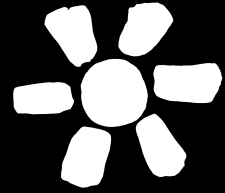


OVERVIEW

It is easy to see that items made of wood come from trees; however, many tree products are not so obvious. In this activity, students will discover the diversity and multitude of products that are in some way derived from trees.

**BACKGROUND****Products from the Forest**

It is estimated that a person living in the United States uses 200 board feet of lumber, 160 square feet of wood panels and 650 pounds of paper — or the equivalent of a mature 100-foot tree — every year. Those of us living in the United States use more wood each year than we use of all other industrial materials combined.

That is not surprising when you think about the fact that trees produce thousands of products of value to humans. Some estimate at least 5,000 different products come from trees; others estimate as many as 10,000. Regardless of the correct number, what can be said with confidence is that we get a lot of different products from trees! Tree products are a part of each of our lives each and every day.

How is it that so many different products can come from the same natural resources? The answer lies in the structure of a tree. Trees are made up of cellulose fibers that are held together with a glue-like substance called lignin. This makes the wood from trees strong enough to use for building houses and for making furniture. When that same wood is cooked, the cellulose is separated from the lignin to make wood pulp. Wood pulp can be made into paper, whereas the lignin can be used to make different chemicals that go into products such as cosmetics, medicines and foods.

Products from Solid Wood**Sawtimber Lumber**

Sawlogs are used to produce lumber (boards, decking, timbers, structural framing), veneer, plywood and other products. There is a high demand for both softwood and hardwood sawtimber.

Approximately 75 percent of the wood used today comes from softwoods (such as pine). For example, 95 percent of homes are wood frame construction

and these buildings are often constructed with softwood lumber. In order to build an average 1,800 square foot home, approximately 10,000 board feet of lumber is needed. Softwoods are also used in the manufacture of low-cost unfinished furniture.

While some hardwoods are used in construction, hardwood lumber (such as black cherry, oak, maple and ash) is used mainly for furniture, kitchen cabinets, flooring, doors and tool handles. Pennsylvania is an important producer of hardwood products. Some of the finest cherry and oak furniture is produced in Pennsylvania. Quality hickory and ash are in particular demand for handle stock. Some of the best white ash from northern Pennsylvania is used to manufacture major league baseball bats.

Sawtimber Building Boards (Veneer & Plywood)

Veneer is a thin sheet of wood ($\frac{1}{8}$ inch or less) of uniform thickness that is produced by peeling, slicing or sawing logs or bolts. The veneer may be cut thick enough to be used as is or it may be glued together as thin sheets to form plywood.

Virtually all species of hardwood timber of sufficient size and quality are used for veneer. Veneer species include poplars, oaks, walnuts, ashes, cherries and maples, as well as, some less important species such as hickory and sassafras. Pennsylvania is known the world over for its quality hardwoods, and veneer is one of the most valuable wood products from its forests.

Large, high-quality hardwood species are used to produce face veneers for paneling and commercial veneers for furniture cores, backs and concealed furniture parts. Veneer panels are often glued onto poorer-quality wood products. For example, doors often have a veneer covering over a less-expensive core stock.

Plywood is produced by gluing together three or more thin sheets of wood

GRADE LEVELS:

Grades 5–10

OBJECTIVES: Students will (1) examine various products and determine which ones are made from trees, (2) describe ways that trees are used to make products and ways that these products can be conserved and (3) explore methods for recycling and reusing products.

PENNSYLVANIA PROPOSED ENVIRONMENT & ECOLOGY STANDARDS ADDRESSED:**4.2.7**

- A. Know that raw materials come from natural resources.
- B. Examine the renewability of the resources.
- D. Describe the role of recycling and waste management.

4.8.7

- A. Describe how the development of civilization relates to the environment.

4.2.10

- A. Explain that renewable and nonrenewable resources supply energy and materials.
- B. Evaluate factors affecting availability of natural resources.
- D. Explain different management alternatives involved in recycling and solid waste management.

4.8.10

- A. Analyze how society's needs relate to the sustainability of natural resources.

ESTIMATED DURATION:

Preparation: 30 minutes, Activity: Two 50-minute class periods.

MATERIALS NEEDED: Various products (See Getting Ready, Step 1) and copies of Student Pages

CD-ROM: Use the section on "Wood you Buy that?"

vener with the wood grain of the alternate sheets placed at right angles to increase strength or in the same direction if a more uniform look is desired. Plywood is used for paneling, furniture, concrete forms, sporting equipment and numerous other uses. Hardwood plywood is used in about 80 percent of furniture manufactured in the United States.

Cabin Logs

The demand for cabin logs from softwood species such as hemlocks has increased in recent years. New homes from cabin logs are more rustic looking and tend to be less expensive, both of which likely contribute to their increasing popularity.

Cooperage

High-quality hardwood sawtimber is also used to make cooperage for barrels, baskets and boxes. White oak is primarily used for cooperage for barrels, while basket and box industries use veneer from poplar, sycamore, cottonwood and elm. There are two types of cooperage: (1) tight cooperage that holds liquids and (2) slack cooperage used for shipping fruits, vegetables and hardware. The demand for cooperage has declined as other packaging materials have replaced barrels and kegs, and new regulations have permitted kegs to be reused.

Fence Posts

Fence posts are used for fences on farms, ranches and residential yards. This provides a good use for small timber, especially timber obtained by thinning pine plantations. Pines are a preferred species for fence posts because pine is relatively easy to treat with preservatives; however, some hardwood species, such as black locust, are being used increasingly for fence posts. Regardless of species, the wood must be reasonably straight and fairly dense for strength.

Mine Timbers

There are still some limited markets available for timber used in mines. These timbers are used as supports in the construction of mine tunnels, shafts, openings and chambers. Hardwoods, principally oaks and southern pines, are the main species used for mine timbers.

Railroad Cross Ties

Railroad cross ties are used to support steel railroad tracks. There is still a high demand for low-grade hardwood to be used for railroad cross ties.

Pallets

The demand for wooden pallets has steadily been increasing. Pallets are constructed from lumber and plywood. The increased use of pallets has helped to mechanize the shipping of products by truck, rail, water and air.

Poles

There is still a high demand for telephone and other utility poles even though the trend is now to put most electric communication cables under ground. Primarily southern pine species are used for utility poles, although some tall, straight hardwood species, such as sweet gum, are also used.

Piling

Piling is treated with creosote as a preservative and used in the construction of bridges, docks, wharves, foundations and in other heavy general construction. The demand for piling is decreasing with the increased use of steel and concrete.

Fuelwood

Preferred fireplace woods are the hardwood species such as oaks and hickories. A cord is a pile of wood that is cut and stacked to 4 feet x 4 feet x 8 feet. A cord of air-dried, dense hardwood (oak or hickory) weighs about two tons (4,000 pounds) and has the heating value equivalent to a ton of coal or 200 gallons of fuel oil. Wood charcoal for barbecues is another type of fuelwood that is produced from solid wood. Approximately 20 percent of Pennsylvania households use wood to supplement heating during the winter. Use of fuelwood is higher in Pennsylvania than in any other state, totaling approximately 2,500,000 cords.

Specialty Products from Solid Wood

Some specialty products that are manufactured from solid wood for building construction include flooring, siding, molding, shingles and shakes. Wooden matches, clothespins and toothpicks are also specialty products from solid wood.

PROCEDURES

Getting Ready

1. Before doing this activity, collect as many of the following items as you can:
 - ◆ Newspaper
 - ◆ Toothpicks
 - ◆ Diapers
 - ◆ Piece of lumber or plywood

- ◆ Tissue paper
- ◆ Lacquer
- ◆ Rayon clothing or rug
- ◆ Sponge (synthetic, not natural)
- ◆ Baseball
- ◆ Wooden chopsticks or wooden mixing or salad spoons
- ◆ Protective goggles
- ◆ Book or magazine
- ◆ Cardboard box
- ◆ Can of paint thinner, turpentine or mineral spirits
- ◆ Acoustical ceiling tile
- ◆ Bottle cork
- ◆ Rubber gloves
- ◆ Photographic film
- ◆ Shampoo

Most of these items should be readily available around the house. Others may be available from your school's buildings and grounds department, shop, or art department. Scraps of plywood and lumber may also be available from a home improvement store.

2. You will be dividing your students into groups of four, so make enough copies of student pages for each group.

Doing the Activity

1. Place the items you collected around the room. Label each item with a number.
2. Divide the class into teams of four and have them work together to determine which of the products around the room are made from trees. All team members must agree with the team's decision about each product and must be able to explain why each product is on the team's list.
3. Have the students in each team number themselves from one to four. Tell all the 1's that it is their responsibility to record the information that their team agrees on. They will have to report their group's findings to the rest of the class. Tell the 2's that they must make sure that everyone in the group has an opportunity to speak as the team tries to reach decisions. Assign the 3's the responsibility to make sure the group stays on track and gets everything accomplished in the time allowed. The 4's are the only people in the group who may leave the group to ask you questions.
4. Have the teams move around the

room and examine the products. (Warning: Do not allow students to open any of the product containers.) After they have decided if one item comes from trees in some way, they should record it on a list and move on to the next item.

5. Once teams have established their lists, give each team a set of the "Tree Readings." Each student should read the article that corresponds to his or her number. (Student Pages can be cut in half.)
6. After reading the articles, students should explain the contents to their team members. Each person is responsible for making sure everyone else in the group understands what his or her article says.
7. The team should then re-evaluate the list of products they came up with in Step 4. Are there any products they want to add or delete from their list? Once again, remind students that everyone on their team must agree with the changes and should be able to explain why each item is on the list.
8. Have the teams share their lists with the rest of the class. Discuss the diversity of products we get from trees. Check the students' understanding of the articles by asking them to explain why they included certain products. If they didn't realize it during the activity, they should realize by the end of the discussion that all the numbered items placed around the room come from trees in some way.
9. How will this new awareness of forest products affect students' lifestyles? Will they make any changes? Talk about conservation practices where their families use a forest product, but could also (1) recycle the product, (2) reuse the product or (3) reduce its use.

EXTENSION

- Have students return to their groups and brainstorm a list of the ways they use paper. Have them write down possible substitutes for the three or four items on the list that they think are the most important. Have them compare the environmental and economic factors associated with these products and their possible substitutes by answering the following questions. (They will need to do research to an-

swer some of the questions. Encourage them to divide the research among their group members.)

1. Would the substitute serve the same purpose as efficiently and cheaply as the tree product?
2. Is the substitute made from a renewable or non-renewable resource?
3. Does the production of the substitute require more or less energy than the production of the original product? (Students will need to research this.)
4. Is the substitute reusable or recyclable? Was the original forest product reusable?
5. What, if any, are the long-term implications for continuing to use the paper product or its substitutes?

ASSESSMENT

Wood furniture is an obvious tree product, but, many common products such as toothpaste, which contains cellulose or wood fiber, are not. A scavenger hunt for tree products is a fun way to assess students' understanding of the concepts

and information presented in this activity. The scavenger hunt can be done in school, outdoors or in a supermarket or drugstore.

1. Organize students into groups of three.
2. Provide each group with a list of items to find, such as:
 - ◆ Two products derived from the gum of trees (rubber products, chewing gum)
 - ◆ Two objects made directly from wood (furniture, toothpicks, spools)
 - ◆ Two products made from tree resin (violin rosin, soap, varnish)
 - ◆ Two products extracted from the leaves or bark of trees (astringent lotion, cork, honey)
3. Challenge your students to find items that are not obvious tree products.
4. After a fixed amount of time, have the students share their discoveries and explain which part each product is from.

Adapted from Project Learning Tree