With continued population growth, renewable resources, such as trees, are often used faster than they can be replaced.

TIMBER!

Objectives:

Students will be able to:

✓ Record and calculate the supply and demand of a natural resource.

✓ Graph the supply and demand for trees based on their calculations.

✓ Explain the effect on a natural resource when demand exceeds supply.

✓ Contrast arithmetic growth with geometric growth.

Skills:

Calculating, graphing, working in cooperative groups, interpreting data

Minutes	# of trees at start of minute	# of new trees	# of trees cut	# of trees at end of minute
1	120	+4	-1	123
2				
3				
4				
5				
6				
7				
8				

Method:

In groups, students role-play a forest management simulation and calculate the supply and demand for trees in a hypothetical forest. They record and graph their results.

Materials:

For each group of **four** students you will need:

➢ 120 toothpicks in a container
➢ 32 toothpicks in a rubber band

➢ Stopwatch or clock with a second hand
➢ Graph paper

Introduction:

People rely on wood from trees to heat their homes, cook their food, and provide building materials and paper for homes, schools and businesses. The more people there are, the greater the demand for wood. While it takes only seconds to cut down a tree, it takes years to grow a new one. We also depend upon forests to regulate climate, clean air and water, conserve precious soil, and provide homes for many birds and animals. In almost every part of the world, trees are being cut down at a faster rate than they are being replaced. The following simulation illustrates what happens to a given forest when the demand for tree products outstrips the supply.

Procedure:

1. Divide the class into groups of **four** students. For each group, assign the following roles: *lumberjack, forest, forest manager, and timer.*

2. Give **120** toothpicks in a cup to each student representing the **forest**. These sticks represent the supply of trees available to the lumberjack for cutting.

3. Give **32** toothpicks to the students representing the **forest managers**. These sticks represent trees that will grow during the game.

4. The **lumberjack records** the transfer of trees each minute on a chart like the one illustrated.

➢ Begin the game when the timer gives the signal. After *15 seconds*, the timer tells the forest manager to give the forest one tree. *Every 15 seconds* for the rest of the game, the forest manager adds another tree to the forest. In doing so, the forest manager simulates the average rate at which trees grow to maturity and become timber reserves in the real world.

➢ Stop at the end of the *first minute* of the game and let the lumberjack remove **one** tree from the forest. The tree represents the amount of wood the world needs for heating, cooking and building materials at its present population.

➢ Continue the game. At the end of each succeeding minute, the *world's demand for wood doubles* as a result of a growing population. At the end of the second minute, the lumberjack cuts **two trees** from the forest; at the end of the third minute, the lumberjack cuts **four trees** from the forest, at the end of the fourth minute, the lumberjack cuts **eight** trees from the forest, then 16, 32, 64, 128, and so on.

➢ End the game when the wood reserves in the forest can no longer meet the demands of the lumberjack. At the start of each minute, from 1 to 8, students should have found the following number of trees available: 120, 123, 125, 125, 121, 109, 81, and 21.

➢ Sort the "trees" back into their original containers when done with data collection

Discussion Questions & Follow up activities

1. How many minutes did it take for the lumberjack to cut all the trees in the forest?

2. Was the forest always shrinking? Explain

3. If the forest manager could develop a tree that grows at a rate of one tree per second, would tree growth keep up with the timber demand? Why not?

4. What could be done to prevent the demise of the forest in this scenario? List and describe two potential ideas.

5. What are practical ways you can think of in terms conserving paper at home or on campus that would decrease utilization of paper goods and help conserve forest resources?

6. List 3 reasons why forests are commercially important.

7. List 3 reasons why forests are ecologically important.

8. Fuel wood is particularly important in many developing countries, which leads to deforestation and overuse of many species trees. Brainstorm two ideas that could help to reduce fuel wood demand, and explain how your ideas would contribute to sustainability of forest resources.

9. Compare and contrast an old growth forest vs. a second-growth forest (*consult pg. 194 in your text*).

10. Compare and contrast clear cutting vs. selective cutting. How might these harvesting techniques be utilized to help to preserve the long term sustainability of a forest as opposed to depleting the forest?

11. A large proportion of domestic logging in the U.S. occurs in national forests (national forests are collectively owned by the government and taxpayers). Describe one positive and one negative aspect of allowing harvesting of trees by private companies on public land such as national forests.

12. Graph the decline of the forest and the growth of the demand, plotting points on a line graph. This can be done manually with graph paper or electronically with a spreadsheet program, such as Microsoft Excel. You will need to graph number of trees over time, and you want two lines on the same grid (one for tree supply and one for tree demand).

13. According to the graph you made, at what time do supply and demand become equal?

14. According to the graph you made, what was tree supply and demand like at 5 minutes?

15. On the same grid, graph the population growth of the tree population over time assuming no harvesting of trees by lumberjacks occurred (color or highlight this line in red). What would the tree population have been at 7 minutes assuming no tree cutting?

16. If a new variety of a tree was produced by botanists through selective breeding that had a growth rate 3 times that of the trees in the scenario, how would that have affected the outcome of the simulation?

17. Assume you were the owner of the land on which the tree harvesting scenario took place. Halfway through harvesting your tree "crop" you realize that demand is outpacing demand. List and describe on way you might enhance supply and one way to decrease demand so that you can ensure yourself a steady, sustainable profit from your trees into the future.