

**Time Frame**  
5-6 class periods

## Key Words

Crossties  
Forest products  
Technology

## Teacher Pages

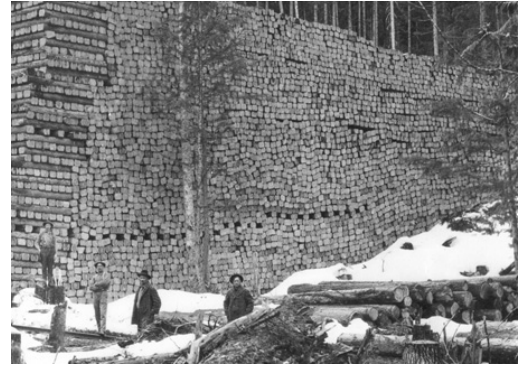
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## OVERVIEW

**Fueling the Fires** has students examine the role wood played in the American Industrial Revolution. By calculating how much wood was consumed by U.S. railroads before and after the invention of wood preservatives, in addition to reading about the use of barbed wire for fencing, students will observe the connection between technology and forest conservation. Students also will learn how research and development have contributed to the diverse use of forest products in everyday household items.



Railroads consumed vast quantities of wood. Crossties were hued and sawn by the millions. *British Columbia Forest Service Photo.*

## OBJECTIVES

### National Council for History

- The student understands the connections among industrialization, the advent of the modern corporation and material well-being. (*Era 6: The Development of Industrial United States, Standard 1A*)
- The student understands the effects of rapid industrialization on the environment. (*Era 6: The Development of Industrial United States, Standard 1D*)

### National Standards for Social Studies

- The student will analyze the role that supply and demand, prices, incentives, and profits play in determining what is produced and distributed in a competitive market system. (*Standard 7b: Production, Distribution & Consumption*)
- The student will show through specific example how science and technology have changed people's perceptions of the social and natural world, such as in their relationship to the lands, animal life, family life, and economic needs, wants and security. (*Standard 8b: Science, Technology, & Society*)

## LESSON PLAN

### Day 1

Set the stage for this activity by leading a group discussion answering the following questions:

1. What role did wood play in the American Industrial Revolution?
2. How can technology help conserve the environment?
3. Name two products derived from the forest 150 years ago. Name two products derived from the forest present-day.

Assign Worksheet 1 (**Student Page 8**) and Worksheet 2 (**Student Page 9**) and have students read the Essay (**Pages 1-7**) in order to answer the questions.

### Day 2

Distribute Worksheet 3 (**Student Page 10**), "Notes" (**Student Page 11**), and "Photos" (**Student Page 12**). The Photos page was created to look like an authentic piece of evidence (written by hand, fragments, and human errors such as a misspelling and a cross-out) so students would be exposed to the difficulties involved in examining historical sources. *Optional: Worksheet 3 describes the contents of a box that has been found. Instead of merely handing out the contents (Notes and Photos), you could place these pages in a box to make the activity seem more realistic.* Read aloud the **scenario, problems, and assignment** described on Worksheet 3 to familiarize the students with their work for the day. For this assignment students are asked to create a short television program describing the role wood played in the American Industrial Revolution. You might want to suggest some possibilities for completing the assignment such as a news report, documentary, interview, short movie, or even a music video. Additionally, allow students some flexibility when deciding how to create their program. For instance, some students may want to tape their show on a camcorder, others may choose to design a PowerPoint presentation, or some could act in a short movie or pretend to be news anchors. Depending upon the length of your class periods, this activity probably will run for 2 days (the first involving completion of the chart on Worksheet 3 and preparation of the television program and the second will allow time for each group of students to perform their program for the class).

### Day 3

Distribute "The Railroad and the Tie" (**Student Page 13**). Ask for a volunteer to read Part I aloud to the class. If the students have no questions, move onto Part II. Before arranging students into groups to begin the activity, carefully explain the sample graph provided on "The Railroad and the Tie." Remind students that when graphing they need to label the "x" and "y" axes, provide a title for the graph, and make sure to use equal intervals when drawing a graph (for example, the sample graph used intervals of 10 years and 10,000 miles of track). Instruct students that not all line graphs will include a point for each interval. So, even if they have 7 years on their graph, for instance, they might only have data that corresponds to 5 of the years shown on their graph. Divide students into groups and distribute Worksheet 4 (**Student Page 14**).

Allow students 20-25 minutes to draw their 2 graphs and answer the questions from Part IV of "The Railroad and the Tie." Place a completed version of Worksheet 4 on an overhead projection to allow students the opportunity to check the accuracy of their 2 graphs. Ask a volunteer from each group to place the answers to the 3 questions from Part IV on the board. Go over the answers for each question so that students understand any errors they may have made.

### Day 4

**Pre-class preparation:** Look at (**Teacher Page 6**), entitled "Object Cards." Place the items listed on the cards in five separate numbered containers or boxes. For example, box one should contain a packet of instant hot chocolate, a small package of tissues, and a container of glue. Make sure that the boxes or containers have lids so that students cannot see the objects until they are instructed to do so. Cut out the five "object cards," but do not place them in the corresponding boxes at this time.

At the beginning of class, divide students into 5 groups. Distribute one box to each group. Inform students that each of the items contained in their boxes are related somehow – allow students 5 minutes to hypothesize about the possible connection and instruct them not to show any of their items to anyone outside of their group! After 5 minutes, inform students that the connection between the objects is that they all come from trees; quickly review the vocabulary from Worksheet 1 that relates to this topic (resin, terpene, and cellulose) before proceeding any further.

Distribute the corresponding “object cards” and Worksheet 5 (**Student Page 15**). Instruct students that the cards contain additional information about each of their objects and the game they soon will play. Read the directions together on Worksheet 5 and allow the groups 15 minutes to complete the worksheet. Ask each group to come to the front of the room to play the “It Comes From A Tree” game – award the winning group a prize. Once the game has been completed assign students the following **homework assignment**:

Ask students to keep a week-long inventory of household items derived from trees that they and their family use on an everyday basis. The list should contain 15 items, but should not include any of the specific items already discussed in class. Instruct students that one way to discern if a product comes from a tree is by reading its ingredients. Write the following tree derivatives on the board or an overhead sheet for students to copy: cellulose (or any form of cellulose such as cellulose powder, gum, or methylcellulose); eucalyptus; cedar oil; pulp; balsam; lemon peel; citric acid; carnauba; resin; camphor; esters; cocoa butter. Warn students that even though many household items contain one or more of the above derivatives, some products, most especially household cleaners like Windex and Palmolive, do not always reflect this information on the label. Encourage students to use “Goods from the Woods” and “Products from the Woods” from the [Links](#) section if they need help completing their inventory. At the end of the assignment ask students to share a few of the items from their list with the rest of the class.

### Sample inventory of household items derived from trees.

Item	Tree Derivative	Item	Tree Derivative
Body Beautiful liquid soap	Citric acid	Krispy Creme donuts	Cellulose gum
Colgate toothpaste	Cellulose gum	Kraft cheese	Cellulose powder
Edge shaving gel	Fatty acid esters and palmitic acid	Advil Allergy Sinus	Carnauba wax and microcrystalline cellulose
Pine Sol (plastic bottle)	Resin	One A Day Vitamins	Cellulose and resin
Grey Poupon mustard	Apple cider vinegar and cellulose	Sea Breeze Astringent	Camphor and eucalyptus globulus oil
Nestle chocolate chips	Cocoa butter	Listerine mouthwash	Eucalyptol
Maybelline nail polish	Nitrocellulose and camphor	Garnier Shampoo	Apple extract and lemon peel

## Day 5

Choose from one of three types of activity assessments.

Application and Integration Exercise (Teacher Page 7)

Test (Teacher Page 8)

Reflective Exercise (Teacher Page 9)

Use the Answer Key to check answers (Pages 10-15)

## CLASS EXTENSIONS

- Have students research the history of a railroad company in their local area or state. Ask students to focus on how this company used wood in its operations during the nineteenth and early twentieth centuries. As a follow-up, invite an employee from this company (if still in existence), or another railroad company, to speak to the class about the role wood plays in their modern operations.
- Students learned in this activity how technology helped preserve American forests through inventions that curbed wasteful use of wood. In order to test students' understanding of this phenomenon, stage a competition in which students are asked to design an invention that would help preserve trees or improve a modern practice involving the use of a forest product.
- Have students research the development and location of railroad lines in their state, including the major starting and ending points, the dates on which construction both began and ended, and the reasons behind the choice of the locations for the lines. Additionally, ask students to identify the products transported by the railroads in their state during the late nineteenth and early twentieth century. Finally, have students make a list of the products no longer carried by railroads and ask them to speculate as to why these products are not transported today.

## TEAM TEACHING POSSIBILITIES

**Technology:** Instead of having students compose graphs for Worksheet 4 on the sheet provided, ask students to create their graphs in Microsoft Excel or similar software.

**English:** Worksheet 3 asks students to create a 5-minute television broadcast about the role wood played in the American Industrial Revolution. As an additional component of this exercise, have students write a script for the broadcast outlining the important topics and issues.

**Math:** Since Worksheet 4 incorporates math skills, this exercise could be introduced in a social studies class and completed in a math class. Alternatively, math teachers could build on the exercise by having students compose more complex graphs and answer questions that test understanding of the information conveyed by the graphs.

**Science:** Using the essay and Worksheet 5 as a guide, ask students to compose a list of wood derivatives (cellulose and resin, for example). Assign students one or two derivatives and ask them to research its physical and/or chemical composition and explain the process of how this material is used in the production of everyday household objects.

## LINKS

**Forest History Society**--Bibliographic resources on forestry, conservation and environmental history. <http://www.foresthistory.org>

**North Carolina Forestry Association** – “Goods from the Woods” contains information on forest products.

<http://www.ncforestry.org/docs/Products/goods.htm>

**The Library of Congress (American Memory)** – Extensive collection of railroad maps from 1828-1900.

<http://memory.loc.gov/ammem/gmdhtml/rrhtml/rrhome.html>

**Railway Tie Association** – Publications and links about the history of railway ties.

<http://www.rta.org/>

**Forest Products Laboratory** – Detailed reference source for forest products.

<http://www.fpl.fs.fed.us/>

**Products Made From Wood** – Extensive list of products derived from trees. (pdf file)

<http://forestry2.ca.uky.edu/conners/WoodUses.pdf>

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Olson, Sherry. *The Depletion Myth: A History of Railroad Use of Timber*. Cambridge, Massachusetts: Harvard University Press, 1971.

Williams, Michael. *Americans and Their Forests: A Historical Geography*. New York: Cambridge University Press, 1989.

## Object Cards (Worksheet 5)

### **Card #1**

#### **\*Instant hot chocolate**

Contains thickening and preserving agent cellulose or methylcellulose, the building block of wood.

Forbidden words: *drink, marshmallows, winter*

#### **\*Tissues**

Papers (tissues, paper towels, newspaper, etc.) are made from wood pulp, which often come from branches of large trees or stumps of smaller trees.

Forbidden words: *nose, blow, cold*

#### **\*Glue**

Glue and adhesives can be made from hard resins or gums, which are found in the sap of some trees.

Forbidden words: *sticky, white, Elmer's*

### **Card #2**

#### **\*Spearmint Chewing Gum**

Artificial flavoring for gum such as spearmint comes from terpenes (a group of pine derivatives).

Forbidden words: *bubbles, chew, crack*

#### **\*Soft drinks**

Some citrus drinks contain esters, a tree derivative used to enhance the flavor of soda. Sports drinks and orange-flavored soda often contain wood resin and liquid terpenes from the stumps of pine trees.

Forbidden words: *soda, Coke, carbonated*

#### **\*Soap**

Many soaps and detergents are made from fatty acids derived from wood. Some gums that are found in the sap of trees contain antiseptic qualities and are therefore used to make soap.

Forbidden words: *clean, shower or bath, dirt*

### **Card #3**

#### **\*Lotion**

Lotions that contain Vitamins A and E, often come from wood extracts that are formed during the process of making paper.

Forbidden words: *dry, moisturize, scented*

#### **\*Crayon**

Carnauba wax, a resin produced by the leaves of the carnauba tree, gives crayons a waxy component.

Forbidden words: *Crayola, color, draw*

#### **\*Toothpaste**

Terpene, a wood derivative, often is used to add to the spearmint or peppermint flavors of toothpaste. Cellulose also can be found in some toothpastes.

Forbidden words: *teeth, toothbrush, clean*

### **Card #4**

#### **\*Liquid Cleaners**

Pine stumps contain resins and terpenes used in making many lemon-scented liquid cleaners.

Forbidden words: *clean, polish, Pledge*

#### **\*Cinnamon**

Many cooking spices come from trees. Cinnamon comes from the bark of laurel trees.

Forbidden: *spice, French toast, gum*

#### **\*Maple syrup**

A sweet syrup that comes from the sap of the sugar maple.

Forbidden words: *French toast and pancakes, breakfast, sap*

### **Card #5**

#### **\*Hair spray**

Hair spray, and many other adhesives, often come from tree resins, or sticky substances that harden when exposed to air.

Forbidden words: *hold, sticky, stiff*

#### **\*Sandwich bag**

Cellophane (the material used for sandwich bags) comes from wood during the pulping process used to make paper.

Forbidden words: *snacks, plastic, Ziploc*

#### **\*Aspirin**

The bark of the willow tree provides ingredients for aspirin. The bark of other trees also contributes to some cancer-fighting drugs.

Forbidden words: *swallow, pills, white*

## ASSESSMENT 1: APPLICATION & INTEGRATION

In 1887, M.G. Kern, an agent for the U.S. Forestry Division wrote the following statement:

“Considering the stupendous amounts of timber already withdrawn from native forests, the annual demands of railways now in operation, and the increase in mileage from year to year, it becomes necessary to take a more accurate survey of the fields of demand and supply, unbiased by the popular delusion of the inexhaustible forest wealth of America. The necessity is no longer to be ignored or lightly treated as in the past.”

### **Assignment:**

The year is 1900 and you have been assigned the task of writing a press release (an announcement of a newsworthy event that is issued to the press for release to the public) defending the position taken by M.G. Kern. In order to strengthen your case, answer the questions below before you begin your assignment.

1. What is the main idea of M.G. Kern’s statement?
2. List and explain five ways that railroads came to rely upon American forests during the nineteenth century.
3. Name two suggestions made to combat the problem of forest depletion during the nineteenth century.
4. Provide two examples of how technology helped ease the strain placed on the environment by American industrialization during the latter-half of the nineteenth century.
5. How did the economic principles of supply and demand affect the role wood played in the American Industrial Revolution?

Using the answers to the above questions, draft a one-page press release defending the position taken by M.G. Kern. Make sure to include facts and specific evidence to strengthen your case.

## ASSESSMENT 2: TEST

1. Describe some of the uses for wood before the American Industrial Revolution.
2. Explain the relationship between crossties and concerns regarding forest depletion.
3. What were some of the technological advances during the nineteenth and twentieth centuries that helped conserve trees? What factors sparked these innovations?
4. Explain the impact railroads had on American forests during the nineteenth and early twentieth centuries.
5. Explain the impact railroads had on American society during the nineteenth and early twentieth centuries.
6. Provide two examples of materials extracted from trees in the production of common household items. Name two items in either your classroom or home that are derived from trees.
7. How did steamboats utilize wood during the nineteenth century?
8. Explain the significance of wood in the American Industrial Revolution.



## ASSESSMENT 3: REFLECTIVE EXERCISE

Write an essay analyzing the role wood played in the American Industrial Revolution.

### **Fueling the Fires**

*Use the notes below to help you write a cohesive essay.*

#### **Paragraph 1: Take a stance.**

Did wood play a significant role in the American Industrial Revolution? Why or why not?

#### **Body: Provide evidence to support your argument.**

Use each of the categories listed below to support your stance taken in Paragraph 1.

1. Railroads and crossties
2. Steamboats
3. Technology
4. U.S. population
5. Supply and demand

#### **Last Paragraph: Conclusion.**

1. Restate your stance. Summarize your proof. State the long-term consequences of your argument on society.

## TEACHER'S ANSWER KEY

### Worksheet 1: Keywords

#### Across

1. Considered the basic building block of wood. **Cellulose**
3. The **railroad** drastically changed the perception of time, space, and distance in America.
6. The Industrial **Revolution** was a period in American history marked by rapid industrialization, vast technological improvements and increased urbanization.
8. A framework consisting of vertical, slanted supports and horizontal crosspieces supporting a bridge.

#### Trestle

11. **Forest** products come from the renewable resource of trees.
12. Amount of goods that people are ready to buy for a given price. **Demand**
13. A beam or rod, typically made of wood, that supports and connects the rails of a railroad track.

#### Crosstie

14. Amount of goods available for meeting a demand or for purchase at a given price. **Supply**

#### Down

2. Until the growth of railroads after the Civil War, **steamboats** transported most people and goods in the U.S.
4. **Barbed** wire helped shape life in the American West by greatly reducing the number of trees used for wooden fence posts.
5. A cone-bearing tree, often evergreen. **Conifer**
7. New **technology**, most specifically the chemical treatment of wood, helped reduce the amount of wood used by American railroads.
9. Sticky material found in many trees and plants that hardens when exposed to air. **Resin**
10. Compound derived from the oils of plants and trees. **Terpene**

### Worksheet 2: Essay Analysis

1. List three common uses for wood in America before the advent of the Industrial Revolution.  
**a. Building houses; b. Cooking meals; c. Heating homes and other buildings (three possible answers) Other answers include, wood was used for tools, transportation (boats and horse carriages, for instance), and furniture.**
2. Describe how the rapid increase in the population of the United States during the latter half of the nineteenth century affected American forests.  
**Extensive forestland was cleared to make room for the increased population in the United States during the late nineteenth century. In urban areas with swelling populations, vast amounts of wood were used to fuel the fires of industrialization and in rural areas, many people cleared forests to farm. The increased number of people living in the United States resulted in great demands placed on American forests.**
3. How did steamboats place strain on American forests during the nineteenth century?  
**By 1850, over 700 steamboats were transporting goods to and from major American ports. Besides typically being constructed of wood, steamboats consumed large amounts of fuelwood on a daily basis.**

4. What role did the economic principles of supply and demand play in the amount of wood used during the American Industrial Revolution?

**Because wood was relatively cheap for much of the nineteenth century, due to its plentiful supply, the majority of people and companies saw no reason to look for ways to increase the life of wooden products such as crossties. However, by the late nineteenth century and into the twentieth century, the supply of wood decreased in the East leading to an increase in the price of the product. Furthermore, since the demand for wood was high across the country, especially in areas having limited access to the resource such as the plains and prairies, the cost of wood continued to rise. Because of the steadily rising cost of wood, American railroad companies (among others) began to implement measures to increase the durability and average life span of the wooden products they used in their operations.**

5. Provide two examples of how technology helped conserve trees during the nineteenth and twentieth centuries. Supply evidence to support your two examples.

**One example of how technology helped conserve trees was the chemical treatment of crossties. Before the evolution of chemical treatments, crossties typically lasted between 5 and 7 years; the addition of preservatives increased the life span to between 30 and 40 years. The chemical treatment of crossties therefore decreased the amount of trees used by American railroads. Another example of how technology helped conserve trees was the invention of barbed wire. Instead of using wood for fences, many Westerners used barbed wire to fence in their animals and prevent open grazing, thereby decreasing the number of trees cut down for this purpose.**

6. Explain how the nickname “iron road,” could be considered a misleading description of nineteenth-century American railroads.

**Despite the fact that railroad tracks were forged of iron, railroads used more wood than any other resource. For instance, station houses, bridges and trestles, railroad cars, and telegraph poles normally were constructed of wood during the nineteenth century. The most significant way that railroads relied upon wood was in the construction and replacement of wooden crossties – the average mile of track required over 2,500 crossties.**

7. Compare and contrast forest products of the past in the United States with modern goods derived from trees.

**In the past, Americans used wood to build homes, fences and furniture, and for recreational equipment such as baseball bats and jigsaw puzzles. Early Americans also used wood to cook food and heat their homes and enjoyed the consumable components of trees like nuts, fruit, and maple syrup (to name just a few). In modern times, although much furniture and some sporting equipment is constructed of wood, research and development has led to more diverse uses for forest products. Many everyday items such as toothpaste, shampoo, and liquid cleaners, often contain derivatives of trees.**

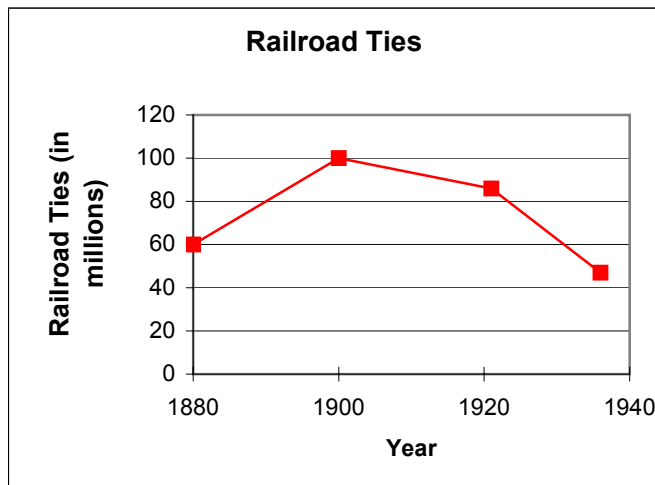
### Worksheet 3: Wood Keeps the Fires Burning

Answers will vary but below are examples of some acceptable responses.

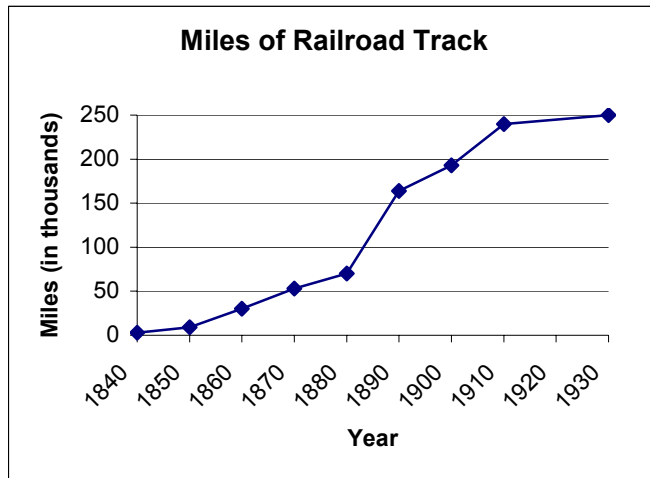
FACT	CONCLUSION
Photo 1 shows a bridge and trestle that contains over 1 million feet of timber. The notes state that wood was the primary material in most bridges of the 19 <sup>th</sup> century and early 20 <sup>th</sup> century.	Most bridges of the time period were constructed of wood.
In the notes it states that, "was not until 1905 that railroad passenger cars were made of steel." The notes also state that even though railroads were called the "iron road," for most of the 19 <sup>th</sup> century only train engines and rails were made of iron.	Before 1905 railroad cars most likely were made of wood.
The notes state that by the late nineteenth century railroads accounted for between 20 and 25 percent of the total lumber consumption in the U.S.	American railroads needed a substantial amount of wood to operate during the late 19 <sup>th</sup> century.
Lumber production increased 8 times between 1850 and 1910 and the mileage of U.S. railroads increased 30 times during the same period.	During the Industrial revolution there was an increased demand for wood.

### Worksheet 4: Using a Line to Graph History

Graph #1: Railroad Crossties



Graph #2: Miles of Railroad Tracks



Graph Questions

1. In the 10-year period between 1900 and 1910, how many new miles of track were built? How many cross ties were installed for the tracks built between 1880 and 1940? **Between 1900 and 1910, 47,000 miles of railroad track were built and 293 million cross ties were installed between 1880 and 1940.**
2. In what 10-year period between 1840 and 1930 was the rate of mile of track installed the greatest? **The rate of mile of track installed was the greatest between 1880 and 1890.**
3. Over time did the miles of railroad track built increase or decrease? Over time did the number of cross ties installed increase or decrease? How do you explain the discrepancy? **Even though the miles of railroad track built increased during the late eighteenth century and into the early twentieth century (due to America's expanding economy and continued industrialization) the number of cross ties installed during this same period decreased. The reason for the decrease can be explained by the fact that beginning in the early years of the 20<sup>th</sup> century, the majority of cross ties were being treated with chemical preservatives—the treatment increased the life of the average cross tie, thereby substantially decreasing the number installed each year.**

**Worksheet 5: It Comes from a Tree**

Answers will vary, but below are examples of acceptable responses from each of the 5 object cards.

Name of Object	Connection to Forest	Descriptive Words or Phrases
Instant hot chocolate	Contains cellulose, the building block of wood.	- Good to have when it is cold - Tastes good after playing in the snow
Spearmint chewing gum	The spearmint flavor of chewing gum comes from terpenes, an organic compound derived from the essential oils of plants and trees.	- Makes your mouth feel fresh and clean - Some come with comics, others with trading cards

Lotion	Wood extracts formed during the paper making process often are found in lotions that contain Vitamins A and E.	- Makes your skin feel good - Many types including some that help prevent sunburns
Liquid cleaners	Lemon-scented liquid cleaners often contain resins and terpenes that come from the stumps of pine trees.	- When floors, counters, or tables are dirty, this helps make them look good again - Sometimes smells like lemon
Hair spray	Tree resins, sticky substances that harden when exposed to air, can be found in hair spray.	- Some types of this product have been found to cause damage to ozone - aerosol

### Assessment 1: Test

1. Describe some of the uses for wood before the American Industrial Revolution.

**Before the American Industrial Revolution wood was used to construct houses (and other buildings), fences, furniture, roads, bridges, and carriages. Wood also was used to heat homes and cook food. Finally, wood was used in the smelting of iron throughout the eighteenth and into the nineteenth centuries.**

2. Explain the relationship between crossties and concerns regarding forest depletion.

**When the supply of timber seemed plentiful railroad companies did not need to find methods to make wooden crossties last longer. However, concerns about forest depletion, due to the fact that railroads and other industrial segments consumed so much wood, prompted research and development regarding the possibility of increasing the average life span of the crosstie. By the early twentieth century the majority of wooden crossties were treated with preservatives, thus reducing the number of trees needed by railroad companies for their operations.**

3. What were some of the technological advances during the nineteenth and twentieth centuries that helped conserve trees?

**One of the most significant technological advancements that helped conserve trees was the chemical treatment of wooden crossties used by railroads. Whereas untreated crossties normally lasted between 5 and 7 years, chemically treated ones usually last between 30 and 40 years. Preservatives injected into wood used for fence posts also helped conserve trees because it took much longer for the posts to deteriorate. Finally, the invention of barbed wire for fencing drastically reduced the number of wooden fences constructed in the U.S., thereby helping to conserve trees.**

4. Explain the impact railroads had on American forests during the nineteenth and early twentieth centuries.

**American railroads used wood for many purposes during the nineteenth and early twentieth centuries. Although it was nicknamed the "iron road," railroad companies used wood in the construction of station houses, telegraph poles, railroad cars, bridges and trestles, and fences. However, the most prevalent use of wood by railroads could be found in the crosstie. On average, every mile of track required over 2,500 crossties. Hence, American railroads, because of their extensive use of wood, placed considerable strain on U.S. forests.**

5. Explain the impact railroads had on American society during the nineteenth and early twentieth centuries.

**Railroads had a significant impact on American society. First, railroads altered people's perceptions of time, space, and distance. People could travel places on railroads that they previously believed inaccessible. Moreover, the amount of time necessary to travel from one point to another drastically dropped. Second, railroad construction (mainly the transcontinental railroad) helped unite a growing country. Railroads facilitated the formation of political and commercial networks between regions of the nation and the ability to disseminate goods and information in a timely manner further united the American public.**

6. Provide two examples of materials extracted from trees in the production of common household items. Name two items in either your classroom or home that are derived from trees.

**Cellulose, the building block of wood, and resin, a sticky substance that hardens when exposed to air, are two examples of materials extracted from trees in the production of everyday household objects. Hair spray (containing resins) and toothpaste (sometimes contains resins and/or cellulose) contain materials extracted from trees.**

7. How did steamboats utilize wood during the nineteenth century?

**During the nineteenth century, steamboats remained an important form of transportation in the United States. Typically constructed of wood, steamboats also used wood as fuel for much of the century because of its plentiful supply and relatively low cost. Steamboats often stopped twice daily at wooding stations (small, unauthorized stations where people cleared forestland they did not own) in order to buy wood for fuel.**

8. Explain the significance of wood in the American Industrial Revolution.

**Although often overlooked, wood played a significant role in the American Industrial Revolution. Wooden steamboats transported goods to and from commercial ports, and railroads, despite being called the "iron road," relied heavily upon wood. Besides using wood in the construction of railroad cars, station houses, telegraph poles, and bridges and trestles, railroad companies needed large quantities of wood for crossties. All in all, it is fair to say that wood fueled the fires of industrialization.**