

Time Frame

4 Class periods +
Library Research +
Class Presentations

Key Words

Timber Management
Research
Gum Naval Stores
Wood Preservative
Research
Watershed Research
Recycle Research

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OVERVIEW – Teacher Pages

Forest Research and It's Benefits

has students examine forest sustainability and the research conducted to help us utilize resource while managing forestlands in a sustainable manner. Students will learn about key forest research conducted since the early 1900s, as well as learning about key researchers.



Image 1: Forest Researcher measuring the growth of pine tree in the lab.

OBJECTIVES

National Council for History

The student engages in historical analysis and interpretation; Hypothesizing the influence of the past. (*Historical Thinking, Standard: 3J*)

Students examine economic, social, and cultural developments in contemporary United State. (*U.S. History - Era 10, Standard 2*)

The student will utilize visual and mathematical data presented in charts. (*Historical Comprehension, Standard 2*)

National Standards for Social Studies

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*)

National Geography Standards

G5 Environment and Society – The student will explain that the physical environment is modified by human activities which are influenced by the ways in which human societies value and use Earth's natural resources, and by Earth's physical features and processes.

LESSON PLAN

Teacher Preparation - Download and print Module 11 using Adobe Acrobat.

Day 1 activity: Make copies of the Essay (Student Pages 1-8) for each student in your classroom. Make copies of Worksheet 1 (Student Page 9) and Worksheet 2 (Student Page 10) for each student.

Day 2 activity: Make copies of Eloise Gerry, Carlos Bates, Bruce Zobel, Malcolm Furniss, Jerry Franklin and Kent Kirk biographies (Student Pages 11-22) for each student in the class. Make 6 copies of Worksheet 3 (Student Page 23) for each group or individual student (depending on how you would like to do the activity).

Day 3 activity: Make copies of the Assessment you have chosen to use.

Day 1

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

- What resources/products do we use that come from forests?
- Should you be concerned about using natural resources from our forests?
- What is Forest Research?
- What things do you think researchers study in our forests?
- Why do you think forest research is important?
- What improvements in wood products do you think we could use today?

Now read the essay, "Forest Research & Development History" (Student Pages 1-8) together as a class (silently at desk or out loud). **Assign:** Worksheet 1 (Student Page 9) and Worksheet 2 (Student Page 10)

Day 2

Discuss: "What made them who they were/are?" Worksheet 3: Follow Teacher Instructions (Teacher Pages 5-6)

Assign: Gerry, Bates, Zobel, Furniss, Franklin & Kirk Biographies & Worksheet 3 (Student Pages 11-23)

Day 3

Discuss: Personality traits of the researchers. Complete "Personality Trait Tally Sheet." (Teacher Page 6)

Day 4

Choose from one of three types of activity assessments.

- Application and Integration Exercise (Student Page 24)
- Test (Student Pages 25-26)
- Reflective Exercise (Teacher Page 7 (Teacher Instructions); Student Page 27-29)

Use the Answer Key to check answers (Teacher Pages 8-13)

CLASS EXTENSIONS

- Arrange a field trip to visit an experimental forest or range near you to view current research, participate in hands-on activities, etc. <http://www.fs.fed.us/research/efr/efr-sites/index.shtml>.
- Invite a Forest Researcher into your classroom to discuss their job and current research activities being conducted in your area.

Team Teaching Possibilities

Technology: Create graphs from survey data collect in Assessment 3

English: Complete Worksheet 1. Or discuss what a biography is and teach students how to be a biographer. Discuss with the students what kinds of information are needed to have a complete biography: name or names, place and date of birth, family, places lived, hobbies, occupations, significant incidents in his/her life, and what made him/her famous, etc. Use examples from Activity 2 to help in this discussion. Possibly have students use these questions to become a biographer (in groups or individually), by writing a biography on other teachers in the school or on a parent/grandparent at home.

Math: Have students go to or call a local Recycling Center and find information to answer the following questions. How many aluminum cans need to be recycled to power a TV for an hour? How many hours are there in a year? With these two figures determine the number of aluminum cans needed to be recycled in order to power a TV for a year. You could contact the local recycling center or electric company to find out enough facts to create a worksheet with numerous questions based on discovered facts. Determining the number of cans needed to run the lights in the school for day, the number of pieces of paper or pounds of paper needed to be recycled to create a new ream of recycled paper, etc.

Science: Look into research projects currently underway today at the Forest Products Laboratory - Research in Progress, <http://www.fpl.fs.fed.us/documnts/rips/>.

Create your own research project such as, creating a compost pile with your students in the fall and planting a small schoolyard garden in the spring. You could use compost on half of the garden and potting soil on the other half. Then see which part of the garden does better. Some places to look for information on composting: <http://www.epa.gov/epawaste/conserva/rrr/composting/index.htm>, http://www.dep.state.pa.us/dep/deputate/enved/Rec_Lessons/compost.htm, and http://journeytoforever.org/edu_compost.html.

LINKS

Forest History Society--Bibliographic resources on forest product research and environmental history <http://www.foresthistory.org/Research/Biblio.html>. Ordering Resource for: *American Forests: A History of Resiliency & Recovery*, *The Greatest Good* film <http://www.foresthistory.org/Publications/>.

PaperRecycles.org teamed up with **Scholastic** to offer suggestions and ideas for teachers to get there students involved in recycling efforts <http://teacher.scholastic.com/lessonplans/recycling/>.

Paper University: <http://www.tappi.org/paperu> - teaches kids all about paper, use, production.

USDA Forest Service Southern Research Station, Especially for Kids: contains various activities for students to learn more about forests and forest research. <http://www.srs.fs.usda.gov/kids/index.html>.

Forest Products and Technology Lesson Plan (LEAF Lesson Plan) – Students will learn about the workdone at the Forest Product Lab by acting as wood scientists. <http://www.uwsp.edu/cnr/Leaf/Adobe/Resource/Change/LESSON9S.pdf>.

The Natural Inquirer – “Facts to the Future Edition,” March 2004. The articles in this Natural Inquirer include just a few of the renewable natural resources studied by USDA Forest Service scientists. <http://www.naturalinquirer.usda.gov/pdf/7.pdf>.

Forest Products Laboratory, “Greatest Hits” – highlights some of the many technologies discovered at the Forest Products Laboratory. http://www.fpl.fs.fed.us/resources-products/research-highlights/greatest_hits.pdf.

REFERENCES

Aldrich, Mark. "From Forest Conservation to Market Preservation: Invention and Diffusion of Wood-Preserving Technology, 1880-1939." *Technology and Culture* 47, no. 2 (April 1, 2006): 311-340.

Zerbe, John & Green, Phyllis. *Extending the Forest Resource: 90 Years of Progress at the Forest Products Laboratory*. Forest History Today, Fall 1999.

<http://www.answers.com/topic/federal-water-pollution-control-act-1948>. June 28, 2007. (House Report no. 1829, to accompany Senate Bill 418, 80th Congress, 2d session, April 28, 1948)

Ice, George G. and Stednick, John D. *Forest Watershed Research in the United State*. Forest History Today, Spring/Fall 2004.

Forest Products Laboratory, Environmental Technologies website.
http://www.fpl.fs.fed.us/research-highlights/init_env.html. (7/2/07).

Recycled Paper, Enzyme Treatment info:
<http://www.fpl.fs.fed.us/documnts/pdf1996/sykes96b.pdf> (7/6/07)

Bornett, David, Carl Houtman, Said Abubakr, and Joseph Peng, *Compatibility of Pressure Sensitive Adhesives With Recycling Unit Operations*. AIChE Symposium Series No. 322, Vol. 95, 1999. <http://www.fpl.fs.fed.us/documnts/pdf1999/borme99a.pdf> (7/6/07)

Davis, Christopher, University of Florida - Developed Paper Recycling Method Could Benefit Forests, Industry, July 28, 2000, <http://news.ufl.edu/2000/07/28/ink/> - 7/11/07

West, Terry. 1991. "Research in the USDA Forest Service: a historians' view." Washington, DC: USDA Forest Service, History Unit. [Unpublished ms.],
www.fs.fed.us/global/wsnew/fs_history/issue16.doc

Scott, Walter E., *Wisconsin Academy review*, p.28 (Spring 1955).
<http://digicoll.library.wisc.edu/cgi-bin/WI/WI-idx?type=turn&entity=WI.v2i2.p0030&isize=M> - viewed 7/17/07

Miller, Regis B. *Xylaria at the Forest Products Laboratory Past, Present, and Future*, 1999.
<http://www2.fpl.fs.fed.us/WoodColl/MADw/xylaria%20at%20fpl.pdf> - 7/17/07

Havlick, David, *Dr. Eloise Gerry, Scientist-Author-Teacher*, Forest History Society, 2004.
<http://foresthistor.org/Research/usfscoll/people/Gerry/Gerry.html>

(Day 2 Activity - Teacher Instructions)

Worksheet 3: What made them who they were/are?

Researchers Studied:

Eloise Gerry – new chipping method
Carlos Bates – watershed research
Bruce J. Zobel – forest genetics
Malcolm M. Furniss – entomology – bark beetle
Jerry F. Franklin – old-growth forest research
T. Kent Kirk – recycling

Teacher Instructions:

Assign students to read the 6 brief biographies of the researchers above (Worksheet 3, **Student pages 11-22**). – You may consider dividing the students into groups and assigning one or two of the biographies to each group; allowing time in class for students to read the biographies.

Discuss: After reading the researcher biographies, lead a general discussion with students about personality traits.

Example questions: What are personality traits, give examples? Do they think some personality traits are necessary for some jobs? What personality traits might be necessary for the researchers they just learned about?

As a class create a list of personality traits and define each trait. For example: **Expertise** (knowledgeable or highly experienced in a particular field)

Pass out Worksheet 3, “What made them who they were/are?” (each student or group should receive the appropriate amount of copies per biography for which they are responsible), using the worksheet, fill out the chart with the top 7 personality traits (8 total traits - the first trait is provided, Expertise) and place them in column one...make sure that the students understand the meaning of each personality trait in column one. When you feel that they have a strong understanding of the terms, give them time to fill out the worksheets. Explain that they should use the information they just learned in the brief biographies to fill out one worksheet for each of the four researchers. (The worksheets can be completed in class or at home dependent on your time frame.)

Next Day: Upon completion of Worksheet 3 (**Student pages 23**), have your students discuss the similarities and differences of each of the six researchers. Use the Personality Tally Sheet (**Teacher Page 6**) to fill in the personality traits chosen by your class and then to mark the personality traits of each researcher (only mark the box if the class comes to a consensus on a particular trait). Do the students agree on the personality traits of each of the researchers? Discuss discrepancies. Are there certain personality traits that all the researchers have in common? What do the students think of this? Which personality trait do they think was most important for the success of each researcher? They learned about one female researcher; did she possess the same number of personality traits as the other researchers? If they found she possessed more, do they think this was necessary to her success? Why or why not? Given the time period in which she was employed, do they think she needed to possess more personality traits to be successful? Do they think female researchers today need to possess more personality traits than males? After completing this activity are there certain personality traits they wish they possessed or they'd like to work to possess? Do they possess certain personality traits that they think would make them a good researcher?

(Day 3 Activity - Teacher Page)

Personality Trait Tally Sheet:

Researcher	Expert							
Gerry, E								
Bates, C								
Zobel, B								
Furniss, M								
Franklin, J								
Kirk, K								

(Assessment 3 - Teacher Instructions)

Assessment 3: Reflective Exercise

Pre-Discussion:

How are we affected by forest research today? We just finished learning about forest research and forest research discoveries. Many of the things we learned about had a great impact on society at the time of the discoveries but does this still impact our lives today? Let's take a look at one example, naval stores.

- What impact do you think the naval stores technological improvements have on us today?
- Were the new chipping methods and addition of sulfuric acid to prolong gum flow really such a major discovery? Why or why not?
- Do you think these technological advances in naval stores techniques impact us today?

Pass out Assessment 3 (**student pages 27-29**). Have the students read over the list of uses of Rosin and Turpentine today. Tell the students they are going to conduct a survey about rosin and turpentine use. Introduce the concept of a survey by discussing:

- What are some of the ways in which we get information from people about a specific subject? (Interviews, surveys, questionnaires, Internet search, etc)
- What is a survey? (A method of gathering information about a specific topic)
- What are some of the reasons for conducting a survey? (Answers will vary but may include learning more about what people like to do, places they like to visit, things they like to eat, things they use, number of people in their family, etc)

Explain to students that they will be conducting a survey to learn how people use rosin and/or turpentine in their daily lives. Students must ask at least 10 people the survey questions and then compile their data into a Histogram. Go over the assessment directions with the students. Explain that a Histogram is a bar graph in which the length of the bar illustrates the number of observations or the frequency of each item.

On the turn in day:

When the students turn in this assessment, once again discuss the questions you asked initially.

- What impact do you think the naval stores technological improvements have on us today?
- Were the new chipping methods and addition of sulfuric acid to prolong gum flow really such a major discovery? Why or why not?
- Do you think these technological advances in naval stores techniques impact us today?
- Were the students surprised to learn about all of the products containing turpentine and rosin?

TEACHER'S ANSWER KEY

Worksheet 1 (Teacher Answers)

Answers will vary for this activity. However, students should use information they learned in the essay to describe forest research.

Worksheet 2 (Teacher Answers)

Sentences provided below and suggested definitions, however, definition answers will vary for this activity.

Environmental concerns

1. **Sentence:** There are numerous **environmental concerns** facing society today and most of them center on ways of maintaining an ecological balance in our world. OR There are numerous **environmental concerns** facing society today and most of them center on ways of maintaining an ecological balance in our world.

2. **Definition:** Problems, struggles, issues, effects of altering the environment in our society

Urban Forests

1. **Sentence:** Some researchers focus on urban forests, product safety and human health, and forest products consumption. OR For example, researchers might analyze the effects of an urban forest on air quality and water quality in the city.

2. **Definition:** Numerous trees, forested park, or forest located in an urban, developed, or city/town area.

Forest Disturbance

1. **Sentence:** These researchers might examine the economic impacts of forest disturbances, such as insect infestations.

2. **Definition:** Something that causes a interference or disruption in a forest therefore causing harm or damage to all or part of the forest ecosystem.

Naval Stores

1. **Sentence:** Research Center in Lake City, Florida, where new techniques for **naval stores** production were developed. Naval stores refer to the storing of products extracted from raw pine gum from living pine trees.

2. **Definition:** Creating and stocking up goods made from the sap/gum of pine trees.

Watershed

1. **Sentence:** Most forest hydrologists attribute the first watershed studies in the U.S. to the Wagon Wheel Gap Project in Colorado, which began in 1909 and ended in 1926. OR Over the last century hundreds of forest watersheds have been monitored and used in watershed studies. (And numerous other options.)

2. **Definition:** Watersheds are areas where people get water. There are numerous watersheds through the U.S. They are natural areas that help store water for later human use/consumption.

Recycling

1. **Sentence:** The U.S. Forest Products Laboratory made significant advances in recycling paper in the late 1960s and again in the 1990s. OR Recycling helps extend the functional life of wood fiber and helps reduce the buildup of waste in landfills. (And numerous other options.)

2. **Definition:** Taking old materials and reusing them to create new products.

Worksheet 3 (Teacher Answers)

Answers may vary for this activity, however, student should be able to show why they feel their answers are correct with examples in their “Behavior that demonstrates this Personality Traits” column. The information below should also offer some assistance.

Researcher	Expert								
Gerry, E	X								
Bates, C	X								
Zobel, B	X								
Furniss, M	X								
Franklin, J	X								
Kirk, K	X								

Person Studied: Eloise Gerry (Example of possible personality traits and possible behavior answers)

Personality Traits:	Behavior that demonstrates this Personality Traits:
Expertise	Gerry had both a bachelors and masters degree. She had experience in wood anatomy and training in the preparation of wood specimens and photomicrographs.
Determination	“Gerry proved to be... determined to contribute greatly to society.”
Diligence	“Gerry proved to be an exceptional scientist, a devoted Forest Service employee...” “it is not her (Gerry’s) habit merely to DO, but always to DO MORE than is normally required or expected.”
Assertiveness	
Resourceful	When Gerry was hired in 1910 the FPL did not have a wood collection. Gerry needed wood samples, so she started collecting samples from expositions and fairs, and then moved to Columbia, MS to study southern pines.
Aptitude	
Nerve	Gerry was a pioneer for female scientist in the U.S.
Persuasive	

Worksheet 3

Person Studied: Carlos G Bates

Personality Traits:	Behavior that demonstrates this Personality Traits:
Expertise	Bates had a Bachelors of Science in Forestry. "Bates distinguished himself in three (fields): silvics, shelterbelt forestry, and watershed management."

Person Studied: Bruce J. Zobel

Personality Traits:	Behavior that demonstrates this Personality Traits:
Expertise	Zobel received a Bachelor's in Forestry, a Master's in Forestry, and a Ph.D. in Forestry. He also received numerous awards for his research.

Worksheet 3

Person Studied: Malcolm M. Furniss

Personality Traits:	Behavior that demonstrates this Personality Traits:
Expertise	Furniss had a Bachelors of Science in Forestry and a Masters of Science in Entomology. "He is widely recognized for his expertise in bark-beetle identification."

Person Studied: Jerry F. Franklin

Personality Traits:	Behavior that demonstrates this Personality Traits:
Expertise	Franklin received a Bachelor's and Master's in Forest Management, and a Ph.D. in Botany. "Dr. Franklin has spent more than 40 years studying old-growth forests"

Worksheet 3

Person Studied: T. Kent Kirk

Personality Traits:	Behavior that demonstrates this Personality Traits:
Expertise	Kirk has a Bachelors in Forestry, Masters in Plant Pathology and a PhD in Biochem and Plant Pathology.

Assessment 1: Application & Integration Exercise

(Teacher Page - Answers)

Student assignments will vary. After students bring in their top three article choices, you should assign one article per individual or group (depending on the number of article choices this will vary). The students will be allowed to design a poster, write an article, or produce a video. These items should give a brief summary of the article assigned to the student or group, explaining the latest happenings at the Forest Products Lab. You will have access to the original articles via the FPL Press Room (<http://www.fpl.fs.fed.us/pressroom/index.html>) and be able to grade accordingly.

ASSESSMENT 2: TEST (Teacher Page - Answers)

1. What is Timber Management Research?
Timber management research deals with trying to find answers to the challenges of forest regeneration (renewal), improving growth and yield, and protecting forests from insects, disease, and fire.
2. What is the Forest Product Laboratory?
The Forest Product Laboratory opened on April 1, 1910 and its primary goal was to discover new technologies for producing wood products while creating less logging waste.

Assessment 2 – Cont

3. What major research development helped the naval store industry?

The Lake City Research Center found that nearly half of the chipping labor could be saved with no loss in gum production by spraying sulfuric acid on a fresh cut to prolong the flow of gum. This one research development saved the naval stores industry about a million dollars in 1951.

4. What benefits resulted from Wood Preservative Research?

Wood preservatives extended the life of railroad ties, thus saving the railroad companies money in the long run. The early research on wood preservatives reduced the demand for railroad ties by 75 percent and led to the use of preservation methods for other wood products as well, such as fence posts, and various building materials.

5. Explain what the Wagon Wheel Gap Project in Colorado studied.

Wagon Wheel Gap was a cooperative project with the Weather Bureau and the Forest Service. This project was to be a study of the effects of timber removal on water yield or stream flow and erosion under the conditions of the central Rocky Mountains

6. What were some of the major research developments in recycling?

Major developments in recycling included: discovering ways to recycle paper products to create new “recycled” paper products, discovering new techniques for removing contaminants, especially adhesives to create new recycled paper products, and discovering a new process for recycling paper that lowered the cost to the producer.

7. Why is forest product research so critical?

Forest products research is critical to the social and economic well being of people on a global level, because the demand continues to increase on a natural resource that continues to decrease.

ASSESSMENT 3: REFLECTION (Teacher Page - Answers)

Answers will vary depending on student surveys. Students should turn in a **list** of the 10 or more people that they surveyed, along with their completed **tally sheet** and **2 Histograms**.