergini (Sea Ducks)
https://digitalcommons.unl.edu/bioschandwaterfowl/18/

U.S. Fish and Wildlife Service: Ducks at a Distance Guide
https://www.fws.gov/uploadedFiles/Ducks%20at%20a%20Distance-OCR.pdf

Maine Department of Inland Fisheries and Wildlife

ELABORATE SITES FOR OTHER MAINE SPECIES

Maine Department of Inland Fisheries and Wildlife: Freshwater Mussels
https://www.maine.gov/ifw/docs/FWMussel_speciesassessment.pdf

Maine Department of Inland Fisheries and Wildlife: Freshwater Fishes of Maine
https://www.maine.gov/ifw/docs/fishesofmaine.pdf
Maine Department of Inland Fisheries and Wildlife: Maine Moose Facts

**Reference Texts**


**Allagash Food Web Diagram**

**Lesson: Food Web in Allagash Waters**

Using the research that you have done and the observations that you have made, complete a food web diagram.

You must include the following components:

- Common merganser in the middle of the diagram.
- At least four interactions with other biotic factors. Interactions should include a drawing of the organism involved.
- At least three abiotic interactions with abiotic factors.
  - Interactions should include a drawing of the factor involved.
  - Colored arrows need to be drawn between each interaction. Aquatic ecosystem interactions should be one color, while terrestrial ecosystem interactions should be another.
- Labels on all interactions with terms including: primary producer, primary consumer, secondary consumer, tertiary consumer, etc.

Your diagram must clearly show what energy source is powering both food webs.

You must include an explanation of what the source of the energy is in terrestrial and aquatic food webs and how it flows through the two food webs. Your explanation must include a claim statement, at least two pieces of evidence based on your observations or research, and reasoning connecting your claim with your evidence.
# Allagash Food Web Diagram Rubric

## Lesson: Food Web in Allagash Waters

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biotic Factors</strong></td>
<td>More than 6 biotic factors correctly placed in food web.</td>
<td>4 biotic factors correctly placed in food web.</td>
<td>Less than 4 biotic factors placed in food web or some factors not placed correctly in web.</td>
<td>Less than 3 biotic factors placed in food web or factors not placed correctly.</td>
</tr>
<tr>
<td><strong>Abiotic Factors</strong></td>
<td>More than 4 abiotic factors correctly placed in food web, including the sun.</td>
<td>3 abiotic factors correctly placed in food web, including sun.</td>
<td>2 or less abiotic factors correctly placed in food web or some factors not placed correctly in the web.</td>
<td>Less than 2 abiotic factors placed in food web or factors not placed correctly.</td>
</tr>
<tr>
<td><strong>Labels and Arrows</strong></td>
<td>Labelling and arrows are neat and effective.</td>
<td>Labelling and arrows are acceptable.</td>
<td>Some labels or arrows are missing or confusing.</td>
<td>Multiple labels or arrows are missing or confusing.</td>
</tr>
<tr>
<td><strong>Craftsmanship</strong></td>
<td>Neatness, effort and craftsmanship is evident in the project.</td>
<td>Project is acceptable but could use more attention to detail at a few points.</td>
<td>Project is mostly completed but needs more work. Lacks attention to detail.</td>
<td>Project is incomplete or very messy.</td>
</tr>
<tr>
<td><strong>Summary Paragraph</strong></td>
<td>Explanation includes a fully developed claim, evidence and reasoning. Explanation is correct.</td>
<td>Explanation is substantially correct. Is missing components of claim, evidence and reasoning.</td>
<td>Explanation is weak. Is missing multiple components of claim, evidence and reasoning.</td>
<td>Explanation is not correct or is missing.</td>
</tr>
</tbody>
</table>
Subject: Math and Science

Grade: Middle School (6–8).

Time Frame: 1–2 class periods.

Adapted by: Nancy Philbrick, from activity created by Terry Harper.

LESSON OVERVIEW

Students will assume the role of mechanical engineers to solve multi-step problems involving the power transmission system of the Lombard log hauler. They will calculate gear ratio, torque, and gear speed. Students will analyze their data to find the theoretical miles per hour of the Lombard hauler. Finally, the class will discuss how individual parts working together enable such a machine, with a 90 horsepower engine, to pull a load of up to 300 tons.

Learning Objectives

The student will (a) calculate gear ratios, torque, gear speed, and theoretical miles per hour for the Lombard log hauler; (b) successfully analyze data to find the theoretical miles per hour of the Lombard hauler; and (c) through class discussion, develop understanding of the power system of the Lombard log hauler.

Academic Standards

Maine Learning Results—Math and Science—and Next Generation Science standards correlate with this lesson.

Maine Learning Results, Math (Common Core)

8.F.A.1 Functions – Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

7.RP.A.3 Ratios and Proportional Relationships – Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.
6.RP.3 Ratios and Proportional Relationships – Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

Maine Learning Results, Science

A1.a Systems: Middle School – Explain how individual parts working together in a system (including organisms, Earth systems, solar systems, or manmade structures) can do more than each part individually.

D4.e Force and Motion: Middle School – Describe and apply an understanding of the effects of multiple forces on an object, and how unbalanced forces will cause changes in speed and direction.

Next Gen Science Standards

MS. PS.2-2 Motion and Stability: Forces and Interactions – Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Cross Cutting Concepts – Systems and System Models; Cause and Effect

Science and Engineering Practices – Analyzing and Interpreting Data; Using Mathematics and Computational Thinking

Waterway Themes

Theme III – People have lived, worked, and traveled in the Maine Woods since ancient times.

A Working Forest Subtheme: Timberland investors changed the flow of history—and Allagash waters—by floating harvested logs north to markets and then logs and pulpwood south, relying on the labor of men, draft animals, and machines.

Materials

☐ calculators
☐ computers or projector (to show videos)
☐ Lombard Log Hauler Fact Sheet; see Waterway Lesson Plans, page 140
☐ Calculate Gear Ratio, Torque, and Speed assignment; see Waterway Lesson Plans, page 141

Prerequisite Knowledge/Skills

- fraction computations skills
- knowledge of ratios and rates
- ability to analyze and interpret data tables

TEACHING PROCEDURE

Engage

Introduce the Lombard log hauler by discussing the information in the Lombard Log Hauler Fact Sheet with the students. During the discussion include soliciting other ideas students might have about ways to move logs in the woods during the early 1900s, as a comparison to the log hauler.
Explore

It is recommended that the class go over the first three pages of the assignment as a group. Next allow the students to work in small groups to complete the challenge. As the students work through the challenge, they will be sharing ideas and thoughts about the process.

Explain/Elaborate

Students’ understanding and ability to explain their thoughts should continue to progress throughout the lesson. Wrap up with a discussion regarding the efficiency of the log hauler compared with other ways to move the logs across the land, and how mechanical advantage enables such a machine to pull a load of up to 300 tons.

Evaluate/Assess

Formative assessment is ongoing throughout the explanation/elaboration and the wrap-up phases of the lesson through observation and evaluation of student discussions. Students’ completed work should be assessed for accuracy.

Extend

Consider showing one or both of the videos so students can get a full understanding of the hauler; total time of both videos is approximately 12 minutes.

Additional Resources


**Answer Key: Calculate Gear Ratio, Torque, and Speed**

Keep in mind that answers may vary slightly depending on rounding to different place values and the use of both fractions and decimals.

**The Challenge**

The challenge is to calculate the final gear ratio, torque, gear speed, and miles per hour for the Lombard log hauler in the above photo.

**Step One: Gear Ratios**

Find the individual gear ratios using the formula:

$$ R = \frac{N_2}{N_1} $$

<table>
<thead>
<tr>
<th>Gear</th>
<th>Number of Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: B</td>
<td>56 : 23</td>
</tr>
<tr>
<td>B: C</td>
<td>16 : 56</td>
</tr>
<tr>
<td>C: D</td>
<td>36 : 16</td>
</tr>
<tr>
<td>D: E</td>
<td>9 : 36</td>
</tr>
<tr>
<td>E: F</td>
<td>22 : 9</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
A: B &= \frac{56}{23} = \frac{2.4}{1} = 2.4:1 = 2.40 \\
B: C &= \frac{16}{56} = \frac{1}{3.5} = 1:3.50 = 0.29 \\
C: D &= \frac{36}{16} = \frac{2.25}{1} = 2.25:1 = 2.25 \text{ ft-lbs} \\
D: E &= \frac{9}{36} = \frac{1}{4} = 1:4 = 0.25 \text{ ft-lbs} \\
E: F &= \frac{22}{9} = \frac{2.4}{1} = 2.4:1 = 2.40 \text{ ft-lbs}
\end{align*}
\]
**Step Two: Final Ratio**

Using the above data, solve for the final (compound) gear ratio.

Note: With complex gear machines having more than two gears, we only use the driver and driven gears (usually the first and last ones) to find the final gear ratio.

\[
\text{Final gear ratio} = \text{Gear ratio of} \quad \frac{A}{B} \times \frac{E}{F}
\]

\[
\text{Final gear ratio} = \frac{2.4}{1} \times \frac{2.4}{1} = 5.76
\]

**Step Three: Torque**

Using the gear ratios that you found in Step One, calculate the output torque using the formula:

\[
T_{\text{out}} = T_{\text{in}} \times R
\]

The value for \( T_{\text{in}} \) at gear “A” = 6,360 ft-lbs

The \( T_{\text{out}} \) for each gear becomes the \( T_{\text{in}} \) for the next gear.

<table>
<thead>
<tr>
<th>Torque In ((T_{\text{in}}))</th>
<th>Torque Out ((T_{\text{out}}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = 6,360 ft-lbs.</td>
<td>6,360 x 2.4 = 15,264</td>
</tr>
<tr>
<td>B = 15,264 ft-lbs.</td>
<td>15,264 x 0.29 = 4,361</td>
</tr>
<tr>
<td>C = 4,361 ft-lbs.</td>
<td>4,361 x 2.25 = 9,821.25</td>
</tr>
<tr>
<td>D = 9,821.25 ft-lbs.</td>
<td>9,821.25 x 0.25 = 2,455.31</td>
</tr>
<tr>
<td>E = 2,455.31 ft-lbs.</td>
<td>2,455.31 x 2.4 = 5,892.74</td>
</tr>
<tr>
<td>F = 5,892.74 ft-lbs.</td>
<td></td>
</tr>
</tbody>
</table>

**Final Torque**

Note: To find the final torque, use the final ratio from Step Two.

\[
\frac{5,892.74}{(F \cdot T_{\text{in}})} \times \frac{5.76}{(\text{final gear ratio})} = 33,942.18 \text{ ft-lbs}
\]
**Step Four: Speed**

Using the gear ratios that you found in Step One, calculate the final gear speed using the formula:

\[ \frac{S_{\text{in}}}{R} = S_{\text{out}} \]

The value of \( S_{\text{in}} \) at gear “A” = 208 rpm. The speed \( S_{\text{out}} \) at each gear becomes the speed \( S_{\text{in}} \) for the next gear.

*Speed in (\( S_{\text{in}} \))*

\[
\begin{align*}
A &= 208 \text{ rpm} \quad \frac{208}{2.4} = 86.7 \\
B &= 86.7 \text{ rpm} \quad \frac{86.7}{29} = 300 \\
C &= 300 \text{ rpm} \quad \frac{300}{2.25} = 133 \\
D &= 133 \text{ rpm} \quad \frac{133}{25} = 532 \\
E &= 522 \text{ rpm} \quad \frac{532}{224} = 238 \\
F &= 238 \text{ rpm} \quad \frac{238}{5.76} = 41
\end{align*}
\]

Final Speed = 41 rpm

Note: To find the final speed, use the final ratio from Step Two.

**Step Five: Miles per Hour**

Several conversions are needed to calculate the theoretical miles per hour (mph).

rotations to inches—> inches to feet—> feet to miles—> minutes to hours

Follow the steps below to get the final miles per hour.

\[
\begin{align*}
\text{Final speed from Step 4 (rpm)} & \times \frac{113.04}{\text{Length of wheel in inches}} = 4,634.64 \text{ inches per minute} \\
\text{4,634.64 inches per minute} & \div 12 \text{ inches} = 387.22 \text{ feet per minute} \\
\text{387.22 feet per minute} & \div 5,280 \text{ feet (per mile)} = 0.07 \text{ miles per minute} \\
\text{0.07 miles per minute} & \times 60 \text{ minutes/hour} = 4.20 \text{ miles per hour (mph)}
\end{align*}
\]

Final miles per hour (mph) = 4.20. Congratulations!
CLASS DISCUSSION

What elements do you see in the photo above that gives the Lombard log hauler advantages such that a machine with only 90 horsepower can pull a load of up to 300 tons? Discuss with your classmates.

A few potential elements:

- Gears provide mechanical advantage.
- Snow and ice reduce friction.
- Tracks have a lower ground pressure than wheels.
Lombard Log Hauler Fact Sheet

Lesson: Gears, Ratio, Torque, and Speed Along the Allagash

The Lombard log hauler was a machine used to haul logs across land in the woods, usually on snow and ice. The first haulers were steam powered and were later replaced with gasoline engines, then diesel-powered haulers. They were used in the Allagash in the early 1900s through the 1930s.

Some interesting facts about the Lombard log hauler:

- Four people—engineer, fireman, pilot or steersman, and conductor—were needed to operate a log hauler.
- They carried about 14 cords of wood, which is about 6,000–7,000 board feet per sled.
- The length of a train of sleds was known to have exceeded 1,650 feet.
- The early models had no brakes!
- A typical hauler pulled about eight sleds.
- Lombard haulers could pull up to 300 tons.

Facts found at:

Videos Showing the Log Hauler in Action

https://www.youtube.com/watch?v=k0--WWnjKzk

https://www.youtube.com/watch?v=hoVWBouchHA
CALCULATE GEAR RATIO, TORQUE, AND SPEED

LESSON: GEARS, RATIO, TORQUE, AND SPEED ALONG THE ALLAGASH

Mechanical engineers frequently need to apply mechanical advantage to solve a problem. Mechanical advantage is multiplication of force by the use of simple machines such as a lever, pulley, inclined plane, wheel and axles, gears, etc. When using gears, the mechanical advantage is called the gear ratio.

Today’s challenge is to calculate the final gear ratio, torque, gear speed, and miles per hour for a Lombard log hauler. When harvesting trees for lumber and pulp, companies in Maine used different types of equipment to move logs in the woods. One such machine used in the early 1900s was the Lombard log hauler.

This problem involves calculating gear ratios. Gears are a force multiplier. The tooth of a gear acts as a lever. As each tooth exerts pressure on another it causes the gear to move. To determine the mechanical advantage of machines, engineers calculate the gear ratio. The gear ratio is the rate at which the last and first gears rotate.

The gear ratio is defined as the input speed relative to the output speed. If we know the gear ratio than we can calculate the torque, gear speed and miles per hour.

KEY TERMS

**For Calculations**
- ft-lbs = foot-pounds (see torque)
- hp = horsepower
- mph = miles per hour
- \( N_1 \) = number of teeth of input (driving) gear
- \( N_2 \) = number of teeth of output (driven) gear
- \( R \) = gear ratio
- rpm = rotations per minute
- \( S \) = speed
- \( T \) = torque ()

**Vocabulary Terms**
- gear ratio (R) – input speed relative to the output speed.
- torque (T) – a force that produces rotation, expressed in foot-pounds (ft-lbs).
- speed (S) – the number of revolutions per minute (rpm).
- horsepower (hp) – the rate at which work is done; equal to 550 foot-pounds per second.
- miles per hour (mph) – a unit of speed representing the number of miles traveled in one hour.
CALCULATING GEAR RATIO (R)

While there are two ways to calculate the gear ratio and gear speed (rpm), we will use the number of teeth on the gears for our calculations.

To calculate the gear ratio we will use the following formula:

\[ R = \frac{N_2}{N_1} \]

**Example**

In the example below the ratio of 3:1 tells us that for every three (3) revolutions of the drive gear the driven gear will make one (1) revolution.

CALCULATING TORQUE (T)

Once we know the gear ratio, we can calculate the torque. The formula to find the torque is:

\[ T_{\text{out}} = T_{\text{in}} \times R \]

For the previous example, if we have a torque in of 0.25 ft-lbs.

\[ T_{\text{out}} = 0.25 \times \frac{3}{1} = 0.75 \text{ ft-lbs}. \]

0.75 ft-lbs is what will be exerted on shaft “B.”
CALCULATING GEAR SPEED (S)

Gear speed is expressed as revolutions per minute (rpm). The formula to calculate speed is:

\[ \frac{S_{\text{in}}}{R} = S_{\text{out}} \]

For the previous example with a speed in \( (S_{\text{in}}) \) of 90 rpm, the speed out \( (S_{\text{out}}) \) would be 30 rpm.

\[ \frac{90}{\frac{3}{4}} = S_{\text{out}} \quad S_{\text{out}} = 30 \text{ rpm} \]

Complex Gear Machines

Since the problem we will be working on involves a power transmission system with multiple gears, we need to know how to calculate the gear ratio (R), torque, and speed for the entire system.

\[ \text{Gear Ratio} = \frac{N_{\text{out}}}{N_{\text{in}}} \times \frac{N_{\text{out}}}{N_{\text{in}}} \ldots \]

\[ = \frac{40}{120} \times \frac{20}{80} = \frac{80}{9600} \]

\[ = \frac{1}{12} = 1 : 12 \text{ or } 0.0833 : 1 \]

Speed: \( \text{RPM}_{\text{out}} = \frac{\text{RPM}_{\text{in}}}{\text{Ratio}} \)

\[ \text{Speed} = \frac{30 \text{ RPM}}{1/12} = 360 \text{ RPM} \]

Torque: \( \text{Torque}_{\text{out}} = \text{Torque}_{\text{in}} \times \text{Ratio} \)

\[ \text{Torque}_{\text{out}} = 0.25 \text{ ft lb} \times \frac{1}{12} = 0.020833 \text{ ft-lbs} \]

Note: For gear trains with more than two gears only the driver and driven gears (usually the first and last ones) matter. In other words, the intermediate (idler gears) don’t affect the gear ratio.

Simple, right? Now on to the challenge.
The challenge is to calculate the final gear ratio, torque, gear speed, and miles per hour for the Lombard log hauler in the above photo.

**Step One: Gear Ratios**

Find the individual gear ratios using the formula:

\[ R = \frac{N_2}{N_1} \]

\[ \text{A: B} = \frac{56}{23} = \frac{2.4}{1} = 2.4 : 1 = 2.40 \]

\[ \text{B: C} = \frac{16}{56} = \frac{1}{3.5} = 1 : 3.50 = 0.29 \]

\[ \text{C: D} = \text{____} = \text{____} = \text{____} = \text{____} \]

\[ \text{D: E} = \text{____} = \text{____} = \text{____} = \text{____} \]

\[ \text{E: F} = \text{____} = \text{____} = \text{____} = \text{____} \]

---

<table>
<thead>
<tr>
<th>Gear</th>
<th>Number of Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear A</td>
<td>23</td>
</tr>
<tr>
<td>Gear B</td>
<td>56</td>
</tr>
<tr>
<td>Gear C</td>
<td>16</td>
</tr>
<tr>
<td>Gear D</td>
<td>36</td>
</tr>
<tr>
<td>Gear E</td>
<td>9</td>
</tr>
<tr>
<td>Gear F</td>
<td>22</td>
</tr>
</tbody>
</table>
**Step Two: Final Ratio**

Using the above data, solve for the final (compound) gear ratio.

Note: With complex gear machines having more than two gears, we only use the driver and driven gears (usually the first and last ones) to find the final gear ratio.

\[
\text{Final gear ratio} = \text{Gear ratio of } \frac{A}{B} \times \frac{E}{F}
\]

\[
\text{Final gear ratio} = \frac{2.4}{1} \times \text{____} = \text{____} = \text{____}
\]

**Step Three: Torque**

Using the gear ratios that you found in Step One, calculate the output torque using the formula:

\[
T_{\text{out}} = T_{\text{in}} \times R
\]

The value for \( T_{\text{in}} \) at gear “A” = 6,360 ft-lbs

The \( T_{\text{out}} \) for each gear becomes the \( T_{\text{in}} \) for the next gear.

<table>
<thead>
<tr>
<th>Torque In (( T_{\text{in}} ))</th>
<th>Torque Out (( T_{\text{out}} ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = 6,360 ft-lbs</td>
<td>6,360 x 2.40 = 15,264</td>
</tr>
<tr>
<td>B = 15,264 ft-lbs</td>
<td>15,264 x 0.29 = ________</td>
</tr>
<tr>
<td>C = _________ ft-lbs</td>
<td>_______ x _______ = _______</td>
</tr>
<tr>
<td>D = _________ ft-lbs</td>
<td>_______ x _______ = _______</td>
</tr>
<tr>
<td>E = _________ ft-lbs</td>
<td>_______ x _______ = _______</td>
</tr>
<tr>
<td>F = _________ ft-lbs</td>
<td></td>
</tr>
</tbody>
</table>

***Final Torque***

Note: To find the final torque, use the final ratio from Step Two.

\[
____ \times \text{____} = \text{____ ft-lbs}
\]

\[
(F-T_{\text{in}}) \times \text{(final gear ratio)}
\]
**Step Four: Gear Speed**

Using the gear ratios that you found in Step One, calculate the final gear speed using the formula:

\[
\frac{S_{(in)}}{R} = S_{out}
\]

The value of \( S_{in} \) at gear “A” = 208 rpm. The speed \( out \) at each gear becomes the speed \( in \) for the next gear.

*Speed in (S*in*)*

\[ A = 208 \text{ rpm} \quad \frac{208}{2.4} = 86.7 \]

\[ B = 86.7 \text{ rpm} \quad \frac{86.7}{.29} = \text{_______} \]

\[ B = \text{_______} \text{ rpm} \]

\[ C = \text{_______} \text{ rpm} \]

\[ D = \text{_______} \text{ rpm} \]

\[ E = \text{_______} \text{ rpm} \]

\[ F = \text{_______} \text{ rpm} \]

**Final Speed = __________ rpm**

Note: To find the final gear speed, use the final ratio from Step Two.
Step Five: Miles per Hour

Several conversions are needed to calculate the theoretical miles per hour (mph).

rotations to inches → inches to feet → feet to miles → minutes to hours

Follow the steps below to get the final miles per hour.

\[
\text{\[\text{Final speed from Step 4, rpm}\] \times 113.04 = \text{\[\text{Length of wheel in inches}\]\ inches per minute}}
\]

\[
\frac{\text{\[\text{Inches per minute}\]} + 12 \text{ inches}}{12 \text{ inches}} = \text{\[\text{Feet per minute}\]} \text{ feet per minute}
\]

\[
\frac{\text{\[\text{Feet per minute}\]} + 5,280 \text{ feet (per mile)}}{5,280 \text{ feet (per mile)}} = \text{\[\text{Miles per minute}\]} \text{ miles per minute}
\]

\[
\frac{\text{\[\text{Miles per minute}\]} \times 60 \text{ minutes/hour}}{60 \text{ minutes/hour}} = \text{\[\text{Miles per hour (mph)}\]} \text{ miles per hour (mph)}
\]

Final miles per hour (mph) = \text{\[\text{Congratulations!}\]}

Class Discussion

What elements do you see in the photo above that give the Lombard log hauler advantages such that a machine with only 90 horsepower can pull a load of up to 300 tons? Discuss with your classmates.
CHANGING TECHNOLOGY ALONG THE ALLAGASH

**Subject:** Engineering Design, Science.

**Grade:** Middle School (6–8).

**Time Frame:** One Class Period.

**Prepared by:** Nancy Philbrick.

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**LESSON OVERVIEW**

Students will analyze changing technology in the area now encompassed by the Allagash Wilderness Waterway. After reviewing a provided list of different technologies employed along the Allagash, students will create a timeline that shows the evolving technology of the place. After creating their timelines, students will choose one technological resource and explain the effect it had on the people of the time.

**Learning Objectives**

The student will analyze nonfiction writing to (a) increase understanding of the desire for and effect of changes in technology, and (b) explain how advancing technology affects the amount of human energy needed to complete a task.

**Academic Standards**

Maine Learning Results and Next Generation Science standards correlate with this lesson.

*Maine Learning Results, Science*

**C3.a Science, Technology and Society: Middle School** – Describe how science and technology can help address societal challenges including population, natural hazards, sustainability, personal health and safety, and environmental quality.

**C3.c Science, Technology and Society: Middle School** – Identify factors that influence the development and use of science and technology.

**C4.a History and Nature of Science: Middle School** – Describe how women and men of various backgrounds, working in teams or alone and communicating about their ideas extensively with others, engage in science, engineering, and related fields.
Next Gen Science Standards

**Cross Cutting Concept:** Systems and System Models Connected to Energy and Matter – Energy and matter are basic to any systems model, whether of a natural or a designed system. Systems are described in terms of matter and energy. Often the focus of an investigation is to determine how energy or matter flows through the system, or in the case of engineering to modify the system, so a given energy input results in a more useful energy output.

**Science and Engineering Practices:** Practice 8: Obtaining, Evaluating, and Communicating Information – Communicate scientific and/or technical information (e.g., about a proposed object, tool, process, system) in writing and/or through oral presentations.

**Waterway Themes**

**Theme III** – People have lived, worked, and traveled in the Maine Woods since ancient times.

**A Working Forest Subtheme:** Timberland investors changed the flow of history—and Allagash waters—by floating harvested logs north to markets and then logs and pulpwood south, relying on the labor of men, draft animals, and machines.

**Materials**

- paper for creating student timelines, preferably larger than 8½ x 11 inches.
- Student ‘K-W-L’ Chart; see Waterway Lesson Plans, page 67.
- Allagash Technology Timeline; see Waterway Lesson Plans, page 152.
- Background: Allagash Technology; see Waterway Lesson Plans, page 154.
- Lombard Log Hauler Fact Sheet; see Waterway Lesson Plans, page 140.
- “Steel Horses for Long Hauls” in The Northern, 1926; see Waterway Lesson Plans, page 18.

**Prerequisite Knowledge/Skills**

- Research skills.
- Ability to synthesize short reading passages.

**Teaching Procedure**

After a brief introduction to technology and its advancements throughout time, the students will begin by attempting to order a list of technology developments in the Waterway. Next, they will do a short reading to gather information about the technology. After reading they will correct their first attempt at ordering the list. When this is done, students will create a timeline displaying the correct information. After completing the timeline, the students will choose one piece of technology to learn more about the effect it may have had on the people of the Allagash. This lesson may be more effective if students work in pairs or small groups. This will create the opportunity for students to have conversations about the advancements.
Engage

Begin by reviewing the definition of *technology*, and briefly describe the Allagash Wilderness Waterway. Then distribute the “K-W-L” (Know-Want to Know-Learned) chart. Students will fill out the “K” section to record their prior knowledge of the types of technologies that might have been used along the Allagash. Completing the “W” section will engage them by raising questions about the topic.

Distribute the Allagash Technologies activity sheet. Ask students to rank the technologies listed and create a timeline, following the provided instructions. Point out that two sample timelines are provided; they may choose the format they like the best. Students will be exposed to the technology in being asked to determine the order that it was introduced.

Explore

When the majority of students have completed their timelines, distribute the Background: Allagash Technologies information sheet. Ask students to explore the text and other resource materials of their choosing, such as the videos listed in the Lombard Hauler Fact Sheet or other available materials. During the exploration stage of the lesson, students will read about and discuss the different technological advancements.

Explain/Elaborate

Have students complete the “L” column of the “K-W-L” chart to solidify the concepts they have been exploring. The timeline and further research will provide students with the opportunity to demonstrate understanding of the progress.

Introduce formal terms, definitions, and explanations for concepts, processes, skills, or behaviors encountered during the lesson so far.

Conduct a class discussion to give students the opportunity to verbalize their understanding of technology along the Allagash. Ask for a few volunteers to share their timelines with the class. Prompts might include:

- What surprised you about how people have employed technology?
- How did technology change people’s lives along the Allagash?
- What type of work was associated with most of the technologies described?
- Can you think of any new technologies that are in use along the Allagash today (hint: GPS, cameras on cell phones)?

Evaluation/Assessment

The “K-W-L” chart will act as a prior knowledge assessment to see what the students understand about technology prior to the lesson. They will be able to track their learning when the “Learned” section of the chart is complete. Assessment of student learning by the educator can be done by analyzing the timelines and conversations students have during the lesson.
Students and teachers can review and compare timelines, identify success and challenges, and evaluate results as a group.

Extend

Appendix E of *Storied Lands & Waters of the Allagash Wilderness Waterway* by Bruce Jacobson is a 10-page chronology in which human events are offered in the history of Allagash watershed and the Waterway. It may be of interest to students regarding historical timelines.
Technology is often defined as any product made by humans to meet wants or needs. Throughout history, working people along the Allagash river system have developed new and improved technology, with the intent of doing work more efficiently. The Allagash is a 92-mile river and lake system winding through the forest of northern Maine.

Below is a list of some of the many technological resources used throughout the history of the Allagash.

**CLASS ACTIVITY**

1. Number each item below in the order that you think they would have been created to improve the efficiency of work done along the Allagash.

   _______ Chamberlain Dam
   _______ stone axe
   _______ Telos Cut
   _______ fiberglass canoes
   _______ dugout boats
   _______ horses pulling sleds
   _______ Lombard log hauler, gasoline engine
   _______ 1,500-foot wooden trestle at Chamberlain Lake
   _______ Lombard log hauler, steam engine
   _______ steam-powered tramway
   _______ birchbark canoes
   _______ steel axe
   _______ railroad
   _______ steamboat *H. W. Marsh*
   _______ crosscut saw

2. When you have completed your list, read the information sheet and make any needed corrections to your answers. Identify the correct order by placing the date of implementation next to each item.

3. Create a timeline to demonstrate the order in which the resources were used. Following are two examples of timelines to help you get started.
Example 1

Following the last ice age, Wabanaki ancestors arrive in the Allagash region and travel canoe routes through the area for thousands of years.

1606–1776 The English and French claim possession of the Allagash region at different times.

1780s A treaty following the American Revolution places the Allagash within a region of disputed land between Canada and the United States.

1820 Maine admitted to the Union through Missouri Compromise.

* bp = years before present.

4. After you have completed your timeline, chose one item from the list and learn more about it. Be ready to share this information with the whole class.
BACKGROUND: ALLAGASH TECHNOLOGY

LESSON: CHANGING TECHNOLOGY ALONG THE ALLAGASH

Technology has long played a part along the Allagash River system. Dams, railroads, Lombard log haulers, hand tools, and other technological advancements transformed how people have interacted with the Allagash landscape.

The Allagash area has been inhabited by people for thousands of years. Native American artifacts from as many as 10,000 years ago have been found throughout the area. Tools of that time include stone axes and gouges for woodworking.

Boating was, and remains, a major mode of transportation throughout the 92-mile Allagash water system. The canoe has been one style of watercraft that has stood the test of time because it can travel in shallow water and is easily carried across land between water routes. One of the earliest canoe styles used on the Allagash was made of birchbark, constructed without any metal fastenings. Evidence shows that close to 4,000 years ago, the canoe was used in Maine. Elsewhere, the canoe replaced an earlier dugout boat style (basically a hollowed-out log). No early dugouts have been found in Maine. In modern times, use of canoes has shifted mostly to recreational purposes. Today they are made from a variety of materials, including composites and fiberglass.

During the 1800s, entrepreneurs recognized the opportunity to profit from harvesting trees in this region. The first authorized harvest of white pine in the Allagash was near Telos Lake in 1835. Loggers used steel axes to fell the huge white pine trees. With a desire to increase work production, technological advancements were plentiful. Axes began to be replaced by large cross-cut saws in the mid-1800s, then chain saws became common after World War II. Mechanical feller-bunchers now handle the smaller trees of the modern forest.

Since there were few roads and no highways or modern-day logging trucks, moving logs across the land was a particular struggle. Floating them on streams, lakes, and rivers provided the best solution: lumbermen used waterways rather than highways. In 1838, wanting to get logs south to Bangor, lumbermen built dams at Chamberlain Lake, raising its water level to aid in reversing the water flow at that point from its natural route north, toward Canada. By 1841, the water—and logs—flowed south from Chamberlain through a man-made canal, known as Telos Cut, and over Telos Dam to Webster Stream and the East Branch Penobscot River.
Two steamboats were built on the shore of Chamberlain Lake. There was no way to get the large vessels onto the Allagash lakes other than to haul in the pieces and then put them together at the lake. Remember, there was no road system, and shallow water and waterfalls prevented floating large boats upriver from the St. John. The paddle steamer *H. W. Marsh* was completed on May 10, 1903. It and other boats were used to tow log *booms*,* and to move men and supplies.

Another major innovation that advanced logging in the Allagash was the Lombard log hauler. This machine made it possible for loggers to move logs across the land to the water’s edge more efficiently. First built in 1903; the machine was a track-driven vehicle powered by a steam engine. In 1915 a new gasoline-powered version of the Lombard log hauler was developed.

Many other solutions to the problem of moving the logs across the land were also implemented in the woods. Tramways and railroads were built, both of which used steam engines to move logs along double rails. The tramway, built in 1903, was a log-conveying system that carried logs between Chamberlain and Eagle lakes. In 1926, a 1,500-foot wooden trestle was built across the northern end of Chamberlain Lake to allow a railroad to run from Eagle Lake to Chesuncook Lake. From there, the logs would go into the West Branch Penobscot River where they were floated to mills in Bangor.

With the remoteness of the logging camps, it was difficult to get supplies in and out. As is the case in many wooded areas of Maine today, there were no public roads. When needed temporary roads were built for the specific purpose of getting to the logging areas. A network of modern haul roads was built beginning in the 1950s.

Today, much of the evidence of the logging industry in the Allagash Wilderness Waterway is gone, yet some remains. In an effort to restore the natural setting of the area, many of the dams have been removed and the railroad and tramway systems have given way to logging trucks. Modern equipment and machinery have replaced the need for a human workforce, and this once heavily populated working community has been preserved as a natural wilderness Waterway for all to enjoy. Today, technological advancements in recreation equipment, such as boats and camping gear, continue to have lasting effects on the people who visit the area.

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*A boom is a barrier stretched across a river. In early logging, booms were used to create rafts of logs for storage and transport on rivers and lakes.*
EXPLORING ALLAGASH WATERWAY WATERSHEDS WITH MAPS

Subject: Social Studies.

Grade: Middle School (6–8).

Time Frame: 3 to 4 hours; can be broken into 2 or 3 sessions, over multiple days.

Prepared by: Jane Crosen (incorporating work by Bruce Jacobson, Nancy Philbrick, and Penobscot River Watershed Education Program).

LESSON OVERVIEW

Students will get to know the natural and man-made drainage patterns and other features of the Allagash Wilderness Waterway, while gaining map-reading and mapmaking skills. After comparing various maps showing Allagash landforms, students will then trace and label water features and other landscape elements within the Waterway, using the Maine Atlas as a primary source while correlating information from other maps and sources. Working in pairs in this hands-on activity, students will be engaged in virtual exploration of the Waterway, practicing collaboration, information sorting, and attention to detail. Their map sections can ultimately be assembled into a larger map of the Allagash (six sections per complete map). While the object of this lesson is not mapmaking as art, students could apply their new mapping skills to making a finished map of this or another area.

Learning Objectives

The student will (a) develop a working definition of the term watershed; (b) trace water drainage patterns in the Allagash region and become familiar with the Allagash Wilderness Waterway landscape; (c) accurately label specific locations on a map; and (d) become oriented to different kinds of maps, elements common to maps, and how to read the landscape.

* Watershed definition portion adapted from “Get to Know Your Watershed,” which is part of the Penobscot River Watershed Education Program that was a collaborative project led by Maine Sea Grant, University of Maine Senator George J. Mitchell Center, and Penobscot River Restoration Trust, working in partnership with Old Town Elementary School and the City of Old Town, Maine. It is utilized here with modification under a Creative Commons Attribution (CC-BY) 3.0 license. “Get to Know Your Watershed” includes the cupped-hand activity as an adaptation of a lesson in From Ridges to Rivers: Watershed Explorations, Ages 9–12. 4-H Watershed Project, 4-H Youth Development Program, San Luis Obispo County, CA. 1999.
Academic Standards

Maine Learning Results Social Studies

D1 Geographic Knowledge, Concepts, Themes, and Patterns

D1.b: Middle School: Students understand the geography of the community, Maine, the United States, and various regions of the world and the geographic influences on life in the past, present, and future.

Waterway Interpretive Themes

Theme II – Flowing waters sustain wild life throughout the Waterway

Basins of Water Sub-Theme: Low mountains and ridges surround the Waterway, forming basins where water flows downhill into lakes and the Allagash River.

Materials

- flip chart or blackboard and markers
- pencils and removable labels
- fine-tipped blue and black marker pens or colored pencils, one of each color per working pair of students
- masking, drafting, or magic tape; a few rolls to share
- Maine Atlas and Gazetteer, Delorme. Many households in Maine have a copy of the Delorme Atlas; ask students in advance to bring in copies for use in class. One copy needed for each working pair of students.*
- Map Worksheets 50, 55, 56, 61, 62, and 66; see Waterway Lesson Plans, pages 180–189.
  Note: Copies of Map Team worksheets, one per working pair of students; there are 6 different team worksheets, so for a class of 18 students make 3 copies of each worksheet, so that the individual map studies can be taped together to form 3 larger watershed maps.
- large flat-screen monitor with computer connection for teacher to project PDF map images (from online using hyperlinks); pointer or mouse cursor preferably with zoom feature.
- “Allagash Wilderness Waterways” map and guide (2016). Some copies may be available from the Maine Bureau of Parks and Lands in Ashland, Augusta, or Greenville. It may also be retrieved from http://www.maine.gov/dacf/parksearch/PropertyGuides/Maps/FullSize/aww-map.pdf

* The map dimensions size and scale are slightly larger in 2011 and earlier Atlas editions, and certain details vary between editions; e.g., pre-2012 editions include lake and pond pool elevations, while later editions include updated designations, boundaries, and relief shading. These variations should not affect the learning objectives and experience.
Prerequisite Knowledge/ Skills
Students should have basic map-reading skills, including knowledge of longitude and latitude, and topography.

TEACHING PROCEDURE
Engage: Flowing water
Students are introduced to the Allagash Wilderness Waterway, the importance of water, and the concept of a watershed.

1. Share with students that they will be learning about the Allagash Wilderness Waterway, which stretches for about 92 miles in northern Maine. The Allagash waters flow primarily north to the St. John River confluence. Describe how flowing water is central to the idea of the Waterway (photos of water in the AWW will enhance this section).
   a. “The central feature of the Waterway is . . . water. Water—in rills, rapids, eddies, quiet pools, or frozen sheets—attracts most visitors, as over the millennia it has drawn others for enjoyment, sustenance, and transport. The surface of eight lakes, four ponds, and the river accounts for greater than half of the area within the [Waterway]. More than 100 brooks and streams flow down the Waterway’s small mountains and rugged ridges. One cannot visit the Allagash without experiencing water in some form” (Jacobson, 2018, p. 225).
   c. “Plants and animals, including humans, depend on life-giving water flowing in Waterway soils, streams, wetlands, ponds and lakes, and the Allagash River” (Jacobson, 2018, p. 227).

2. Define watershed as a class, for students who may not be familiar with this term. Guide discussion toward the idea of an area of land that “sheds” water that is not absorbed by the ground or plants after falling as rain or snow.

* If you use topographic maps as additional resources, be aware that 24 USGS 7.5-minute quads, at a scale of 1:24,000, cover the entire Allagash watershed (see Additional Resources for list). If available, a sampling of printed 7.5-minute topos would engage students’ interest in exploring traditional maps. The older 15-minute quads (also listed in Additional Resources section) are closer in scale to the Maine Atlas, showing a larger area, and easier to work with. They can be found, viewed, and downloaded as PDFs through the USGS Store, https://store.usgs.gov/. See the Additional Resources section for tips on how to search for maps and use the USGS topo Map Viewer.  

□ “Allagash Waterway Watersheds” map, download from http://www.awwf.org or http://brucejacobson.com/download/581/. Needed as reference in mapping activity, so provide one or two 11 x 17” color copies for students to share or student access to the internet.
□ Allagash Headwaters: Dams Changed the Flow student handout; see Waterway Lesson Plans, page 174.
□ Detail of USGS 15-minute 1962 topo Churchill Lake (for projection); see page 161.
□ USGS Topographic Map Symbols student handout, see Waterway Lesson Plans, page 178.*
a. Ask students to share what they know about how water moves in rivers and streams, and guide them toward the idea that surface water flows downhill, where it collects in water bodies (streams, rivers, ponds, bogs, etc.) that are connected to one another, and eventually flows all the way to a lake or the ocean.

b. Drainage basin is another term for watershed.
   Note: Sometimes watershed is used to denote the divide between two basins.

c. Ask students to compare their ideas with the information on the What Is a Watershed? student handout.

3. If circumstances permit, conduct the following hands-on activity to illustrate the watershed concept.
   a. Ask the students to pair off and cup their hands, holding them together like a bowl with their fingers tilted forward, lower than their palms. Have them take turns using a spray bottle to squirt water into their partner's hands, and watch how the water flows down the creases of their hands into the basin of their palms and then out along the cracks between their fingers. This miniature model of a watershed basin illustrates how surface water flows “downhill” along the topography of the land.
   b. Ask the students to reflect on what they learned through the cupped-hand activity. Give them an opportunity to modify their definition of a watershed, based on the activity.

**Explain: Watershed drainage patterns**

Students are oriented to the Waterway’s location in relation to other Maine river systems, as shown on shaded relief maps and watershed maps.

Present the following maps in sequence, as hyperlinked below. The projected maps should be large and clear enough so students can read details. In presenting and explaining the maps, use a mouse cursor with zoom as a pointer, and increase/reduce the percentage and scroll/pan around the maps as needed to show features.

1. To orient students to the Allagash and its topography in a regional context, introduce “Maine Lakes, Rivers, Water” (https://geology.com/lakes-rivers-water/maine.shtml) as a simple map showing Maine’s major river and lake systems in blue. Locate the Allagash River and note its northerly flow, draining into the St. John River, and eventually through New Brunswick to the Gulf of Maine—most of Maine’s other major rivers drain south, directly to the Gulf of Maine.

2. Next show the “Maine Physical Map,” https://geology.com/topographic-physical-map/maine.shtml, introducing it as a shaded relief map showing Maine’s major waterways in relation to its topography, with the northern reach of the Appalachian Mountains running northeast through the state as far as Maine’s highest mountain, Katahdin, visible though not labeled on the map. Explain that the river systems drain from the higher elevations down to the lowest elevations, ultimately at sea level.
3. To introduce the concept of how a watershed is defined on a map, refer students to the What Is a Watershed? handout (or project “Penobscot River Watershed “from http://www.penobscotriver.org/content/4019/watershed)
   a. Explain that this map defines the watershed of the longest river within the state of Maine, the Penobscot. The area of the state rendered in light gray is the watershed.
   b. Suggest that in following the watershed drainage lines, students might think of the pattern like a tree: the highest feeder brooks as twigs, the larger streams as branches with small lakes and ponds attached by outlet stems, all joining the main stem of the river as the trunk.

4. To relate this to the students’ study area, show (as a large color printout or projected PDF) the “Allagash Waterway Watersheds” map (http://brucejacobson.com/download/581/).
   a. Point out the small locator map outlining the Allagash watershed area in northern Maine, with the same area detailed in the larger map.
   b. Focus students’ attention on the area within the red line: this is the Allagash Wilderness Waterway (the legislation creating the Waterway boundary defines it as extending 1 mile from the watercourse).

**Elaborate: How dams changed the flow**

Before looking further at the Allagash Wilderness Waterway, it is important for students to understand its logging history and how the building of dams altered the natural flow of Allagash waters.

Allagash waters played a pivotal role in the history of Maine’s logging industry. The waters delivered logs to northern mills of all kinds within the St. John River basin, which drains to the Bay of Fundy at St. John, New Brunswick. In the adjacent Penobscot basin, waters flowing to Maine’s Penobscot Bay delivered logs as far south as Bangor. Understanding these two watersheds is essential in considering the stories of the Allagash where, in 1841, lumbermen made big changes. They constructed dams to direct water from the southern lakes and ponds in the Allagash system into the Penobscot River. This allowed them to drive white pine cut around Chamberlain, Telos, and Allagash lakes south to Bangor, rather than following the natural flow north to the St. John River” (Jacobson, 2018, p. 3).

1. Explain that the “Allagash Waterway Watersheds” map (still being viewed) shows the land—within the thick blue line—that was drained by the Allagash River in 1840, before any dams were built, and the water flowed all the way from Telos Lake north to the St. John River.
2. Direct students to the Allagash Headwaters: Dams Changed the Flow handout, particularly to the diagrams.
   a. The arrows in the top diagram show the flow of water through the natural basins of the Allagash River headwater lakes. The other three drawings illustrate how a series of dams built during the mid-1800s raised the water levels of the headwater lakes.
   b. Explain that dams built at the natural outlet of Chamberlain Lake raised the water level, reversing the direction of flow so that the water in Chamberlain and Telos Lakes would instead flow south through a canal called Telos Cut, into Webster
Stream, and onward to the East Branch Penobscot River. This allowed lumbermen to transport logs to markets in Bangor. This was still the age of sail, before logging trucks and roads, and river driving was the easiest way to transport lumber.

c. A portion of the 1840-era Allagash River watershed, the area around Allagash, Chamberlain, and Telos lakes south of the thinner blue line, now directs water to the East Branch Penobscot River. Since 1841 the area has been part of the Penobscot watershed, and today there are two drainages that enter the Waterway.

Engage: Legend and symbols

Students are engaged in exploring the Waterway through maps, and practice finding locations and using a legend.

1. To bring students back to the present-day Waterway, show them fold-out copies of the Maine Bureau of Parks and Lands official Waterway map and guide. Point along the course of the Waterway, from Telos Lake to the St. John confluence.

2. Picking up from the previous section, point out how the official Waterway map shows the current dam locations marked with a bold dark green line, such as Lock Dam.
   a. Point out that a dam at this location was most strategic in changing the flow.
   b. Ask students to see if, after reading the Dams Changed the Flow handout, they can find two other current dams on the map.

3. Explain that this is a recreational map, focusing on features important to canoe-campers and other river travelers.
   a. Ask students what kind of features other than dams are important to Waterway travelers (rapids/falls, campsites, portage trails, boat launches).
   b. Point out how these are located on the map, using symbols keyed to a legend.

4. Note that this is a common and useful element of any good map. The symbols are an economical way of highlighting important features, explained or keyed in the legend.

Explain: Reading topographic maps

Students are introduced to the USGS topographic map system and how it corresponds with the Maine Atlas. They also “get their feet wet” in understanding how to read water features and trace water drainage patterns on topo maps, a skill they will need in reading the Maine Atlas.

1. Tell them: So far we have been looking at relief and watershed maps showing the bigger picture. For maps showing the landscape and water systems in more detail, the best source is USGS topographical maps, topos for short, created by our nation’s mapping agency. The maps made through the 1960s, 15-minute series, were at a scale showing a larger area than the more detailed 7.5-minute series that came later. The 7.5-minute maps are the most commonly available and detailed, and were updated through the 1980s.

2. Show the 15-minute Churchill Lake quad (see next page) as an example of the more detailed topo maps, showing the southeast quadrant of the map; enlarge/zoom in on the Lock Dam area and note how the topo shows Lock Dam with a thin black line.
3. Ask the students to notice and describe how water features and land features are shown and labeled on the topo: water features and their symbols are drawn or shaded in blue, labeled in italic type; land features (mountains, hills, points, islands), built structures, and settlements are usually labeled in black roman type; land cover is shaded in green.

4. Topo maps are the best source of information about the shape of the landscape, including elevation, indicated by brown contour lines and numbers indicating elevation above sea level, in feet or meters—not just mountain summits, but pool elevations of lakes and ponds.
   a. Still looking in the southeast corner of the Churchill Lake topo, ask them to notice the number in the middle of Indian Pond, 940; this means the normal surface of the pond is 940 feet above sea level. Ask students to read out pool elevations in nearby Bog Pond (995), Eagle Lake (922), and Chamberlain Lake (945), higher than Eagle Lake due to the dam.
   b. Ask them to follow with their eyes the blue line leading from Indian Pond to Eagle Lake and, comparing the difference in pool elevation numbers, describe how these water bodies are related. Guide the students toward deducing that Bog Pond, the highest pond, drains down into Indian Pond which flows through its outlet stream into Eagle Lake, which flows north into the Allagash River. They are connected by water as part of the same watershed. Understanding this prepares students for the next activity—an essential concept in tracing watershed drainage systems on maps.

5. Present the USGS Topographic Map Symbols 4-page handout.
   a. Ask the students to look at how various water features—lakes, dams, streams, wetlands, waterfalls, and rapids—are depicted on maps, generally in blue.

6. Display a few examples of printed topos if available, and tell students they can look more closely at USGS topos in an extended lesson and learn how to search and download topo maps online.

7. Explain why the class will use the Maine Atlas instead.
   a. The USGS 7.5-minute topos are at a scale of 1:24,000 (2 5/8” per mile) so it takes 24 quads to cover the Allagash watershed.
   b. For the purpose of this class it is much easier to use the Maine Atlas which shows the same landscape in good detail but at a larger scale, 1:135,000 (1/2” per mile) covering a larger area per page.

Elaborate: Reading the Maine Atlas

Students become oriented to the Maine Atlas and its grid system.

1. Hold up a copy of the Maine Atlas, and ask the students to bring out their copies borrowed from home.
   a. Guide them, looking on with a neighbor, to recognize the map on the cover as a topographic relief map showing high and low areas and water, and locate the Allagash headwater lakes and river on the cover map.
   b. Inviting a show of hands, ask how many students are already familiar with the Atlas and use it at home. Next they will be using the Atlas in a hands-on mapping activity.
that will help them get to know the Allagash Waterway Watersheds and how water flows into and through them.

2. Show the back Atlas cover with its grid system, explaining that each numbered rectangle shows the area covered in that numbered map page, and that north is “up” when looking at the map pages.

3. Point to and list the six map pages that cover the entire Waterway from Chamberlain Lake to the St. John confluence: Maps 50, 55, 56, 61, 62, and 66.

4. With everyone looking at the same page of the Maine Atlas, using Map 55 as an example, show students how each Atlas map page is gridded off west to east in 5-minute increments of longitude, numbered 1 through 5, indicated by thin black grid lines labeled by small numbers at the top and bottom.
   a. Explain that these numbers correspond to GPS longitude locations, measured in degrees, minutes, and seconds, corresponding in turn to lines of longitude on the globe of the Earth. Each map page is also gridded off in 5-minute increments of latitude, measured from the equator, labeled A through E—a very useful and user-friendly system that makes it easy to correlate printed Atlas maps with GPS, GIS, and other mapping/positioning systems. The numbered and lettered grid squares also make it easy to find locations visually, using an index of place names—a system used not just in the Maine Atlas but most other atlases.
   b. So, if we multiply 5 minutes by 5 grid sections, we see that 25 minutes of latitude and longitude are covered on each Atlas map page, a larger area compared with the 15-minute topo we’ve just been looking at. As explained on the inside cover of the Atlas, each map page covers an area nearly 23 miles wide (E–W) by 30 miles high (N–S).

5. In exploring with the Atlas, students will notice other vertical and horizontal lines that may be confusing. These and other symbols are all explained in the legend on the inside cover of the Atlas.
   a. Still looking at Map 55, and referring to the Maine Atlas legend, notice the dashed lines highlighted in yellow. The longer dashed yellow line across the top and down the left side is the county line between Piscataquis and Aroostook counties.
   b. The shorter dashed yellow lines outline township boundaries, with the name of the township spread in large letters in the center of each block.
   c. Have students find the state park boundary symbol in the Atlas legend (                       ), and then locate it on Map 55. This is similar to the red boundary line on the “Allagash Waterway Watersheds” map seen earlier; the Waterway is everything inside, or “downhill,” of the line.

Explore: Reading the Allagash Waterway watersheds

Using sections of the Maine Atlas, students practice reading water features and drainage patterns of the Allagash Waterway watersheds. They also practice locating and identifying other prominent features of the Waterway.

Explain that students will pair off, working on six different map sections that make up the Allagash watersheds.
1. Distribute the pencils and activity handouts, numbered per map page, among Teams 55, 56, 61, and 62. Explain that Teams 55 and 61 may finish sooner, in which case they are to go on and complete the Map 50 and 66 worksheets, which are both short.

2. Explain that the first phase of the mapping activity will be map-reading, finding and inventorying water features (and related prominent features) and “tracing” the watershed with their fingers. The second phase will be mapping (drawing and labeling) all the features they found on tracing paper.

3. Depending on the number of students, there may be two or more teams working on each of the six map sections, so that when taped together the class will assemble more than one complete map of the Waterway’s watersheds.

4. Direct each working pair to open the Atlas to the map section they will be focusing on.

5. Students find and inventory the water features and other prominent features of the Allagash Waterway in the Maine Atlas and Gazetteer, as directed on their team worksheet.

6. If there is not time for the mapping activity (tracing and labeling) in the same class period, direct each working pair to label their Atlas (using a removable label or post-it) and worksheets with their names and store them safely for the next session, where they will need them for phase two.
   a. Whichever team (55 or 61) went on to inventory Maps 50 and 66 should keep those lists also, since they will be tracing those map sections in phase two.

**Elaborate: Tracing/mapping the Allagash watershed**

Students practice their locating and watershed-tracing skills by literally tracing the watershed.

1. Distribute tracing paper and other supplies (paper clips, pencils, fine-tip marker pens and/or colored pencils) to each team.
   a. Each working pair begins by aligning their sheet of tracing paper over their map section with the edge of the paper along the inside fold, using paper clips to hold the paper in place.
   b. It’s important that each team mark on the tracing paper, in pencil, the corners of the outlined map section they are working with. This will be needed in registering their traced lines with the Atlas base map if the paper is moved, and in assembling sets of larger maps when sections are completed. Each pair should also write in the margin the number of their map and their names.
   c. Direct Teams 55 and 61 to complete tracing and labeling their primary maps (55 and 61) before going on to Maps 50 and 66, as guided in their worksheets. A half sheet of tracing paper can be used for mapping each of those shorter sections.

2. Remind students to use blue pens or pencils in tracing and labeling water features, and black ones for locating and labeling land or built features, following the style used on topos and other maps. They may use symbols (as on other maps) to locate falls, dams, and summits.

3. Students should work carefully, using their worksheet inventories as a checklist for completeness and accuracy. If they miss a few of the smaller ponds and tributaries, or don’t have room to label all of them, that’s fine; the important thing is to label the most
prominent water features and “connect the dots” between ponds, tracing streams back to the main stem of the Waterway.

4. Working with their partner, students may discuss the features of the Waterway as they locate each one. If time allows, student can do research to learn more about these locations in the Waterway and/or other places that may have piqued their interest as they were exploring the map. The Prominent Features of the Allagash handout (see page 109) and Maine Bureau of Parks and Lands Allagash Wilderness Waterway website are good places to start, http://www.maine.gov/allagash

5. When enough teams have completed and labeled their tracings, gather one of each of the six map tracings and help students combine the complete set into a larger watershed map.
   a. The best way to do this is to lay the maps out on a floor, wall, table, or other large clean surface, using the grid map on the back of the Atlas as a guide. Register/align all the grid corners and use removable drafting/masking tape or magic tape to hold the sections together. (Teams who are still working can continue.) As later sets of map sections are completed, they can be combined in the same way.
   b. While assembling each set the teacher will have an opportunity to discuss the process with the students and evaluate completeness and accuracy.

Evaluate

As formative assessment throughout the lesson, the teacher should listen in on discussions for student understanding, and be available to offer guidance or answer questions. The teacher can assess the completed maps for accuracy, using the Answer Key provided (see page 168).

Extend

Watersheds and Pool Elevations

If students are interested in adding some of the pool surface (water level) elevations of lakes and ponds to better understand the watersheds’ drainage patterns, most of these numbers (printed small in the center of the water body) may be found in 2011 or earlier editions of the Atlas (the easiest source), measured in feet. Normal pool elevations can also be easily found on 15-minute 1:62,500 USGS quads, in feet. (The 7.5-minute 1:24,000 and 30 x 60 1:100,000 quads label them in meters and are more cumbersome to find and download.)

Pool elevations for many lakes and ponds can also be found on the Maine Department of Inland Fish & Wildlife fishing depths maps, filed under Lake Survey Maps and searchable by county. The average surface water level is noted underneath the list of fish, along with average temperature and other characteristics, and a description of the lake or pond in the context of fisheries management. Students interested in gaining a “deeper” understanding of water bodies as basins will enjoy reading the water depth survey numbers spread across these maps (indicating depths and shallows), and imagining the shape of the lake or pond. https://www.maine.gov/ifw/fishing-boating/fishing/fishing-resources/lake-survey-maps/index.html

Another interesting source of information is Lake Stewards of Maine’s Lakes of Maine website, searchable by lake or pond. https://www.lakesofmaine.org/your-lake.html
Sub-Watersheds

Students can explore the extent of land drained by any of the streams they traced in the lesson by viewing the “Allagash Waterway Watersheds” map. The “Allagash Waterway Watersheds” map shows the 48 sub-basins, or smaller watersheds, that drain into the Waterway. Overall, the Dataset defines the areal extent of surface water drainage to a point, accounting for all land and surface areas in the United States.

The sub-basin delineated on the Allagash map are the smallest units identified, which nest within ever larger units on a regional basis. The blue numbers inside the dashed, blue-line polygons are 12-digit Hydrologic Unit Codes (HUC) assigned to each sub-watershed as part of the USGS Watershed Boundary Dataset (you may need to “zoom” the PDF of the Allagash map to read the codes).* For more details about the USGS dataset, please see http://www.maine.gov/megis/projects/nhd.shtml.

GIS Imagery

Google Earth is another way to look at the landscape and waterways. For instance, a presentation of Waterway campsites can be found in the right-hand menu at http://www.maine/allagash. Google Earth is valuable in showing up-to-date, close-up detail; however, topos, charts, and other traditional maps provide elevation and depth measurements and much other valuable topographical and historical information not found in satellite and GIS imagery.

Additional Resources

Topos and Other Maps of Maine

USGS topos are based on aerial photography and satellite imagery and other survey control data. In the USGS 7.5-minute 1:24,000 series, the entire Allagash watershed is covered by 24 quads, listed south to north: Telos Lake, Mud Pond, Haymock Lake, Soper Mountain, Tramway, Allagash Lake, Spider Lake, Churchill Lake, Clarkson Pond, Upper Russell Pond, Third Musquacook Lake, Umsaskis Lake East, Umsaskis Lake West, Clayton Lake, First Musquacook Lake, Cunliffe Islands, Cunliffe Lake, Ugh Lake, Five Finger Brook, Round Pond, McKeen Lake, Allagash Falls, McKinnon Brook, Allagash.

In the older 15-minute 1:62,500 series, the Allagash watershed is covered by at least 11 quads: Telos Lake, Chamberlain Lake, Clayton Lake, Musquacook Lake, Spider Lake, Churchill Lake, Allagash Lake, Umsaskis Lake, Round Pond, Allagash Falls, Allagash.

In the 30 x 60-minute 1:100,000 series, the Allagash watershed is covered by 3 sections, listed south to north: Chamberlain Lake; Clayton Lake; and Allagash.

Topos may be viewed and downloaded for free through several portals. For a good overview of the system and a link to the USGS Store’s map archive, go to https://researchguides.uic.edu/govmaps/topos

* The HUC codes are constructed as follows: first two digits identify the region; first four digits identify subregions; first six digits identify accounting units; first eight digits identify cataloging units; first ten digits identify watershed units; full twelve digits identify sub-watershed units.
To search, view, and download topos through the USGS Store, https://store.usgs.gov/; Click on Map viewer, type in Allagash locations (Allagash River, Maine; Chamberlain Lake, Maine; Churchill Lake, Maine; etc.), and View Products—then choose View PDF and open or save any map listed on your computer. All historic USGS maps are available; 15-minute quads of the 1:62,500 series are older but cover a larger area. (The 1:100,000 series has 3 metric maps covering AWW, but the files take longer to download.)

The University of New Hampshire Historic USGS Maps of New England & New York archive of 15-minute quads, http://docs.unh.edu/nhtopos/Maine.htm is a user-friendly site to view and compare different editions, but the topos can only be viewed and downloaded in quadrants.


USGS offers some lesson plans for teachers. Their online Lesson 3 (HTML or PDF) seems most associated with the material covered in this Allagash lesson. Note that you may need to copy and paste the following URL in your browser: https://egsc.usgs.gov/isb//pubs/teachers-packets/mapshow.

**Exploring Traditional Waterways**


Cook, D. S. *Above the Gravel Bar: The Native Canoe Routes of Maine.* Solon, ME: Polar Bear & Company. Pages 109–112 describes the Allagash as part of the water transportation network used by indigenous peoples, shown in the map on page 100, “Northern Canoe Routes.”

**Watersheds**


U.S. Environmental Protection Agency, Surf Your Watershed website. URL: http://www.epa.gov/surf/

U.S. Environmental Protection Agency, Healthy Watershed? website. URL: https://www.epa.gov/hwp/

**Work Cited**

MAP 50

Water Features
Your list should include at least 1 brook, 2 ponds, and 1 lake.

- Midnight Pond, Midnight Brook
- Telos Lake, Round Pond

Question
Is Webster Lake on your list? Explain, after checking the official Waterway map and the “Allagash Waterway Watersheds” map.

Webster Lake is downstream of Telos Dam, draining away from the Waterway, in the East Branch Penobscot River.

MAP 55

Water Features
Your list should include at least 12 named brooks/streams (including inlets and deadwaters), 16 ponds, 6 lakes, 2 coves, 1 falls, 1 river.

- Lost Pond, Chamberlain Lake
- Allagash Stream, Little Allagash Falls, Little Round Pond, Otter Pond, Allagash Lake, Johnson Pond, Mud Pond, Crescent Pond, Allagash Pond
- Ellis Brook, Upper Deadwater, Lower Ellis Pond, Upper Ellis Pond
- Martin Cove, Eagle Lake, Soper Brook, Snare Brook, Round Pond
- Russell Brook, Russell Cove, Lower Russell Pond, Middle Russell Pond, Upper Russell Pond, Clarkson Pond, Mile Brook, Mile Pond
- Thoroughfare Brook, Churchill Lake, Little Churchill Pond
- Priestly Lake, Drake Brook, Allagash River
- Chemquasabamticook Stream, Chemquasabamticook (Ross) Lake, North Branch Inlet, Ross Inlet

Questions
1. What about the large lake north of Allagash Lake—did you include this lake and its streams in your list or not? Explain why.

Note: Student worksheets begin on page 181.
Chemquasabamticook Stream, Chemquasabamticook Lake, and Ross Inlet flow north through Clayton Lake and northeast into Long Lake, another dammed Allagash headwater lake. So, you should include these in your inventory.

2. Based on what you find on the official Waterway map, how many portages might paddlers have to make in your map section? – 4

3. Where are they and what obstructions do they get around?
   Carry Trail south of Allagash Lake, Little Allagash Falls, Tramway, Lock Dam

**MAP 56**

**Water Features**

Your list should include at least 9 named brooks/streams, 26 ponds, 13 lakes, 1 arm, 1 river, 1 rapids.

- Mud Pond, Kellogg Brook
- Round Pond, Imlos Pond
- Chamberlain Lake, Arm of Chamberlain
  - Little Leadbetter Pond, Leadbetter Pond, Kyle Pond, Little Indian Pond, Indian Pond, Woodman Pond
- Smith Brook, Haymcock Lake, Eagle Lake
  - Soper Brook, Soper Pond, Upper Soper Pond, Pillsbury Pond, Little Pillsbury Pond, Partridge Pond, Upper Partridge Pond, Lower Partridge Pond, Lewis Pond
- Otter Pond, Churchill Lake
- South Twin Brook, Twin Lake, Cliff Lake
  - North Twin Brook, Grass Pond, Spider Lake, Leadbetter Pond, Pond 64, Lower Portage Pond, Upper Portage Pond
- Pleasant Stream, Pleasant Lake, Lower Deadwater Pond, Upper Deadwater Pond, Little Pleasant Pond
- Harrow Brook, Harrow Lake, Little Harrow Lake
- McCluskey Brook, Bog Brook, Heron Lake, Fifth Musquacook Lake, Fourth Musquacook Lake
- Allagash River, Chase Rapids

**Question** – No questions for Worksheet 56.

**MAP 61**

**Water Features**

Your list should include at least 16 named brooks/streams, 4 ponds, 5 lakes, 1 river, 1 thorofare.

- Drake Brook, Umsaskis Lake, The Thorofare, Long Lake
- Grey Brook, Grey Pond, Johns Pond
Chemquasabamticook Stream, Priestly Brook, **Clayton Lake**, Gilbert Brook, Squirrel Brook, Holmes Brook, Agnes Pond Brook, **Cunliffe Lake**, Canon Brook, Cunliffe Brook, **Ugh Lake**

**Harding Brook**

**Whittaker Brook**

**Schedule Brook**

**Sweeney Brook**, Sweeney Pond  
**Shepherd Brook**, Three Mile Pond  
**Glazier Brook**

Allagash River

**Questions**

1. What about Blue Pond?
   
   *Blue Pond is part of the St. John watershed*

2. Based on what you find on the official Waterway map, how many portages might paddlers have to make in your map section? – 1

3. Where are they and what obstructions do they get around?
   
   *Long Lake Dam*

**MAP 62**

**Water Features**

Your list should include at least 19 named brooks/streams, 16 ponds, 6 lakes, 1 river, 1 headwater, 1 pocket, 1 bogan, 4 rips/rapids/falls.

**Glazier Brook**, Glazier Pond  
**Shepherd Brook**, Shepherd Pond, Threemile Pond  
**Sweeney Brook**, Sweeney Pond, **Henderson Brook**  
Allagash River, Round Pond, **Schedule Brook**, Round Pond Rips,  
**Five Finger Brook**, Pete’s Pond, The Corduroys, No Name Pond, Sag Pond  
**McKinnon Brook**, Ben Glazier Brook, West Branch Glazier Brook  
**Farm Brook**, Spring Bank Rapids  
**Finley Bogan**, Allagash Falls  
**McKeen Brook**, **McKeen Lake**  
**Big Brook**, Connors Brook, Mud Pond, Togue Pond, Beaver Tail Pond, **Big Brook Lake**, Mink Pond  
**Musquacook Stream**, Robbins Brook, Robbins Brook Pond, Lower Horserace Rapids, **McCluskey Brook**, **Grey Brook**, Eyelet Pond, Shepherd Pond, **First Musquacook Lake**, **Second Musquacook Lake**, **Third Musquacook Lake**, **Fourth Musquacook Lake**, Squirrel Pocket, Squirrel Pond, **Halfway Brook**, Long Pond
Questions

1. What do you think a bogan is?

A bogan is a backwater, usually narrow and tranquil. “Along the lakes, the bogs are the little coves that the wind rarely stirs, often with flowed-out stumps sticking up. Along the river, it's some of the backwaters. The marshy ones, not ones where brooks put in cleanly. Places where there's hardly ever any current and a lot of mosquitos. Finley Bogan is the place name that comes to mind. It's in the slow section of water between Michaud Farm and Allagash Falls” (Amanda Barker, personal communication, April 17, 2018).

Dictionary.com places its use in Northern Maine, Northern New Brunswick, and the Maritimes (http://origin-mwebserp.dictionary.com/browse/bogan). The names of seven swamps, streams, and bays in Aroostook County contain “bogan,” and one campsite in northern Somerset County. Bogan is also a surname, which may account for occurrences in the U.S. outside of Northern Maine. In addition to the nine Maine names, bogan is used in 25 place names in other states, according the U.S. Board on Geographic Names (https://geonames.usgs.gov/apex/f?p=138:1:3842505254507).

2. Based on what you find on the official Waterway map, how many portages might paddlers have to make in your map section? – 1

3. Where are they and what obstructions do they get around?

Allagash Falls

4. The Waterway map labels a few more brooks than the Atlas does; what are they?

Bogan Brook, Savage Brook. Croque Brook, Chase Brook

Map 66

Water Features

Your list should include 4 named brooks/streams, 1 river, and 3 rips/rapids.

Allagash River

South Branch West Twin Brook, North Branch West Twin Brook

East Twin Brook, Twin Brook Rapids

Gerald Brook, Eliza Rips (Hole) Rapids, Casey Rapids

Question

Based on what you find on the official Waterway map, do you think the rips and rapids are runnable, or would you have to portage around them?

The map does not show a portage symbol or trail, so they are probably runnable.
WATERWAY Lesson Plans

WHAT IS A WATERSHED?

LESSON: EXPLORING ALLAGASH WATERWAY WATERSHEDS WITH MAPS

“Rivers begin in upland areas and flow downhill, becoming deeper and wider until they reach the sea. Opposite is a typical diagram of a drainage basin and it shows its main features. A drainage basin is part of the water cycle where water is transferred in a continuous cycle between the sea, atmosphere and the land.

“The main features include the following:

- Source – The beginning of the River
- Confluence – Where two rivers meet
- Mouth – Where a river flows into a lake or the sea
- Tributary – A small river or stream that flows into a larger river
- Drainage Basin – The area drained by a river and its tributaries.”* An alternate word for drainage basin is watershed.

According to the U. S. Environmental Protection Agency, “every inch of the United States is part of a watershed—in other words, all land drains into a lake, river, stream or other water body and directly affects its quality. Because we all live on the land, we all live in a watershed—thus watershed condition is important to everyone. . . . Watersheds exist at different geographic scales, too. The Mississippi River has a huge watershed that covers all or parts of 33 states” (https://www.epa.gov/hwp/basic-information-and-answers-frequent-questions#what).

Maine watersheds drain to the ocean, some directly such as along the coast. Others, like the St. John River drainage extend a long distance before reaching the Atlantic; the St. John River runs from Maine through Quebec and New Brunswick to the Gulf of Maine and the Atlantic Ocean at the city of St. John, New Brunswick. The watershed of the longest river within the state, the Penobscot, stretches through much of mid-Maine. Take a look at the “Penobscot River Watershed” map below:

Do you see the “tree” structure of the Penobscot and its tributaries?

(Map source: http://www.penobscotriver.org/content/4019/watershed. Used by permission.)

**WANT TO LEARN MORE?**

- Students can find out more about the modern Allagash watershed—or the watershed where they live—by visiting the U.S. EPA’s “Surf Your Watershed” website. URL: https://cfpub.epa.gov/surf/huc.cfm?huc_code=01010002
- Students can explore the U.S. EPA’s “Healthy Watershed?” https://www.epa.gov/hwp/basic-information-and-answers-frequent-questions
**Allagash Headwaters: Dams Changed the Flow**

**Lesson: Exploring Allagash Waterway Watersheds with Maps**

Allagash waters—and dams used to control the waters—have played a pivotal role in the history of Maine’s logging industry. Following spring thaw, men floated logs cut during the winter to markets. Rivermen adeptly rode and guided the logs downriver, jumping from one to another. They boomed logs together in huge rafts that were floated on lakes and wider stretches of rivers.

The waters delivered logs to northern mills of all kinds within the St. John River basin, which drains to the Bay of Fundy. In the adjacent Penobscot basin, waters flowing to Maine’s Penobscot Bay delivered logs as far south as Bangor. Understanding these two watersheds is essential in considering the stories of the Allagash where, in 1841, lumbermen made big changes.

Three dams remain from many that once stood along the 92-mile network of ponds, lakes, and river in the area that is now the Allagash Wilderness Waterway. In 1841, two dams were constructed to direct water from the southern lakes and ponds in the Allagash system into the East Branch Penobscot River. This allowed lumbermen to drive white pine cut around Chamberlain, Telos (pronounced, “tee – loss”), and Allagash lakes south, rather than following the natural flow north to the St. John River.

In 1838, the owners of Township 6, Range 11 (Amos Roberts and the Strickland Brothers) engaged an engineer (Shepard Boody) to devise a way to make Chamberlain Lake flow against its northward natural current. Boody proposed raising the waters of Chamberlain with a dam at the lake’s outlet, then directing the flow of water and logs through Telos Lake and into Webster Lake—a headwater of the Penobscot River—via a 47-foot drop through Webster Stream. They erected the proposed dam at Chamberlain Lake during 1840 and 1841.

The timber investors had another dam built at Telos Lake to control the flow, in conjunction with Chamberlain Dam, so they could time the drives of logs through Webster Stream to Webster Lake, on their way to Bangor. Telos Cut, a canal 10–15 feet wide and 1–6 feet deep, was built to feed...
water and logs to Telos dam. All was in place by the fall of 1841. As Telos dam was built before Chamberlain Dam delivered any water, it was known as the “Dam-in-the-Woods.”

Several dams have been constructed and reconstructed on Telos and Chamberlain lakes since 1841. Gil Gilpatrick provides a concise treatment of early dam building in the “Dam It All” chapter of his book *Allagash: A journey through time on Maine’s legendary wilderness waterway* (2003). It includes the illustration below.

![Diagram of Allagash Headwaters](image)

Used by permission. (Gilpatrick, 2003, p. 95).
Mapmakers use colored lines and symbols to help represent the features of a geographic area. “For example, individual houses may be shown as small black squares. For larger buildings, the actual shapes are mapped. In densely built-up areas, most individual buildings are omitted and an area tint is shown. On some maps, post offices, churches, city halls, and other landmark buildings are shown within the tinted area” (USGS, n.d., p. 1). Not all maps use the same symbols, but there are enough similarities that, with a little practice, you can be an expert map reader.

“The first features usually noticed on a topographic map are the area features, such as vegetation (green), water (blue), and densely built-up areas (gray or red). Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar classes of information: topographic contours (brown); lakes, streams, irrigation ditches, and other hydrographic features (blue); land grids and important roads (red); and other roads and trails, railroads, boundaries, and other cultural features (black). . . . Topographic contours are shown in brown by lines of different widths. Each contour is a line of equal elevation; therefore, contours never cross” (USGS, n.d., p. 1).

The next three pages show symbols used by the U.S. Geological Survey (USGS). You will not find all of them when exploring the Allagash Waterway Watersheds with maps—for instance, there are no coastal features here. There are many that you will see, however, on both the USGS topo maps and in the Maine Atlas.
**BATHYMETRIC FEATURES**
- Area exposed at mean low tide; sounding datum line***
- Channel***
- Sunk rock***

**BOUNDARIES**
- National
- State or territorial
- County or equivalent
- Civil township or equivalent
- Incorporated city or equivalent
- Federally administered park, reservation, or monument (external)
- Federally administered park, reservation, or monument (internal)
- State forest, park, reservation, or monument and large county park
- Forest Service administrative area*
- Forest Service ranger district*
- National Forest System land status, Forest Service lands*
- National Forest System land status, non-Forest Service lands*
- Small park (county or city)

**BUILDINGS AND RELATED FEATURES**
- Building
- School; house of worship
- Athletic field
- Built-up area
- Forest headquarters*
- Ranger district office*
- Guard station or work center*
- Racetrack or raceway
- Airport, paved landing strip, runway, taxiway, or apron
- Unpaved landing strip
- Well (other than water), windmill or wind generator
- Tanks
- Covered reservoir
- Gaging station
- Located or landmark object (feature as labeled)
- Boat ramp or boat access*
- Roadside park or rest area
- Picnic area
- Campground
- Winter recreation area*
- Cemetery

**COASTAL FEATURES**
- Foreshore flat
- Coral or rock reef
- Rock, bare or awash; dangerous to navigation
- Group of rocks, bare or awash
- Exposed wreck
- Depth curve; sounding
- Breakwater, pier, jetty, or wharf
- Seawall
- Oil or gas well; platform

**CONTOURS**
- Topographic
- Index
- Approximate or indefinite
- Intermediate
- Approximate or indefinite
- Supplementary
- Depression
- Cut
- Fill
- Continental divide

**Bathymetric**
- Index***
- Intermediate***
- Index primary***
- Primary***
- Supplementary***

**CONTROL DATA AND MONUMENTS**
- Principal point***
- U.S. mineral or location monument
- River mileage marker

**Boundary monument**
- Third-order or better elevation, with tablet
- Third-order or better elevation, recoverable mark, no tablet
- With number and elevation

**Horizontal control**
- Third-order or better, permanent mark
- With third-order or better elevation
- With checked spot elevation
- Coincident with found section corner
- Unmonumented***
### CONTROL DATA AND MONUMENTS – continued

**Vertical control**
- Third-order or better elevation, with tablet ★ BM ★± t295
- Third-order or better elevation, recoverable mark, no tablet ★± 5208
- Bench mark coincident with found section corner BM ★± 5208
- Spot elevation ★± 5208

**GLACIERS AND PERMANENT SNOWFIELDS**
- Contours and limits
- Formlines
- Glacial advance
- Glacial retreat

### LAND SURVEYS

**Public land survey system**
- Range or Township line
- Location approximate
- Location doubtful
- Protracted
- Protracted (AK 1:63,360 scale)
- Range or Township labels R1E T2N R0W T4S

**Section line**
- Location approximate
- Location doubtful
- Protracted
- Protracted (AK 1:63,360 scale)
- Section numbers 1 - 36 1 - 36

**Found section corner**

**Found closing corner**

**Witness corner**

**Meander corner** ★ MC

**Weak corner**

**Other land surveys**
- Range or Township line
- Section line
- Land grant, mining claim, donation land claim, or tract
- Land grant, homestead, mineral, or other special survey monument
- Fence or field lines

### MARINE SHORELINES

- Shoreline
- Apparent edge of vegetation)
- Indefinite or unsurveyed

### MINES AND CAVES

- Quarry or open pit mine ★
- Gravel, sand, clay, or borrow pit ★
- Mine tunnel or cave entrance ★
- Mine shaft ★
- Prospect ★
- Tailings ★
- Mine dump ★
- Former disposal site or mine ★

### PROJECTION AND GRIDS

**Neatline**
- 39°15' N
- 90°37'30" W

**Grticule tick**
- 55°

**Grticule intersection**

**Datum shift tick**

**State plane coordinate systems**
- Primary zone tick 64000 FEET
- Secondary zone tick 247500 METERS
- Tertiary zone tick 360000 FEET
- Quaternary zone tick 989600 METERS
- Quintary zone tick 1270000 FEET

**Universal transverse mercator grid**
- UTM grid (full grid) 373
- UTM grid ticks* 750

### RAILROADS AND RELATED FEATURES

- Standard guage railroad, single track
- Standard guage railroad, multiple track
- Narrow guage railroad, single track
- Narrow guage railroad, multiple track
- Railroad siding
- Railroad in highway
- Railroad in road
- Railroad in light duty road *
- Railroad underpass; overpass
- Railroad bridge; drawbridge
- Railroad tunnel
- Railroad yard
- Railroad turntable; roundhouse

### RIVERS, LAKES, AND CANALS

- Perennial stream
- Perennial river
- Intermittent stream
- Intermittent river
- Disappearing stream
- Falls, small
- Falls, large
- Rapids, small
- Rapids, large
- Masonry dam
- Dam with lock
- Dam carrying road
**RIVERS, LAKES, AND CANALS** — continued

- Parniinal lake/pond
- Intermittent lake/pond
- Dry lake/pond
- Narrow wash
- Wide wash
- Canal, flume, or aqueduct with lock
- Elevated aqueduct, flume, or conduit
- Aqueduct tunnel
- Water well, geyser, fumarole, or mud pot
- Spring or seep

**ROADS AND RELATED FEATURES**

*USGS-USDA Forest Service Single-Edition Quadrangle maps only.*

In August 1993, the U.S. Geological Survey and the U.S. Department of Agriculture’s Forest Service signed an Interagency Agreement to begin a single-edition joint mapping program. This agreement established the coordination for producing and maintaining single-edition primary series topographic maps for quadrangles containing National Forest System lands. The joint mapping program eliminates duplication of effort by the agencies and results in a more frequent revision cycle for quadrangles containing National Forests. Maps are revised on the basis of jointly developed standards and contain normal features mapped by the USGS, as well as additional features required for efficient management of National Forest System lands. Single-edition maps look slightly different but meet the content, accuracy, and quality criteria of other USGS products.

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**SUBMERGED AREAS AND BOGS**

- Marsh or swamp
- Submerged marsh or swamp
- Wooded marsh or swamp
- Submerged wooded marsh or swamp
- Land subject to inundation

**SURFACE FEATURES**

- Levee
- Sand or mud
- Disturbed surface
- Gravel beach or glacial moraine
- Tailings pond

**TRANSMISSION LINES AND PIPELINES**

- Power transmission line; pole; tower
- Telephone line
- Aboveground pipeline
- Underground pipeline

**VEGETATION**

- Woodland
- Shrubland
- Orchard
- Vineyard
- Mangrove

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**Topographic Map Information**

For more information about topographic maps produced by the USGS, please call: 1-888-ASK-USGS or visit us at http://ask.usgs.gov/
Lesson: Exploring Allagash Waterway Watersheds with Maps

Complete the Map 55 assignment before working on this Map 50 worksheet.

Water Features

Find and list all the water features on Map 50 in the Maine Atlas that are part of an Allagash watershed, noting all the ponds and brooks and other features shown in blue that enter the Waterway boundary (———-———). Make your list neatly on lined paper.

Your list should include at least 1 brook, 2 ponds, and 1 lake.

Question

Is Webster Lake on your list? Explain, after checking the official Waterway map and the “Allagash Waterway Watersheds” map.

Other Prominent Features

Find and list the following land and built features in Map 50. They will be labeled in black type in the Atlas. You will also need to consult the official Allagash Wilderness Waterway map. Include any summit elevations.

Land features: Telos Mountain

Structures/built features and settlements: Telos Dam.

To learn more about Telos Dam and its role in the history of the Waterway, read the “Allagash Headwaters: Dams Changed the Flow” handout.
Map 55 Worksheet

Lesson: Exploring Allagash Waterway Watersheds with Maps

Before mapping water and other features in the Allagash landscape, we begin by studying them on existing maps and looking closely at the drainage patterns. Your first step is finding all the named water features in your map section and listing them by category. Make your list neatly on lined paper.

Working with your partner, decide which one of you will be the list-keeper. It will take both of you looking carefully to find all the named features, following the stream lines between water bodies in the Waterway drainages. If you can “trace” a stream or pond back to the Waterway’s lakes, it is part of a Waterway watershed. If in doubt, check the drainage pattern (stream lines) on adjacent Atlas map pages, the official Waterway map, or the “Allagash Waterway Watersheds” map.

There are streams, lakes, and ponds on your map page that drain into the West Branch Penobscot River, so follow the stream lines carefully, checking map page 49. You’ll also need to check map page 61.

Water Features

Find and list all the water features on Map 55 in the Maine Atlas that are part of an Allagash watershed. The best way to “follow the water” is to start at the lower right corner of your map section and work your way north and back around, following each Allagash tributary and noting all the ponds and brooks and other features shown in blue that enter the Waterway ( ——— —— ).

You can think of the highest feeder brooks as twigs, the larger tributary streams as branches with small lakes and ponds attached by outlet stems, all joining the main stem of the Waterway as the trunk. Listing the water features geographically by tributary stream will help you keep track of them.

When you have a complete list, underline all the stream/brook names with a straight line, circle all the lake names, and draw a ripply line under rapid/waterfall names; this will make it easier to count. Your list should include at least 12 named brooks/streams (including inlets and deadwaters), 16 ponds, 6 lakes, 2 coves, 1 falls, 1 river.
Questions

1. What about the large lake north of Allagash Lake—did you include this lake and its streams in your list or not? Explain why.
2. Based on what you find on the official Waterway map, how many portages might paddlers have to make in your map section?
3. Where are they and what obstructions do they get around?

Other Prominent Features

Find the following land and built features in Map 55. Most of them will be labeled in black type in the Atlas. For some of them you may need to consult the official Allagash Wilderness Waterway map. Include any summit elevations.

Land features: Allagash Mountain, Poland Mountain, Priestly Mountain, Allagash Ice Cave, Farm Island

Structures/built features and settlements: Allagash Mountain Fire Tower, Tramway and abandoned railroad line, Trains and Trestle, Lock Dam, John’s Bridge

When you finish Map 55, if you have extra time, go on to complete worksheet for Map 50, the southern-most part of the Waterway, following the same instructions.
Lesson: Exploring Allagash Waterway Watersheds with Maps

Before mapping water and other features in the Allagash landscape, we begin by studying them on existing maps and looking closely at the drainage patterns. Your first step is finding all the named water features in your map section and listing them by category. Make your list neatly on lined paper.

Working with your partner, decide which one of you will be the list-keeper. It will take both of you looking carefully to find all the named features, following the stream lines between water bodies in the Allagash watershed. If you can “trace” a stream or pond back to the Waterway’s lakes or main stem of the Allagash River, it is part of a Waterway watershed. If in doubt, check the drainage pattern (stream lines) on adjacent Atlas map pages, the official Waterway map, or the “Allagash Waterway Watersheds” map.

There are a lot of streams and ponds on your map page that drain into the East Branch Penobscot and Aroostook River watersheds, so follow the stream drainage lines carefully and check the watershed boundaries on the “Allagash Waterway Watersheds” map. You’ll also need to check adjacent map pages 62 and 55.

**Water Features**

Find and list all the water features on Map 56 in the *Maine Atlas* that are part of an Allagash watershed. The best way to “follow the water” is to start at the lower left corner of your map section and work your way north and back around, following each Allagash tributary and noting all the ponds and brooks and other features *shown in blue* that enter the Waterway ( ).

You can think of the highest feeder brooks as twigs, the larger tributary streams as branches with small lakes and ponds attached by outlet stems, all joining the main stem of the Waterway as the trunk. **Listing the water features geographically by tributary stream will help you keep track of them.**
When you have a complete list, underline all the stream/brook names with a straight line, circle the lake names, and draw a ripply line under rapid/waterfall names; this will make it easier to count. Your list should include at least 9 named brooks/streams, 26 ponds, 13 lakes, 1 arm, 1 river, 1 rapids.

**Other Prominent Features**

Find the following land and built features in Map 56. Most of them will be labeled in black type in the Atlas. For some of them you may need to consult the official Allagash Wilderness Waterway map. Include any summit elevations.

**Land features:** Pillsbury Island, Soper Mountain, Allen Mountain, Harrow Mountain, Clear Lake Mountain, Haymock Mountain, Pillsbury Mountain, Pleasant Mountain

**Structures/built features and settlements:** Bissonette Bridge, Churchill Dam/Depot, Churchill Boarding House, Churchill Storehouse and History Center, Chamberlain Bridge, H. W. Marsh, Chamberlain Farm, Nugent’s Sporting Camps.
Before mapping water and other features in the Allagash landscape, we begin by studying them on existing maps and looking closely at the drainage patterns. Your first step is finding all the named water features in your map section and listing them by category. Make your list neatly on lined paper.

Working with your partner, decide which one of you will be the list-keeper. It will take both of you looking carefully to find all the named features, following the stream lines between water bodies in a Waterway watershed. If you can “trace” a stream or pond back to the Waterway’s lakes or main stem of the Allagash River, it is part of a Waterway watershed. If in doubt, check the drainage pattern (stream lines) on adjacent Atlas map pages, the official Waterway map, or the “Allagash Waterway Watersheds” map.

**WATER FEATURES**

Find and list all the water features on Map 61 in the *Maine Atlas* that are part of an Allagash watershed. The best way to “follow the water” is to start at the lower right corner of your map section and work your way north and back around, following each Allagash tributary and noting all the ponds and brooks and other features *shown in blue* that enter the Waterway ( ̶ ̶ ̶ ̶ ̶ ̶ ).

You can think of the highest feeder brooks as twigs, the larger tributary streams as branches with small lakes and ponds attached by outlet stems, all joining the main stem of the Waterway as the trunk. **Listing the water features geographically by tributary stream will help you keep track of them.**

When you have a complete list, underline all the stream/brook names with a straight line, circle the lake names, and draw a ripply line under rapid/waterfall names; this will make it easier to count. Your list should include at least 16 named brooks/streems, 4 ponds, 5 lakes, 1 river, 1 thorofare.
Questions

1. What about Blue Pond?
2. Based on what you find on the official Waterway map, how many portages might paddlers have to make in your map section?
3. Where are they and what obstructions do they get around?

Other Prominent Features

Find and list the following land and built features in Map 61. Most of them will be labeled in black type in the Atlas. For some of them you may need to consult the official Allagash Wilderness Waterway map. Include any summit elevations.

Land features: Squirrel Mountain, Grey Brook Mountain, Cunliffe Islands.

Structures/built features and settlements: Clayton Lake, Long Lake Dam, American Realty Road.

When you finish Map 61, go on to complete worksheets for Map 66, the northern-most stretch of the Waterway, and Map 50, the southern-most part of the Waterway, following the same instructions.
Lesson: Exploring Allagash Waterway Watersheds with Maps

Before mapping water and other features in the Allagash landscape, we begin by studying them on existing maps and looking closely at the drainage patterns. Your first step is finding all the named water features in your map section and listing them by category. Make your list neatly on lined paper.

Working with your partner, decide which one of you will be the list-keeper. It will take both of you looking carefully to find all the named features, following the stream lines between water bodies in the Allagash River watershed. If you can “trace” how a stream or pond drains back to the main stem of the Allagash River, it is part of the watershed.

This is an especially tricky map because it includes a watershed divide with some streams and ponds draining into the Red River, Fish River, and Machias River watersheds. When in doubt, check the adjacent Atlas map pages or the “Allagash Waterway Watersheds” map.

Water Features

Find and list all the water features on Map 62 in the Maine Atlas that are part of an Allagash watershed. The best way to “follow the water” is to start at the lower right corner of your map section and work your way north and back around, following each Allagash tributary and noting all the ponds and brooks and other features shown in blue that enter the Waterway ( ).

You can think of the highest feeder brooks as twigs, the larger tributary streams as branches with small lakes and ponds attached by outlet stems, all joining the main stem of the Waterway as the trunk. Listing the water features geographically by tributary stream will help you keep track of them.

When you have a complete list, underline all the stream/brook names with a straight line, circle the lake names, and draw a ripply line under rapid/waterfall names; this will make it easier to count. Your list should include at least 19 named brooks/streams, 16 ponds, 6 lakes, 1 river, 1 headwater, 1 pocket, 1 bogan, 4 rips/rapids/falls.
Questions

1. What do you think a bogan is?
2. Based on what you find on the official Waterway map, how many portages might paddlers have to make in your map section?
3. Where are they and what obstructions do they get around?
4. The Waterway map labels a few more brooks than the Atlas does; what are they?

Other Prominent Features

Find and list the following land and built features in your map section. Most of them will be labeled in black type in the Atlas. For some of them you may need to consult the official Allagash Wilderness Waterway map. Include any summit elevations.

Land features: McGargle Rocks, Round Pond Mountain, Shepherd Brook Mountain, Musquacook Mountain

Structures/built features and settlements: American Realty Road, Round Pond Mountain Lookout Tower, Jalbert’s Sporting Camps, Michaud Farm, Taylor Camps, Cunliffe Depot, Moir Farm, Joe McKeel Gravesite, Lombard Log Haulers, Taylor Landing.
Complete the Map 55 or Map 61 assignment before working on this Map 66 worksheet.

**WATER FEATURES**

Find and list all the water features in your map section that are part of the Allagash River watershed, noting all the ponds and brooks and other features shown in blue that enter the Waterway boundary (———). Make your list neatly on lined paper.

When you have a complete list, underline all the stream/brook names with a straight line and draw a ripply line under rapid/waterfall names; this will make them easier to count. Your list should include 4 named brooks/strems, 1 river, and 3 rips/rapids.

**Question**

Based on what you find on the official Waterway map, do you think the rips and rapids are runnable, or would you have to portage around them?

**OTHER PROMINENT FEATURES**

Find and list the following land and built features found in your map section. Most of them will be labeled in black type in the Atlas. For some of them you may need to consult the official Allagash Wilderness Waterway map.

**Land features:** Three Mile Island.

**Structures/built features and settlements:** Allagash (village).