



How Much Paper Can Be Made from a Tree?



How much paper can be made from a tree?

Although it seems simple, the answer to this question is really quite complicated. There are many factors which influence the amount of paper that can be made from one tree.

Paper manufactured in the U.S. is probably made of **wood fiber**. But where did the fiber come from? A whole tree? Wood chips from a saw mill? Old copy paper? Maybe a combination of all three?

If the paper was made from a whole tree, how old and how big was the tree? What kind of tree was it? Finally, a lot depends on the type of paper. What is its end use? And how was it manufactured?

As you can see, there are so many factors involved, it is impossible to arrive at any one figure. To help explain these variables, let's first take a look at the raw material used to make paper.

Wood fiber--where does it come from?

You may be surprised to learn that about one-third of the raw material used to make paper in the U.S. is **residue** - wood chips and scraps left behind from forest and sawmill operations. These "leftovers" would probably be burned or discarded if not used by the paper industry.

Another third of the raw material is **recovered paper**. Although some papers contain 100 percent recycled fiber, papermakers often combine various amounts of recycled and new fiber to produce the desired quality and grade of paper.

Only about one-third of the fiber used to make paper in the U.S. is from whole trees, which the industry calls **round wood**. It is not considered economical to use large logs for paper when they could instead be used for lumber. For this reason, only trees smaller than 8 inches in diameter, or larger trees not suitable for solid wood products, typically are harvested for papermaking.





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Pre-consumer and post-consumer paper--what's the difference?

Pre-consumer recovered paper consists of trimmings and scraps from printing, carton manufacturing, or other converting processes which are reused to make pulp without reaching the final consumer.

Post-consumer recovered paper (like old corrugated boxes, newspapers, magazines, and office paper), has been used by the ultimate consumer and is then returned to the mill for recycling.

From fiber to pulp to paper



The amount of fiber in a cubic foot of wood varies greatly from species to species. **Hardwoods** (broad-leaved species) tend to have greater wood **densities** than **softwoods** (conifers), meaning they have more fiber per cubic foot of wood.

When trees are harvested for papermaking, the limbs are removed and the trunk is transported to a pulp mill. At the mill, the bark is removed and burned for fuel or processed to use as garden mulch. The wood is often chipped into small pieces about the size of a quarter, and then broken down further into individual fibers in a process call **pulping**. The pulping method influences the amount of fiber the wood yields.

Mechanical Pulping

Sometimes pulping is done mechanically by pressing and grinding the wood to separate the fibers. This **mechanical pulping** process is very efficient. Up to 95% of the dry weight of the wood is converted into pulp. Most newsprint is made from mechanical pulp, recycled fiber, or a combination of the two. Paper made from mechanical pulp is opaque and has good printing properties, but it is weak and discolors easily when exposed to light due to the residual **lignin** in the pulp. (Lignin is a natural wood chemical that holds fibers together.)

Chemical Pulping

A second pulping method is **chemical pulping**, in which a chemical/water solution dissolves the lignin to help separate the fibers. The absence of lignin means that paper made from chemical pulp is stronger and less prone to discoloration. The pulp yield from chemical pulping is much lower, though,



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since the lignin has been removed. Chemical pulps are used to make shipping containers, paper bags, printing and writing papers, and other products requiring strength.

The type of paper being produced determines what pulping method is used. Remember the paper you used when learning to write in kindergarten - the paper with the very wide rule lines? This paper was grayish in color, and you could actually see bits of wood in the paper. Kindergarten writing paper and newsprint do not require high strength, brightness or purity, so mechanical pulps are probably the best choice for making these types of papers.



Papermakers combine mechanical, chemical, and recycled pulp in varying amounts to produce the highest quality paper required by the customer from the least possible amount of fiber.

Some people say that it takes “17 trees to make a ton of paper.” This might make you believe that if a ton less paper were used every year, then at the end of the year, 17 more trees would remain standing.

This is really an oversimplified conclusion. Many of the trees used for papermaking would be harvested or die anyway, even if not one piece of paper were produced. Many are already dying, and must be removed to improve the health of the forest. It makes good sense for papermakers to use these trees for wood pulp.

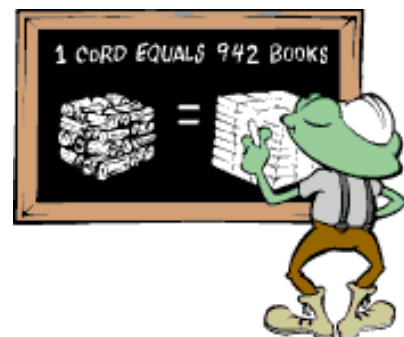
But in general...

As you can see, it is impossible to know exactly how much paper can be made from one tree.

But let's assume that the following paper products have been produced using 100 percent hardwood. A cord of wood is approximately 8 feet wide, 4 feet deep, and 4 feet high. A cord of air-dried, dense hardwood (oak, hickory, etc.) weighs roughly 2 tons, about 15-20 percent of which is water.

It has been estimated that one cord of this wood will yield one of these approximate quantities of products:

- 1,000-2,000 pounds of paper (depending on the process)
- 942 100-page, hard-cover books
- 61,370 No. 10 business envelopes
- 4,384,000 commemorative-sized postage stamps
- 460,000 personal checks
- 1,200 copies of National Geographic
- 2,700 copies of an average daily newspaper



Source: A Tree for Each American, American Forest & Paper Association, Washington, DC



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Here are some important forest facts:



Each year, the U.S. forest community plants some 1.5 billion seedlings. That's an average of more than 4 million new trees planted every day!

More than 5 new trees are planted each year for every man, woman, and child in America, and millions more regrow naturally from seeds and sprouts.

There are more trees in America today than there were 70 years ago.

Remember!

Trees are a renewable resource that will keep growing and growing. Unlike nonrenewable resources such as minerals, forests regenerate naturally, and good forest management by companies, governments, and landowners increases their abundance.



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GREENQUIZ

Word Search - Can you find these terms hidden in the box below?

trees
recovered paper
round wood
post consumer
pre consumer
yield
pulping
lignin
density
hardwood
softwood
fiber
residue



How many words did you find?

See the next page for the answers, but only if you really need them



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Green Quiz Answers

R	U	D	O	O	W	T	F	O	S	V	I	K	J
R	K	S	G	Y	I	E	L	D	E	R	O	Y	I
O	E	R	E	G	H	R	I	K	N	E	F	E	S
U	O	P	R	E	C	O	N	S	U	M	E	R	P
N	T	S	A	D	R	U	R	E	G	U	R	E	T
D	E	D	A	P	E	T	A	E	O	S	K	Y	I
W	G	H	A	R	D	W	O	O	D	N	H	G	P
O	N	Y	H	L	T	E	E	J	H	O	B	H	Y
O	I	D	A	I	E	D	R	E	G	C	R	T	T
D	P	D	A	G	L	E	Y	E	O	T	I	O	K
Z	L	G	F	N	S	S	A	P	V	S	R	I	J
I	U	V	F	I	B	E	R	R	N	O	E	L	K
O	P	T	D	N	E	K	Y	E	X	P	C	T	L
T	Y	U	G	E	F	E	D	T	S	D	D	E	I
T	E	D	A	N	E	D	A	E	O	W	K	Y	R