

Forestry in the Classroom Series



Products From Kentucky's Forests



An Educational Series for Grades 4, 5 and 6

We All Need Trees!

Trees supply thousands of products for our daily lives. We eat fruits and nuts from trees, use decorative woods for jewelry and art projects, and make practical items like books and fences from wood.

Wood is used as a fuel for cooking and heating in stoves, fireplaces and barbecue grills. Houses, paper and boxes are made from trees, and the fibers and chemicals from wood are used to make products such as rayon fabric and rubber balls.

How can so many different products come from trees? It's because of the tree's structure. Trees are made up of cellulose that are held together with lignin. This makes the tree strong enough to use for building houses and furniture.

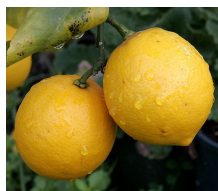
When wood is cooked, the cellulose is separated from the lignin to make wood pulp. This pulp is made into paper. The lignin can be used to make different chemicals that go into products like cosmetics, medicines and some foods.

Since so many products are made from wood and wood fiber, the average American uses the equivalent of a 100-foot tree every year!

Where does it all come from?

Fruits & Nuts

The fruits, nuts, berries and seeds of many trees are an important source of food for



wildlife and people. Some of the most common of these are apples, peaches, pecans, walnuts, coffee and spices such as mace and nutmeg. Other fruits and nuts: oranges, pears, chestnuts.



Foliage

While growing on a tree, leaves produce oxygen, help filter pollutants from the air, provide shelter for many wildlife species and



shade to help keep us cool. When harvested, leaves of the carnauba tree are used to produce furniture polish, car wax,



crayons, lipstick and the coating on many medicine tablets. Whole leaves from some trees, such as bay, are used in cooking, while the oils of other leaves, such as the eucalyptus, are extracted for fragrances and flavorings. Other products made from foliage: garden mulch.

Branches

The branches of large trees and the trunks of smaller trees are used to make thousands of paper products, including writing paper, tissues and boxes. Chemical by-products of the paper-



making process are used in producing cleaning compounds, skin lotions, artificial vanilla flavoring, photographic film and many molded plastic products such as eyeglass frames, football helmets, toothbrushes and buttons.

Other products made from branches: carpeting and upholstery backing, rayon, plastic twines, computer casings, luggage, cellophane, newspapers, baby food, imitation bacon bits, cereal, colognes.

Bark

Bark is used for a variety of purposes ranging from medicine to garden mulch to seasoning for foods.

The willow tree, for example, provides the essential elements of aspirin, while the laurel tree provides



Products, Products Everywhere



cinnamon used to flavor many foods. Cork for wine bottles and fishing tackle comes from the cork oak tree. Bark also is burned to produce energy and used as a dye for fabrics, shoe polishes and other products. Other products made

from bark: cosmetics, poultry bedding, oil spill control agents, the cancer-fighting drug Taxol.

Trunk

The trunks of trees are primarily used to make solid wood products such as furniture, musical instruments, lumber



and handles for tools and sporting equipment. Trunks are also peeled into thin sheets and used as veneer for plywood and furniture. Other products made from trunks: baseball bats, charcoal, canoe paddles, guitars, swing sets, birdhouses, crutches, fences, sleds.

Gums

Gums, which are found in the sap of trees, are used in the manufacture of a variety of products including food, adhesives, paints and medicines. In



foods, gums serve as thickening agents, provide a creamy texture, act as binders to keep ingredients from separating and help retain moisture. In ice cream and other frozen desserts, gums prevent the formation of crystals. The gums of some trees



are used to make adhesives such as glue and hair spray, and act as drying agents in paint and printing ink. Other gums have antiseptic properties and are used in making soaps and cough syrups. Other products made from gums: cough drops, shampoo, dish washing liquid, adhesive bandages.

Stumps

Pine stumps provide the wood rosin and liquid terpenes used in making many products, including orange-flavored soft drinks, pine



cleaners and laundry detergents. Hardwood stumps readily produce sprouts that grow into new trees, assuring that we have plentiful hardwood forests for our future. Other products made from stumps: sports drinks.

Roots



In addition to providing food for the tree, roots play an important role in keeping our waters free of pollutants. They stabilize the soil to prevent erosion and sedimentation, and by absorbing nutrients to feed the tree, they

prevent these nutrients from entering our rivers and streams.

Other products made from roots: sassafras tea, root beer.

The next time you go to the grocery store, see how many tree products you can find.



History of Papermaking

The word paper is derived from the name of the reedy plant papyrus, which grows abundantly along the Nile River in Egypt. However, true paper is made of pulped cellulose fibers like wood, cotton or flax.

First There Was Papyrus

Papyrus is made from the sliced sections of the flower stem of the papyrus plant, pressed together and dried, and then used for writing or drawing. Papyrus appeared in Egypt around 2400 B.C.

Then There Was Paper

A courtier named Ts'ai-Lun, from Lei-yang in China, was the first recorded inventor of paper circa 105 A.D. Ts'ai-Lun presented paper and a papermaking process to the Chinese Emperor and that was noted in the imperial court records. There may have been papermaking in China earlier than the above date, but inventor Ts'ai-Lun did much for the spread of papermaking technology in China.

Newsprint

Charles Fenerty of Halifax made the first paper from wood pulp (newsprint) in 1838. Charles Fenerty was helping a local paper mill maintain an adequate supply of rags to make paper, when he succeeded in making paper from wood pulp. He neglected to patent his invention and others did patent papermaking processes based on wood fiber.

Corrugated Papermaking - Cardboard

In 1856, Englishmen, Healey and Allen, received a patent for the first corrugated or pleated paper. The paper was used to line men's tall hats.

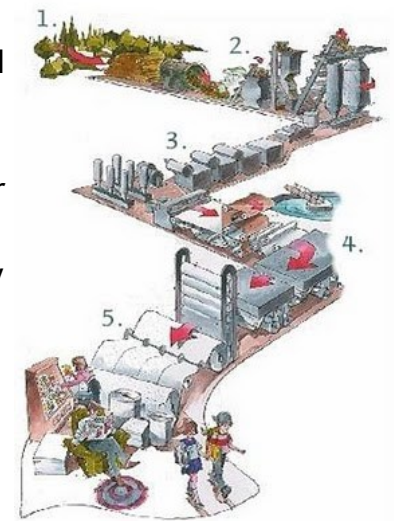
Many people invented machines to do the work but the process has virtually stayed the same.

How Paper is Made

1. The process begins when trees, grown especially for papermaking, are harvested and transported to a paper mill.

2. At the mill, large machines strip away the bark and shred the logs into millions of chips the size of breakfast cereal.

3. The wood chips travel on conveyors to gigantic "pulp cookers", where chemicals and steam are added. The mixture is heated and pressurized, breaking the chips into smaller and smaller pieces and finally forming a dilute water suspension of wood fibers called pulp.



4. The pulp then passes through cleaners and screens and sometimes goes through a bleaching process that will give it the whiteness needed for the grade of paper being manufactured. Other chemicals such as dyes, pigments, sizings, or resins are sometimes added to provide the paper or paperboard (thick paper for boxes) with the appropriate finish.

5. The pulp is then pumped through pipes to a paper machine where it is sprayed onto a wide, moving wire screen. After the water in the pulp drains through the holes, a damp mat of wood fibers remains; this is the paper. It is picked up from the end of the moving belt and dried over steam-heated rollers. Finally, it is cut and packaged into different sizes for different uses.

Recycle Old Paper into New Paper

Materials Needed:

- Scrap paper torn into 1" X 1" pieces (paper towels, construction paper, and paper in your recycle bin work well; avoid glossy finishes or paper with a lot of ink, like newsprint);
- a large bowl or tub; strainer
- a wooden frame around 5" x 7" or 8" x 10";
- nylon or wire screen;
- staples; a plastic basin at least 2.5 gallons in capacity, that is larger than the, frame;
- cloth dishtowels (felt, blotting paper, interfacing, or newspaper may be substituted);
- blender; sponge; household iron; starch
- colored paper, pieces of colored thread, or dried flowers or herbs.

Getting Started:

Soak the scrap paper pieces in hot water in the large bowl or tub for at least 30 minutes.

Buy or build a wooden frame, which you will prepare for paper making. Tightly staple or tack nylon or wire screening to the frame, making a "deckle," which is the surface on which you will layer the fibers.

Fill the blender halfway with warm water, then add a handful of the soaked paper. Blend at medium speed until you no longer see pieces of paper, and the pulp has a soupy consistency. You can blend in a piece of construction paper for color; or stir in short pieces of thread, dried flowers, or herbs



for texture.

Pour the mixture into the large basin and then fill the basin with warm water, mixing thoroughly until the ingredients are evenly

dispersed. Adding a few ounces of liquid starch will help make the paper firm.

Slide the deckle into the basin. Put some pulp onto the screen and, still holding the deckle underwater, gently move it back and forth to get an even layer of fibers on the screen.

Lift the deckle out of the mixture, keeping it flat. Allow it to drip until most of the water has drained off. You should have a uniform layer of pulp mixture on the deckle. Press the pulp gently with your hand to squeeze out excess moisture (rubber gloves will help). Soak up any excess water from the bottom of the screen with a sponge.

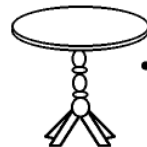
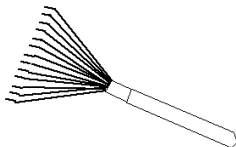
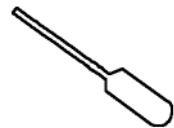
Place newspaper on a flat surface and turn the screen paper-side-down on a cloth. Lift the screen gently, leaving the paper. Gently tap the screen to help release the paper.

Let it dry naturally for several hours or overnight. Gently peel off the paper when it is dry.

When you're finished making paper, collect the leftover pulp in a strainer and recycle it, or freeze it in a plastic bag for future use. Don't pour the pulp down the drain!



Can you find the hidden tree products in the picture below?



It's All Chemical

Trees are a natural supply of valuable chemicals. Chemicals such as turpentine and rosin come from the sticky sap of trees. Lignin is another chemical we get from trees. Cellulose, used for making pulp and paper, is also used in many products.

How can we create so many different chemical products from trees? When chemicals are removed from the tree and mixed with other chemicals, a chemical reaction occurs. The energy from this reaction can create a completely different chemical. This is how chemicals from trees can be used to make products as different as artificial vanilla flavoring and frames for your eyeglasses.



Scientists find useful compounds that trees make naturally and then learn to make them in a factory from synthetic materials. Aspirin originally came from a substance in willow bark. Rubber also has been "copied" in a factory.

Cellulose are converted and used in many products. Cellulose gum is what makes toothpaste "paste" and helps it stay on the toothbrush. Shampoo would be just watery soap without cellulose to make it thick. Cellulose often hides as methyl- or ethyl-cellulose but it's still a tree product.

Torula yeast (a food supplement) is grown on wood sugars and wood mineral nutrients leftover from pulping. This is used in baby food, cereals, baked goods and a lot more.

Chewing gum is a combination of natural rubber (especially chicle, from the Sapodilla trees) with some synthetic latexes to extend the natural latex supply. Other wood chemicals such as rosin esters and terpenes are also common ingredients.

Make a Tree Treat

We eat parts of trees all the time.

Ice cream and salad dressings use a part of the tree called cellulose to make them thick, smooth and creamy. In parmesan cheese, cellulose powder keeps the grated cheese from getting lumpy. Maple syrup, sassafras tea and root beer come directly from trees. Chocolate comes from the seed of the Cacao tree and is a very tasty tree treat. Try making these tree treats!

Tree Shake

Make a tasty shake using ingredients from trees. You may be surprised by what's included!

1 cup vanilla ice cream

1/4 cup orange juice

1 teaspoon cinnamon

1/4 cup almonds or pecans

1 banana

Blend the ice cream, orange juice, cinnamon and banana in a blender (make sure an adult is there to help). Top with pecans for a tasty tree treat.



Fruit Salad

1 apple

1 banana

1 grapefruit

1 orange

2 kiwi

1 pear

Have an adult help you peel and slice the fruit into chunks. Mix the fruit together in a bowl and top with sliced almonds or pecans and shredded coconut.



Trees give us many things. Use the word key below to find some of the things trees are famous for. Look up any words you don't know in a dictionary to find their meaning.

f	r	u	i	t	s	k	n	c	e	l	l	u	l	o	s	e	r	g	a
m	o	f	u	r	n	i	t	u	r	e	a	b	y	r	a	t	u	u	v
a	a	l	m	a	n	i	n	g	i	l	s	i	e	l	r	a	b	m	a
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almonds • avocados • bananas • bark • baseball bats • books • branches • cellulose • cereal
 chairs • chemicals • chocolate • cosmetics • dates • eucalyptus • fibers • film • foliage • fruits
 fuel • furniture • gums • lemons • lignin • magazines • matches • nuts • oils • pallets • paper
 papyrus • pitch • plastics • plywood • pulp • rayon • roots • rosin • rubber • sassafras
 sawdust • shade • shoe polish • stumps • syrup • taxol • torula yeast • trunk • turpentine
 wood chips

