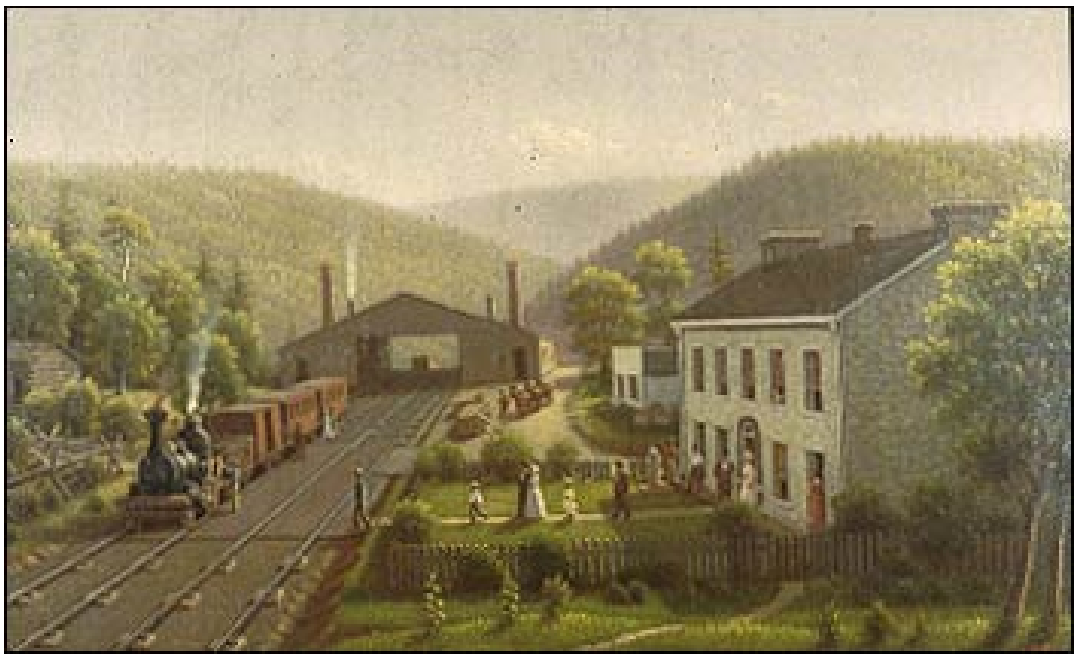
Allegheny Portage Railroad: Developing Transportation Technology



(The State Museum of Pennsylvania, Pennsylvania Historical and Museum Commission)

Imagine riding on horseback or hiking through the Allegheny Mountains of western Pennsylvania in the summer of 1835. A dusty road climbs through an ever narrowing ravine. You are surrounded by steep hillsides covered with towering hemlocks, many reaching over 100 feet high. A small stream, barely four feet across, tumbles down its shallow and rocky course alongside the road. Here, high in the mountains, the air is cool, despite the season, and a feeling of wilderness pervades.

As you round a bend in the road you notice the sound of heavy machinery--wheels turning, engines cranking, ropes straining. You see a cloud of dark smoke belching from an unseen smokestack somewhere on the hillside to your right. Then, through a break in the trees, you glimpse the front section of a boat slowly moving up the steep slope of the mountain! There cannot possibly be a river or canal in such a location. What is more, the boat appears to be moving up a steep grade under its own power. Clearly, an unusual event in America's transportation history is under way.

Document Contents

Where this lesson fits into the curriculum

Time Period: Early 19th century

Topics: The lesson could be used in units on early 19th-century industrialization and expansion. Students will strengthen their skills in geography and history through map reading, examination of paintings and photographs, analysis of firsthand accounts, and other activities.

Relevant United States History Standards for Grades 5-12

This lesson relates to the following National Standards for History from the UCLA National Center for History in the Schools:

US History Era 4

- **Standard 1C:** The student understands the ideology of Manifest Destiny, the nation's expansion to the Northwest, and the Mexican-American War.
- **Standard 2A:** The student understands how the factory system and the transportation and market revolutions shaped regional patterns of economic development.
- **Standard 2E:** The student understands the settlement of the West.

Relevant Curriculum Standards for Social Studies

This lesson relates to the following Curriculum Standards for Social Studies from the National Council for the Social Studies:

Theme III: People, Places, and Environment

- Standard A: The student elaborates mental maps of locales, regions, and the world that demonstrate understanding of relative location, direction, size, and shape.
- Standard B: The student creates, interprets, uses, and distinguishes various representations of the earth, such as maps, globes, and photographs.

- Standard D: The student estimates distance, calculates scale, and distinguishes other geographic relationships such as population density and spatial distribution patterns.

Theme VII: Production, Distribution, and Consumption

- Standard I: The student uses economic concepts to help explain historical and current developments and issues in local, national, or global contexts.

Theme VIII: Science, Technology, and Society

- Standard A: The student examines and describes the influence of culture on scientific and technological choices and advancement, such as in transportation, medicine, and warfare.
- Standard B: The student shows through specific examples how science and technology have changed people's perceptions of the social and natural world, such as in their relationships to the land, animal life, family life, and economic needs, wants and security.
- Standard D: The student explains the need for laws and policies to govern scientific and technological applications, such as in the safety and well-being of workers and consumers and the regulation of utilities, radio, and television.

Relevant Common Core Standards

This lesson relates to the following Common Core English and Language Arts Standards for History and Social Studies for middle and high school students:

Key Ideas and Details
- CCSS.ELA-Literacy.RH.6-12.1
- CCSS.ELA-Literacy.RH.6-12.2
- CCSS.ELA-Literacy.RH.6-12.3

Craft and Structure
- CCSS.ELA-Literacy.RH.6-12.4
- CCSS.ELA-Literacy.RH.6-12.5
- CCSS.ELA-Literacy.RH.6-12.6

Integration of Knowledge and Ideas
- CCSS.ELA-Literacy.RH.6-12.7

Range of Reading and Level of Text Complexity:
- CCSS.ELA-Literacy.RH.6-12.10

Teaching with Historic Places

National Park Service
U.S. Department of the Interior

Allegheny Portage Railroad: Developing Transportation Technology

About This Lesson

This lesson is based on the National Register of Historic Places registration file, "Allegheny Portage Railroad National Historic Site," [http://npgallery.nps.gov/NRHP/GetAsset/e4e4046f-538d-4ef1-9062-21214399cb52] and other source materials on the development of 19th-century transportation. It was published in 2000. TwHP is sponsored, in part, by the Cultural Resources Training Initiative and Parks as Classrooms programs of the National Park Service. This lesson is one in a series that brings the important stories of historic places into the classrooms across the country.

Objectives

1. To explain how the topography of Pennsylvania led to the building of the Allegheny Portage Railroad;
2. To describe some of the innovative technology used in building the Allegheny Portage Railroad and explain how it was later applied to other projects;
3. To compare the technology and level of success of the Pennsylvania Main Line of Public Works (of which the Allegheny Portage Railroad was a part) with other transportation systems of the 1830s and 1840s;
4. To discuss technological change and the affect it has on their lives and the world as a whole;
5. To investigate their own community's transportation history and consider the possible effects of technological advances on the future of transportation.

Materials for students

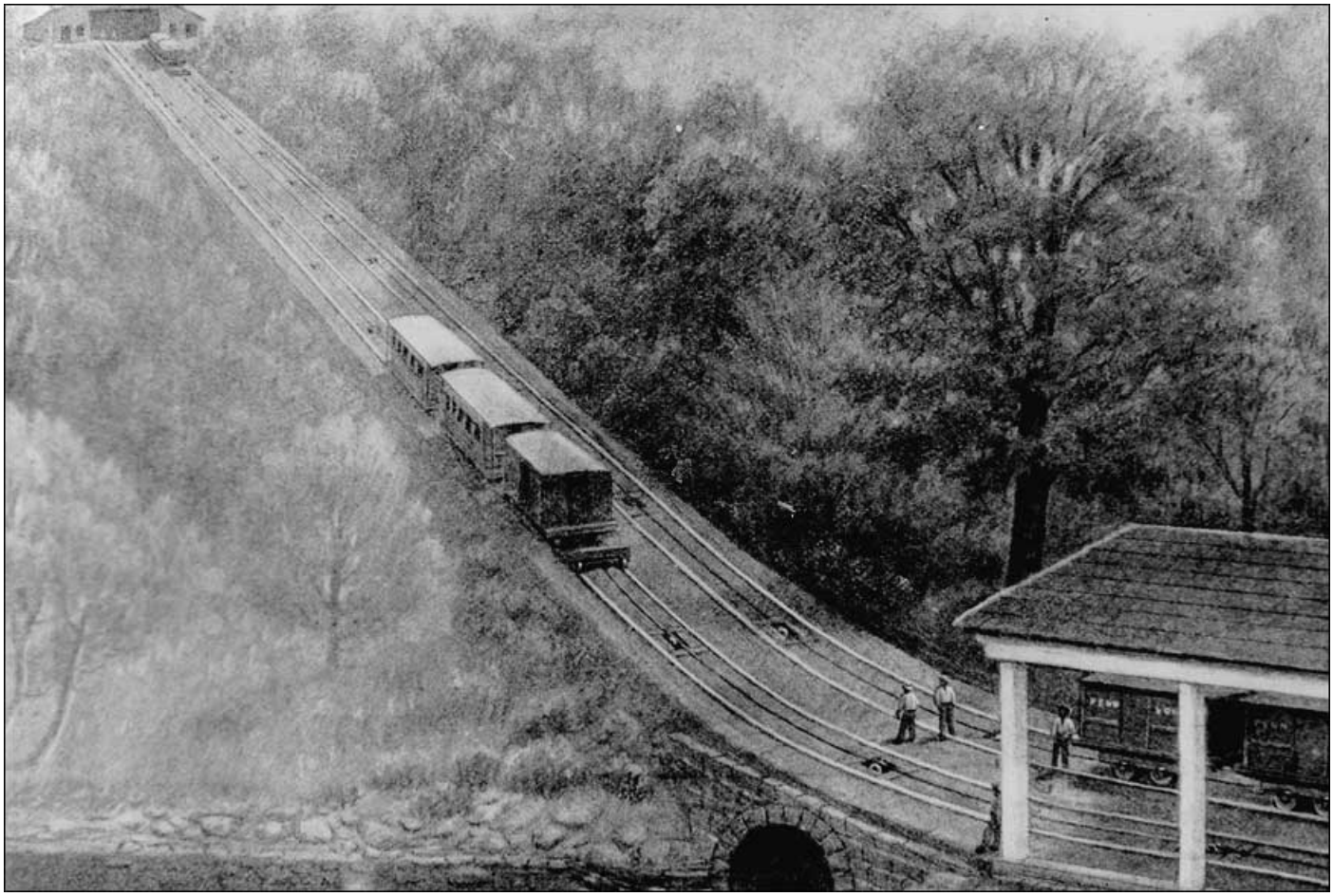
The materials listed below can either be used directly on the computer or can be printed out, photocopied, and distributed to students.

1. One map of the Pennsylvania Main Line of Public Works;
2. Three readings about the inclined planes, the development of new types of transportation routes, and reaction to the Allegheny Portage Railroad;
3. One drawing showing the location of 10 inclined planes along the Allegheny Portage Railroad;
4. Two photographs showing some of the construction materials used for the railroad;
5. Two paintings showing how canal boats were transported on the inclined plane;

Visiting the site

Allegheny Portage Railroad National Historic Site is administered by the National Park Service. It is located 12 miles west of Altoona, Pennsylvania, and can be reached off U.S. Highway 22. The park preserves remnants of the railroad including portions of four inclined planes. For more information, contact the Superintendent, Allegheny Portage Railroad National Historic Site, P.O. Box 189, Cresson, PA 16630 or visit the park's Web pages.

Getting Started



What is different about the train and tracks featured in this painting? How do they work?

Photo Analysis Worksheet

Step 1:
Examine the photograph for 10 seconds. How would you describe the photograph?

Step 2:
Divide the photograph into quadrants and study each section individually. What details--such as people, objects, activities--do you notice?

Step 3:
What other information--such as time period, location, season, reason photo was taken--can you gather from the photo?

Step 4:
How would you revise your first description of the photo using the information noted in Steps 2 and 3?

Step 5:
What questions do you have about the photograph? How might you find answers to these questions?

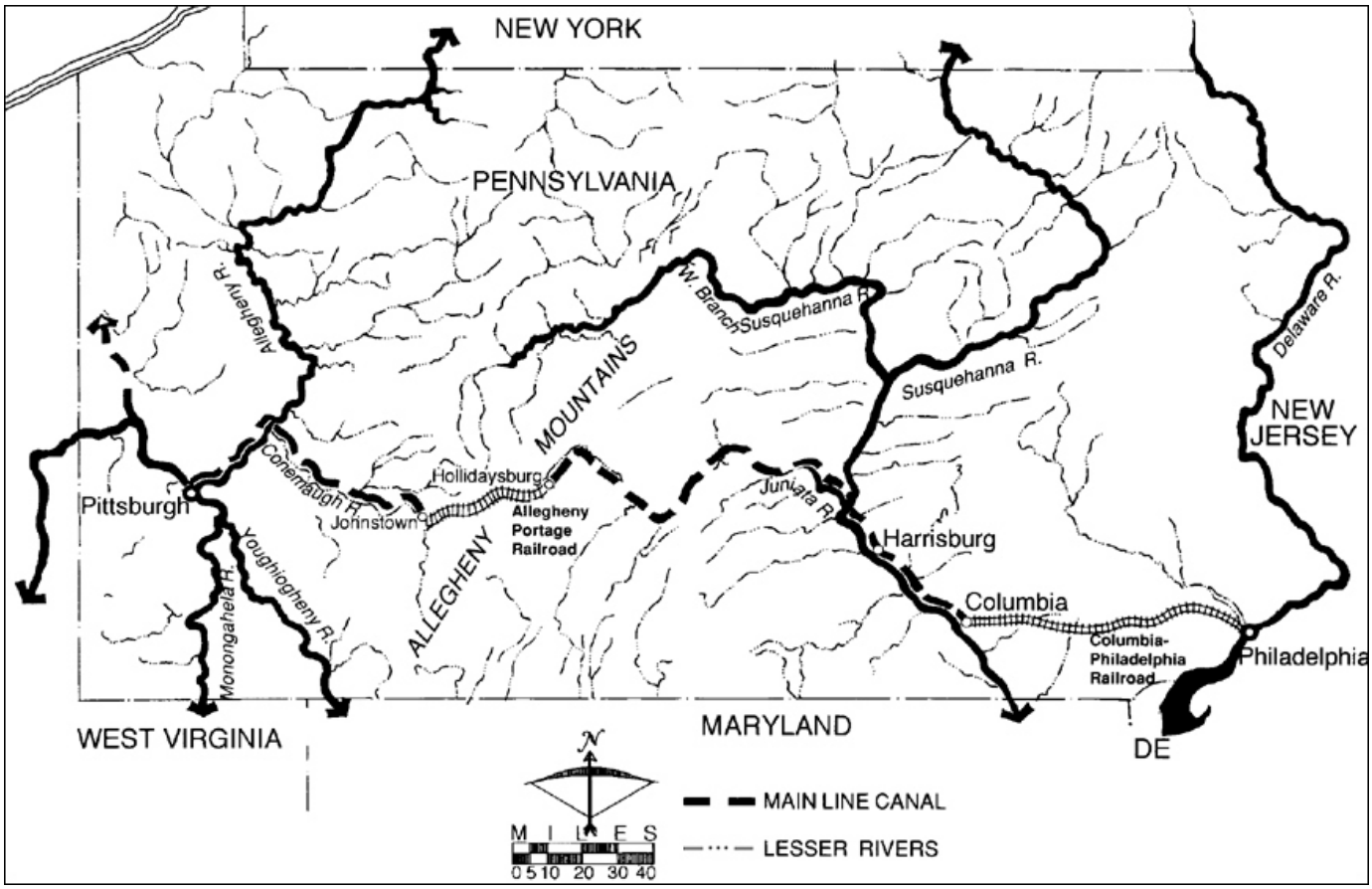
Setting the Stage

As the 19th century dawned, it became clear that the transportation problems facing the new United States were as enormous as its territory. Post roads ran along the Atlantic seaboard, but by the 1820s, it seemed everyone wanted to move west, beyond the coastal mountains. As these new lands were opened for settlement, the few roads penetrating the mountains became clogged with wagons and travelers on horseback and on foot. Railroads and canals would provide more efficient transport, but early railroads could not handle the steep slopes of the Allegheny Mountains. The Allegheny Portage Railroad, which consisted of a series of 10 inclined planes connected by level sections of track, provided an innovative solution to this problem. Stationary steam engines towed railroad cars up the first five inclines and lowered them down the remaining five. This railroad was part of a much larger system, the Pennsylvania Main Line of Public Works, built by the state of Pennsylvania to compete with the Erie Canal in New York.

Begun in 1826, the Main Line system consisted of sections of canal linked with sections of railroad. Eventually this system stretched nearly 400 miles to connect Philadelphia and Pittsburgh. Construction of the Allegheny Portage Railroad section of the Pennsylvania Main Line system began in 1831, and the railroad opened to traffic in 1834. For 20 years, the railroad hauled passengers and freight, including sectional canal boats, over the Allegheny Mountains. Eventually, advancing transportation technologies overtook the portage railroad. In 1854 the Pennsylvania Railroad, a private company, completed a route through the mountains without using inclined planes, making the Allegheny Portage obsolete. In 1857 the Pennsylvania Railroad bought the entire Main Line system from the state and began dismantling the Allegheny Portage Railroad. The Allegheny Portage Railroad National Historic Site preserves what little remains of this unusual transportation system

Locating the Site

Map 1: The Pennsylvania Main Line of Public Works



(National Park Service)

Canals were constructed on relatively level areas and usually followed the courses of rivers.

Questions for Map 1

1) Identify the route of the Allegheny Portage Railroad. Name the two cities at the east and west ends of the railroad. Using the scale provided, calculate the distance of the Allegheny Portage Railroad.

2) What obstacles would have prevented a canal from being built across the state?

3) Identify the route of the Pennsylvania Main Line of Public Works, the system of canals and connecting railroads that was built across Pennsylvania. How were obstacles overcome by the canal engineers?

Determining the Facts

Reading 1: Riding on the Inclined Plane

Packet Juniata, near Lewistown, August 21, 1835.

> Yesterday at Johnstown we soon dispatched the ceremony of a good breakfast, and at 6 a.m. were in motion on the first level, as it is called, of four miles in length, leading to the foot of the first inclined plane. The level has an ascent of 101 feet, and we passed over it in horse-drawn cars with the speed of six miles an hour. This is a very interesting part of the route, not only on account of the wildness and beauty of the scenery, but also of the excitement mingled with vague apprehension, which take possession of every body in approaching the great wonder of the internal improvements of Pennsylvania.
>
> In six hours the cars and passengers were to be raised 1,172 feet of perpendicular height, and to be lowered 1,400 feet of perpendicular descent, by complicated, powerful and frangible [breakable] machinery, and were to pass a mountain, to overcome which, with a similar weight, three years ago, would have required the space of three days. The idea of rising so rapidly in the world, particularly by steam or a rope, is very agitating to the simple minds of those who have always walked in humble paths.
>
> As soon as we arrived at the foot of Plane No. 1, the horses were unhitched and the cars were fastened to the rope.... The stationary steam engine at the head of the plane was started and the cars moved majestically up the steep and long acclivity in the space of four minutes....
>
> The cars were now attached to horses and drawn through a magnificent tunnel 900 feet long.... Now the train of cars were attached to a steam tug to pass a level of 14 miles in length. This lengthy level is one of the most interesting portions of the Portage Railroad, from the beauty of its location and the ingenuity of its construction. It ascends almost imperceptibly through its whole course...and passes through some of the wildest scenery in the state.... The valley of the little Conemaugh River is passed on a viaduct of the most beautiful construction. It is one arch, a perfect semicircle with a diameter of 80 feet....
>
> The 14 miles of this second level are passed in one hour, and the train arrives at the foot of the second plane.... The third level is passed by means of horses. The third plane has a length of 1,480 feet, and a perpendicular height of 130 [feet]. The fourth level is passed by means of horses. The fourth plane has a length of 2,196 feet, and a perpendicular height of 188 [feet]. The fifth level is three miles long, rises 26 feet and is passed by means of horses. The fifth plane brings you to the top of the mountain, 2,397 feet above the level of the ocean, 1,399 feet above Hollidaysburg, and 1,172 feet above Johnstown.
>
> At this elevation in the midst of summer, you breathe an air like that of spring.... Three short hours have brought you from the torrid plain, to a refreshing and invigorating climate. The ascending apprehension has left you, but it is succeeded by the fear of the steep descent which lies before you; and as the car rolls along this giddy height, the thought trembles in your mind, that it may slip over the head of the first descending plane, rush down the frightful steep, and be dashed into a thousand pieces at its foot.
>
> The length of the road on the summit of the mountain is one mile and five-eighths, and about the middle of it stands a spacious and handsome stone tavern. The descent on the eastern side of the mountain is much more fearful than the ascent on the western, for the planes are much

longer and steeper, of which you are made aware by the increased thickness of the ropes; and you look down instead of up.

There are also five planes on the eastern side of the mountain, and five slightly descending levels, the last of which is nearly four miles long and leads to the basin at Hollidaysburg; this is travelled by the cars without steam or horse, merely by the force of gravity. In descending the mountain you meet several fine prospects and arrive at Hollidaysburg between twelve and one o'clock.

Questions for Reading 1

1) How much time did it take to travel from Johnstown to Hollidaysburg on the portage railroad? How did that compare with other modes of transportation?

2) In what ways did the portage railroad differ from railroads of today?

3) In your own words, describe how the railroad cars were hauled over the mountain.

4) How did Philip Nicklin feel about traveling on this railroad? How would you have felt about traveling on this route?

5) From Nicklin's description of the mechanics of the railroad, what problems do you think might have plagued its operation?

Determining the Facts

Reading 2: Innovation on the Portage

The Allegheny Portage Railroad was a triumph of engineering. The levels and inclined planes of the railroad were an immediate improvement over the earlier wagon road through the mountains. Over the course of its short lifetime, improvements were continually made to the portage railroad. As one of the earliest railroads in the country, the Allegheny Portage was the scene of experimentation with railroad building and operational techniques.

Construction Techniques

The Allegheny Portage was the site of the first railroad tunnel built in America. Tunnels were still very new in the United States, existing on only a few canals. In fact, when first considering the idea of a "tunnel" to carry the canal through the Alleghenies in 1825, state engineers were obliged to define the term in their reports as "to be like a large well dug horizontally through a hill or mountain." The Staple Bend Tunnel constructed on the portage railroad cut through a ridge at the top of Inclined Plane No. 1. Its construction saved the railroad two-and-a-half miles of track that would have been needed if the railroad had followed the normal route of the valley in which it was being built. Today, of course, railroad and highway tunnels are common sights all over the country.

The portage railroad also experimented with track construction techniques. The rails on the level sections of the railroad were placed on stone blocks, called sleepers, spaced approximately every three feet along the road. Because these blocks shifted with weather and moisture variations, the rails often separated, making it impossible for trains to move safely along the tracks. Eventually wooden cross ties, as seen on railroads today, were placed along most of the railroad. The wooden cross ties, which bound the two rails together so they would not separate, were not as prone to movement and were much easier to prepare or replace.

Transportation Technology

The level sections of the portage railroad were a testing ground for early locomotives. The first locomotive to operate on commercial track in America had run in 1829 near Honesdale in northeastern Pennsylvania. When the portage railroad opened five years later, it did not have any locomotives. Horses pulled the cars, as was common on railways of the time. In 1835 the engine "Boston" became the first locomotive to run on the portage. It proved a huge success in reliability and power, doing the work of 18 horses. Over the next few years, the railroad acquired 16 other locomotives, and eventually phased out the use of horses. Proving their usefulness on early railroads like the Allegheny Portage helped locomotives become the dominant form of transportation by the end of the 19th century.

Railroad locomotives often had the unusual task of pulling boats along the railroad. As part of a canal system, the railroad's job was to portage or carry canal traffic from one side of the Alleghenies to the other. At first this involved unloading all freight and passengers from the canal boats and loading them into rail cars for transport over the mountains. Eventually an ingenious system was devised to load specially built sectional canal boats directly onto railroad cars to be carried across the Alleghenies. They would then be reassembled on the other side and continue on their way. Today, when you see truck trailers on railroad cars, you are observing a modern version of this containerized shipment.

Inclined Plane Safety and Beyond

The inclined planes of the portage were a serious safety hazard during the early days of the railroad. The hemp ropes used to haul the cars up and lower them down the steep tracks often broke. Several

fatalities resulted from cars crashing down the inclines. To prevent this occurrence, a brake was attached to the downhill side of the cars to prevent them from sliding down the incline tracks. This safety car or safety buck had sled-like runners which would drag on the track when the rope broke. The railroad car would then ride up onto the safety buck where the additional weight would activate a braking mechanism to slow the descent. This device prevented many accidents on the railroad.

In addition to their inherent safety problems, hemp ropes also were very expensive (costing about $3,000 per rope) and short-lived (lasting about 16 months). All of these problems were eventually solved with the installation of wire rope or cable on the inclines. This innovation had the most impact of any of the technological achievements of the railroad. It came about in 1841 when a man named John Roebling convinced the contractor who operated the boat slip at the Johnstown Canal basin to use a type of wire rope he had developed. This first experiment was a failure. Undaunted, Roebling developed a new rope and persuaded the railroad to try it on Inclined Plane No. 3. He obtained a position with the railroad and supervised repairs and adjustments to the machinery and this new rope. This time it was a success. Eventually all the inclines were fitted with Roebling's wire rope. This rope or cable lasted years instead of months and did not break. His success on the portage railroad launched Roebling on a career that began the American wire rope industry. Roebling is best known for the suspension bridges he built all over the country, but his wire works provided cable for all manner of industrial development. His greatest project, the Brooklyn Bridge, was completed by his son. It stands today as the best heir to the technological legacy of the Allegheny Portage Railroad.

Questions for Reading 2

1) What was significant about the Staple Bend Tunnel? Why was it built?

2) Do you think the builders of the Allegheny Portage Railroad thought the railroad would last a long time? Why or why not?

3) What is a "sleeper"? What problems did it cause on the railroad? How were these solved?

4) What role did the Allegheny Portage Railroad play in the development of locomotives in this country?

5) How do you think the sectional canal boats were loaded onto railroad cars?

6) How did the railroad try to cut down on accidents before the hemp ropes were replaced with wire ropes or cables?

7) What were the advantages and disadvantages of hemp ropes and wire ropes used on the inclines?

Determining the Facts

Reading 3: Impressions of the Portage Railroad

[The United States] now numbers among its many wonderful artificial lines of communication, a mountain railway, which, in boldness of design, and difficulty of execution, I can compare to no modern work I have ever seen, excepting perhaps the passes of Simplon, and Mount Cenis, in Sardinia; but even these remarkable passes, viewed as engineering works, did not strike me as being more wonderful than the Allegheny Railway in the United States.

--David Stevenson, 1838

Occasionally the rails are laid upon the extreme verge of the giddy precipice and looking down from the carriage window, the traveller gazes sheer down without a stone or scrap of fence between into the mountain depths below. The journey is very carefully made however, only two carriages travelling together and while proper precautions are taken, it is not to be dreaded for its dangers.

--Charles Dickens, 1843

The trip of a boat over the mountain is now no novel sight.... Since this road was constructed such improvements have been made in the construction of locomotives, that a project has been suggested for relocating the whole road.

--Sherman Day, 1843

At this place the western division of the Pennsylvania Canal commences, and the miserable Portage Railroad, with its short splintery rails and curvatures, its stationary steam engines and abominable inclined planes, terminates. The traveller, who has crossed the mountain over it, will not regret to leave it, but will thank the stars that a better road will soon supersede it.

--Eli Bowen, 1853

Questions for Reading 3

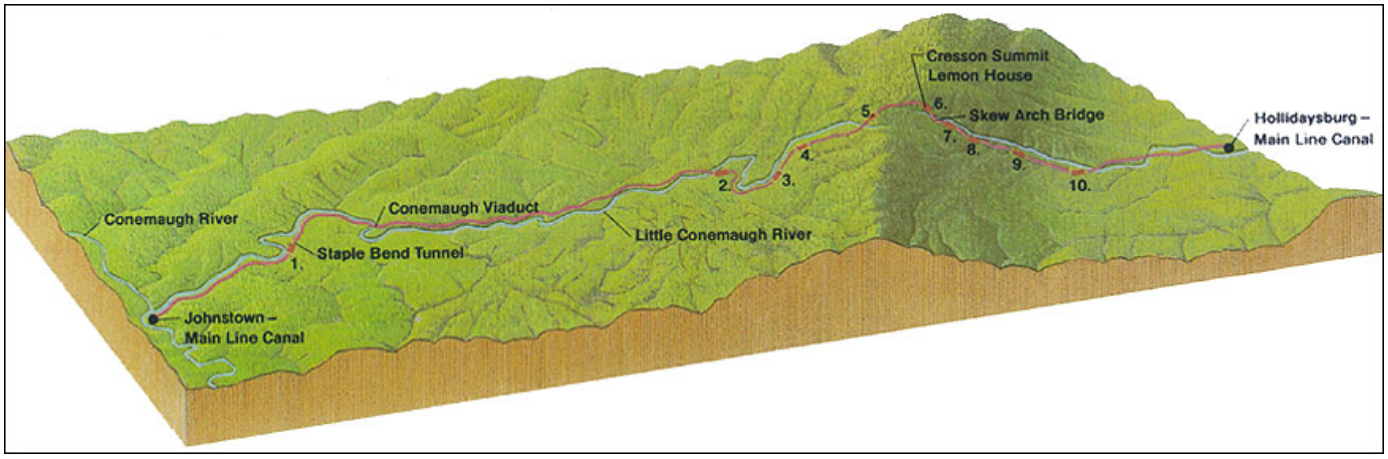
1) How did opinions about the portage railroad change from the 1830s to the 1850s? Why do you think the change occurred?

2) Despite the improvements made on the portage railroad, its passenger traffic declined greatly after the 1840s. What may have accounted for that decline?

3) Based on the descriptions you have read, would you have wanted to travel on the portage railroad? Why or why not?

Visual Evidence

Drawing 1: Ten inclined planes on the Allegheny Portage Railroad



(National Park Service)

The railroad portage over the Allegheny Mountains was crucial to the Pennsylvania Main Line. It joined the system's two great canals into an efficient artery between eastern and western Pennsylvania. Passengers leaving Philadelphia in 1840 could reach Pittsburgh in 4 days instead of 23.

The engineering was simple in principle. In the canal basin at Hollidaysburg, the packet boat sections in which passengers had travelled from Philadelphia were floated onto railroad cars for the portage. They were hauled from the water by stationary engines, then pulled by locomotives at about 15 mph over the long grade to the first incline. In a small shed at the foot of the incline, workers hitched three cars at a time, each averaging 7,000 pounds, to the continuous cable that moved over rollers between the rails. This cable was pulled at about 4 mph by a stationary steam engine beneath a large shed at the top of the incline. When possible, the operators used cars descending on the other track to counterbalance those ascending, lessening the strain on the engines. On the near-level grades between inclines, the cars were drawn by horses or locomotives. The process was reversed on the other side of the summit.

Questions for Drawing 1

1) Locate Johnstown and Hollidaysburg on both Drawing 1 and on Map 1. Which visual shows more detail?

2) Using the information in Reading 1, trace the route of the Allegheny Portage Railroad. Which part of the route seemed more treacherous?

3) Using Drawing 1 and the Reading 1, describe the topography: a) between Johnstown and inclined plane no. 2; b) between inclined plane no. 2 and the summit; and c) between the summit and Hollidaysburg.

Visual Evidence

Photo 1: Stone Sleepers

(Allegheny Portage National Historic Site)

Photo 1 shows a section of stone sleepers from the railroad, still intact and in place at the park.

Questions for Photo 1

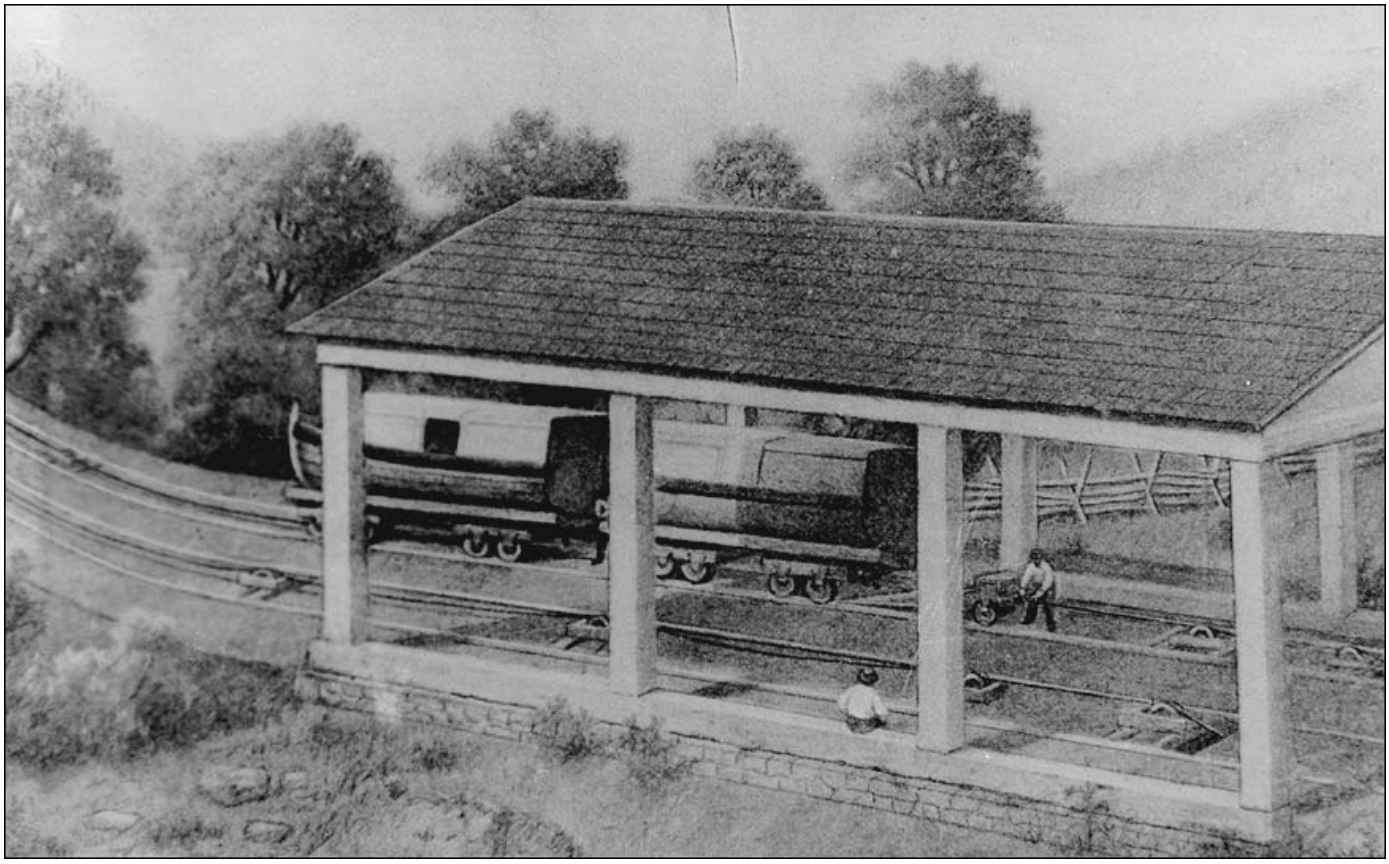
1) What was the purpose of the items shown? (Refer back to Reading 2 if necessary).

2) How do you think the rails were attached to the stone blocks? Are there any clues on the blocks themselves to indicate this?

3) Why do you think stone blocks may have been used on the railroad in the first place? List some possible advantages and disadvantages for using stone versus wood ties. Look at the photo for clues to problems in using stone sleepers.

Visual Evidence

Painting 1: *A Sectional Canal Boat in the Hitching Shed*, by George Storm, date unknown



(National Park Service)

Paintings 1 and 2 are two in a series by George Storm, who grew up near the railroad and watched it operate. Many years after the railroad had closed, Storm painted these pictures from his memories of the portage.

Painting 1 is of a sectional canal boat in the hitching shed at the bottom of the incline. The hitching shed was simply a roof over the tracks at the bottom of each of the inclines where the rail cars were tied to the ropes or cables of the incline.

Questions for Painting 1

1) What is the name of the device with the small sled-like runners that the man is attaching to the rope behind the two rail cars? How did this device work? (Refer to Reading 2 and Painting 2 for more information.)

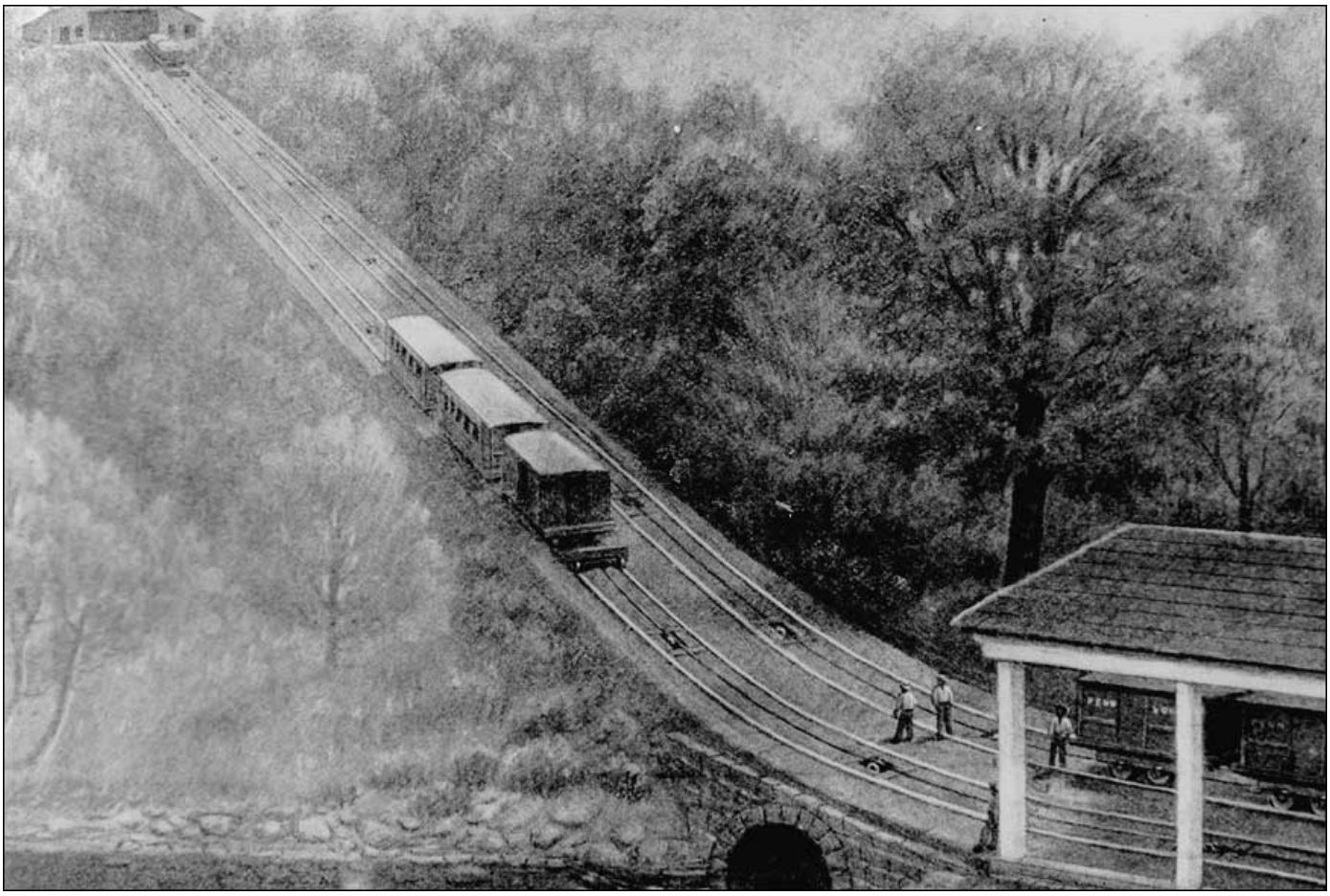
2) Look at the sections of the canal boat loaded on the rail cars. Is this the entire boat? How many other pieces, if any, do you think are missing?

3) Does the boat in Painting 1 look like a freight boat or a passenger boat? Why?

4) What do you think is the purpose of the small wheels--called idler wheels--between the tracks through which the rope passes?

Visual Evidence

Painting 2: *Inclined Plane No. 8,* by George Storm, date unknown



(National Park Service)

Paintings 1 and 2 are two in a series by George Storm, who grew up near the railroad and watched it operate. Many years after the railroad had closed, Storm painted these pictures from his memories of the portage.

Painting 2 is of the full inclined plane. Note the idler wheels and hitching shed at the base of the incline.

Questions for Painting 2

1) Is this the same inclined plane shown in the previous painting? What evidence can you give for your answer?

2) What do you think the building at the top of the incline is? What was located at the top of each of the inclined planes?

3) Note that as one set of cars is going up the incline, another set is coming down. Do you think this was typical? Why would this be the most efficient way to operate the inclines? (Remember both sets of cars are tied in to one continuous rope.) Do the two loads on this incline look to be balanced?

4) Painting 2 is of Inclined Plane No. 8, the longest incline on the railroad. This plane was about 3,100 feet long. The cars were pulled up the plane at four miles per hour. Approximately how long would a trip up this inclined plane take?

Visual Evidence

Photo 2: Artifact found at Inclined Plane No. 6

(National Park Service)

Artifacts are objects made by humans that offer tangible evidence of their activities. As such they are useful for understanding our past. By studying artifacts, we can put together a clearer picture of history. The artifact in the picture was discovered at Allegheny Portage Railroad National Historic Site when one of the inclined planes was being reconstructed.

Questions for Photo 2

1) Based on the photo, the readings, and the location in which this object was found, what do you think it is?

2) Artifacts have five basic properties: history, material, construction, design, and function. Looking at Photo 2, and remembering the readings, describe the basic properties of this artifact.

a. History: When was it probably made and who made it?
b. Material: What does it appear to be made of?
c. Construction: How is it put together?
d. Design: What basic idea underlies its form?
e. Function: Artifacts have both intended functions and unintended functions. How was this artifact originally intended to be used? How were later forms of this artifact used?

Putting It All Together

The Allegheny Mountains form a natural barrier across Pennsylvania nearly half-a-mile high, separating the eastern seaboard (at Philadelphia) from the Ohio River Valley (at Pittsburgh). Nevertheless, in the 19th century it was possible to ride in a boat between those two cities without ever disembarking, even though the craft did not stay in the water the entire time. Although never a true success story in quantity of passengers or freight hauled, the Allegheny Portage Railroad did become an important testing ground for new transportation technologies. The following activities encourage students to consider the impact of past, present, and future advances in technology.

Activity 1: Innovation and Technology

In the early 1800s England was the world leader in railroad technology. The first railroads and locomotives used in the United States were based on English designs. When that technology proved unsatisfactory for the more rugged terrain found in this country, new designs were created and subsequently exported back to England and other parts of Europe. In this way, the United States emerged as a leader in railroad technology. Have students discuss the following questions:

1. Does the United States remain a world leader in technological innovations today?
2. What other technologies imported from other countries has the United States improved upon? What innovations conceived in the United States were perfected in other countries?
3. Early railroad development in this country met with opposition from canal boat operators and wagon drivers. Today, we face new technological developments every day. Do the new technologies developed over the last 50 years or so, such as television and computers, have negative aspects as well as positive ones?

Now divide the class in half, and hold a debate on the pros and cons of changes in technology. Students should ask the opinions of their parents or grandparents to see if opinions differ by generation.

Activity 2: Canals and Railroads

Pennsylvania was not the only state that possessed a complex system of canals. By the 1850s, hundreds of miles of canals crossed the eastern United States. Notable canals included the Morris Canal in New Jersey, the Chesapeake and Ohio Canal in Maryland, the Erie Canal in New York, and the Ohio and Erie Canal in Ohio. Many of these canals had their own natural obstacles to overcome. Have students investigate the canals of several states to compare problems in building these waterways. Questions to consider include:

(1) What innovative measures were developed to overcome barriers along the routes of other canals?
(2) How did the inclined planes used for canals differ from those on the Allegheny Portage Railroad? Useful sources of information include Ralph K. Andrist, *The Erie Canal* (Mahwah, NJ: Troll Associates, 1964); Sherilyn Seyler and Kathleen Kupper, *The Building of the Chesapeake and Ohio Canal*, Teaching with Historic Places Lesson Plan; and Deborah Ayers, *The Ohio and Erie Canal: Catalyst of Economic Development for Ohio*, Teaching with Historic Places Lesson Plan.

Activity 3: Transportation Technology: Past, Present, and Future

Have students research their community's transportation history and write papers answering the following questions. Did the community develop as a result of improvements in transportation technology? Did the topography of the region affect transportation routes? How? Did railroads or canals play a major role in the subsequent growth of the community? If so, how and why has that role changed? Ask students to look for places associated with the community's transportation history. Are these places still in use today? Are they still used for the same purposes? Remind students that, although it is the major means of transportation for most people today, the automobile was not introduced until the turn of the 20th century. Now ask students to imagine and describe the kinds of transportation they think might be available a century from now. Consider some of the effects this future means of transportation might have on the community. (For example, will the relationships between where people live, work, and spend leisure time be the same as they are today? Will there be a need for specialized buildings or building designs? What new equipment, services, and jobs will this new type of transportation bring?) Hold a class discussion on the students' responses.

References and Endnotes

Reading 1

Reading 1 was excerpted from Philip Nicklin, *A Pleasant Peregrination through the Prettiest Parts of Pennsylvania, Performed by Peregrine Prolix* (Philadelphia: Grigg and Elliot, 1836).

Reading 2

Reading 2 was compiled from Anna Coxe Toogood, "Historic Resource Study for Allegheny Portage Railroad National Historic Site," National Park Service, 1973; William Bender, "The Evolution, Decadence and Abandonment of the Allegheny Portage Railroad" in *The Pennsylvania Railroad Men's News*, September & October, 1897; and Donald Sayenga, "Roebling's First Rope" and "Roebling's Second Rope" in Wire Rope News, March & April, 1982.

Reading 3

Reading 3 was excerpted from Anna Coxe Toogood, "Historic Resource Study for Allegheny Portage Railroad National Historic Site," National Park Service, 1973.

Additional Resources

By looking at the *Allegheny Portage Railroad,* students can more easily understand the development of transportation technology in the 19th century, the innovative ways of overcoming the limitations of topography, and the effects that technological change can have on a community. Those interested in learning more will find that the Internet offers a variety of materials.

Allegheny Portage Railroad National Historic Site
Allegheny Portage Railroad National Historic Site is a unit of the National Park System. The park's web pages include information on nearby historic sites related to industrial development in southwestern Pennsylvania. Also included are sections on the history of the area, photographs, descriptions, and materials for teachers. Go to the expanded web page and click on APRR to examine sections on related transportation history, canals, the 1800s, and more.

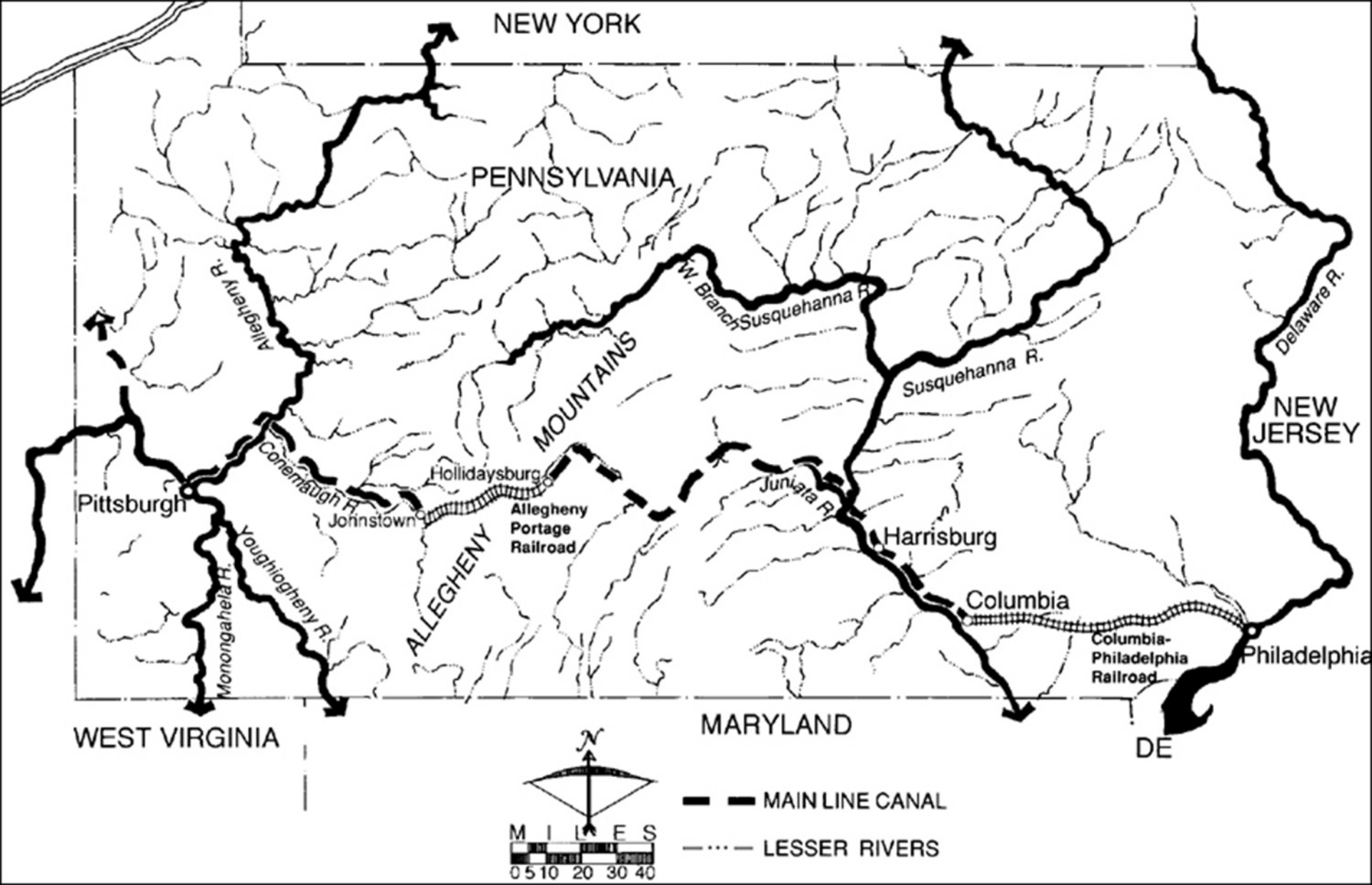
Museums and Historical Societies
Railroad Museum of Pennsylvania
The Railroad Museum houses one of the most significant collections of historic railroad artifacts in the world. Visit their website for a virtual tour of the museum. Go to the Links page for links to teaching resources, other railroad museums, and historical societies.

Smithsonian Institution: National Museum of American History
Visit the Smithsonian's America on the Move website for the history of transportation in America including railroads.

Ontario and Western Railway Historical Society
What began as the New York & Oswego Midland Railroad in 1868 later became the New York Ontario and Western Railway. Their web page features short articles with photographs on the history of this railway, as well as links to other historic railway lines.

Library of Congress
American Railway Maps, 1828-1900
View the Library of Congress collection of Railway Maps by searching with keywords or browsing by geographical location. On the home page, scroll down to links on the "History of Railroads and Maps," "Related Resources" and "Learn More About It!"

Built in America: Historic American Buildings Survey/Historic American Engineering Record.
Search the HABS/HAER database using keywords such as Allegheny Portage Railroad to discover resources such historical photographs and architectural drawings of the bridges, tunnels, and inclines related to the Allegheny Portage Railroad.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PENNSYLVANIA
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Delaware R.
MOUNTAINS
Susquehanna R.
NEW JERSEY
Conemaugh R.
Hollidaysburg
Juniata R.
Pittsburgh
Johnstown
Allegheny Portage Railroad
ALLEGHENY
Harrisburg
Youghiogheny R.
Monongahela R.
Columbia
Columbia-Philadelphia Railroad
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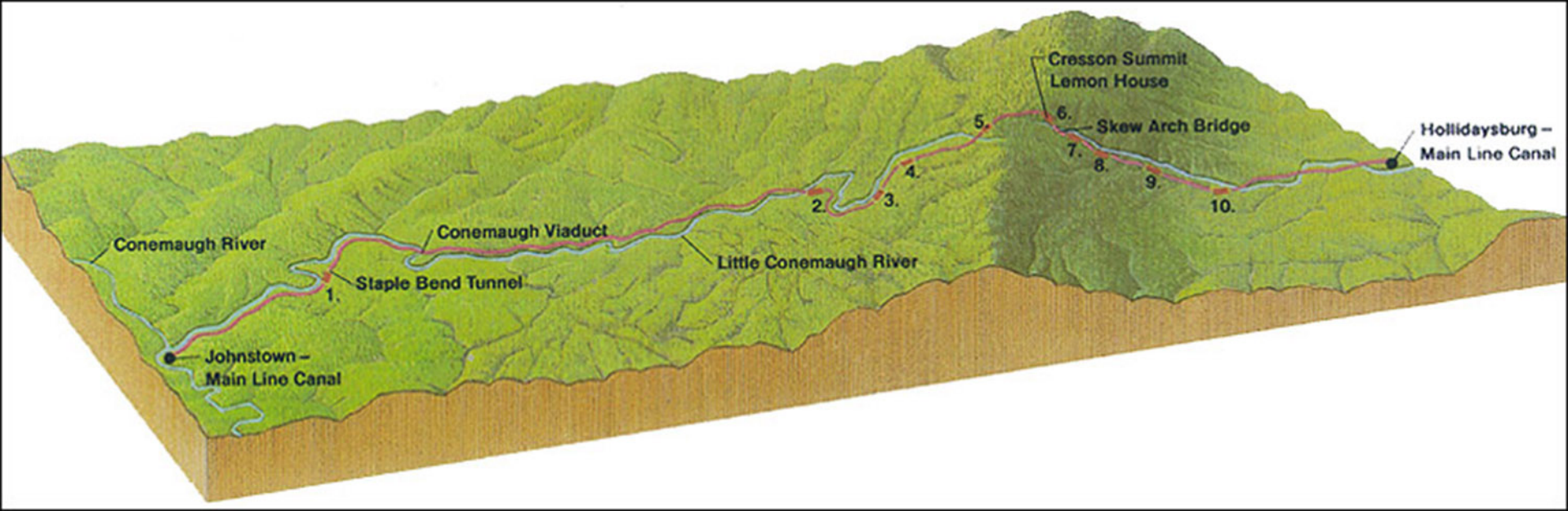
Cresson Summit
Lemon House
6.
Skew Arch Bridge
5.
7.
8.
9.
10.
Hollidaysburg –
Main Line Canal
4.
3.
2.
Conemaugh Viaduct
Little Conemaugh River
Conemaugh River
Staple Bend Tunnel
1.
Johnstown –
Main Line Canal