

SYSTEMS ENRICHMENT EXERCISE

The Impacts of Demand for Sustainable Wood



Students explore the difference between a casual loop diagram and a life cycle diagram.

Objectives

- After completing this exercise, students will be able to
- describe the difference between life cycle diagrams and causal diagrams and
 - explain how demand for sustainable wood helps to promote sustainable forests.

Materials

- Copies of The Impacts of Demand for Sustainable Wood student page

Introduction

This exercise is designed to address two areas of confusion for students: (1) it helps students recognize the difference between life cycle diagrams and causal diagrams, and (2) it helps students understand how demand for sustainable wood products can help maintain forests.

During pilot testing of this module, several instructors observed that students confused causal diagrams (Activity 5) and life cycle diagrams (Activity 10). On the surface, these two tools look similar, but they have quite different purposes. The causal diagrams represent cause-effect relationships within a system. Boxes represent variables and arrows represent those cause-effect connections. An arrow from Box A to Box B indicates that a change in Variable A has an influence on Variable B. (See the slide presentation “Building a Forest System” in Activity 5 for more details.)

Conversely, the arrows in the life cycle diagram represent the flow



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of materials from one stage in a life cycle to another. Here, boxes represent stages in the life cycle of a product or service, and arrows represent the flow of materials over time. So, an arrow from Box A to Box B represents the movement of resources (e.g., wood, aluminum) from Stage A to Stage B of a product’s life cycle.

Pine trees are planted in plantations on private land across the Southeast to supply us with wood products and paper.



To help clarify this distinction for students, this exercise focuses on the production of wood (the first stage of the life cycle for wood products, covered in Activity 10). Students work with a causal diagram that illustrates important economic and ecological relationships that affect this stage of the life cycle.

This leads to the second point of confusion. Many students have misconceptions about how demand for wood products would likely affect forests. When considering the long-term influence of the market on landowners' decisions to maintain private forests or convert their land to other uses (such as a housing subdivision or agriculture), it is clear that having a market for wood enables a landowner to continue to plant trees. This exercise provides students with a greater understanding of how demand for products from sustainably harvested forests is

likely to increase the area of land devoted to forests.

Doing the Exercise

1. If your students have not worked through Activity 5, then you will need to explain causal diagrams to them. You can use the Building a Forest System Diagram presentation from Activity 5. As you go through that presentation, be sure to point out the distinction between the causal diagrams and the life cycle diagrams covered in Activity 10.
2. Distribute the student page, The Impacts of Demand for Sustainable Wood, and ask students to use the information to answer the questions.
3. Use the answer key to lead the class in a discussion to help distinguish these two important systems thinking tools.



The Impacts of Demand for Sustainable Wood (1 of 4)

NAME _____

DATE _____

Introduction

Life cycle diagrams may look similar to causal diagrams, but they express different types of relationships. The life cycle assessment (LCA) diagrams, such as the one in Figure 1, show the flow of materials used to make a product. These materials start as raw materials, move through steps of production to use, and end with disposal. Conversely, the causal diagrams, such as the one in Figure 2, illustrate the cause and effect relationships that impact the behavior of a system. This exercise is designed to help you see the difference between these two tools in the context of the wood furniture life cycle.

Figure 1: LCA diagram of wood furniture from Activity 10

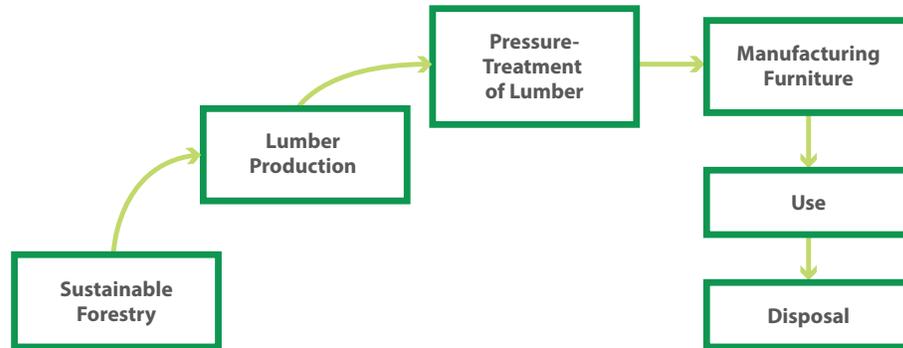
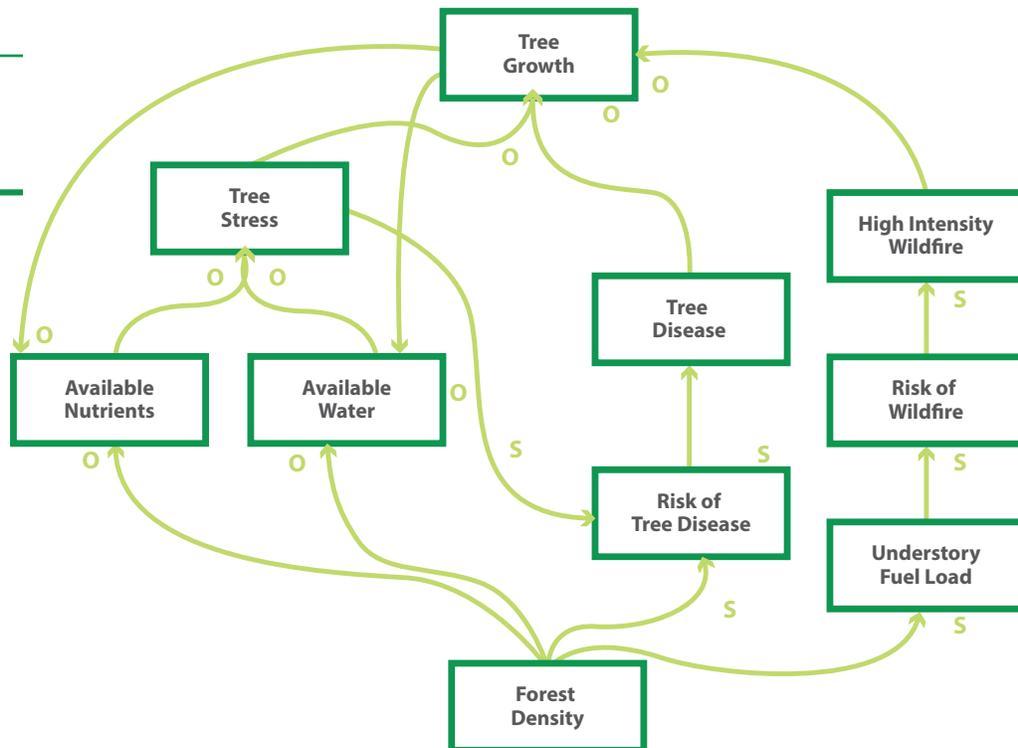


Figure 2: Causal diagram of a managed forest from Activity 5





The Impacts of Demand for Sustainable Wood (2 of 4)

Exploring the Wood Life Cycle

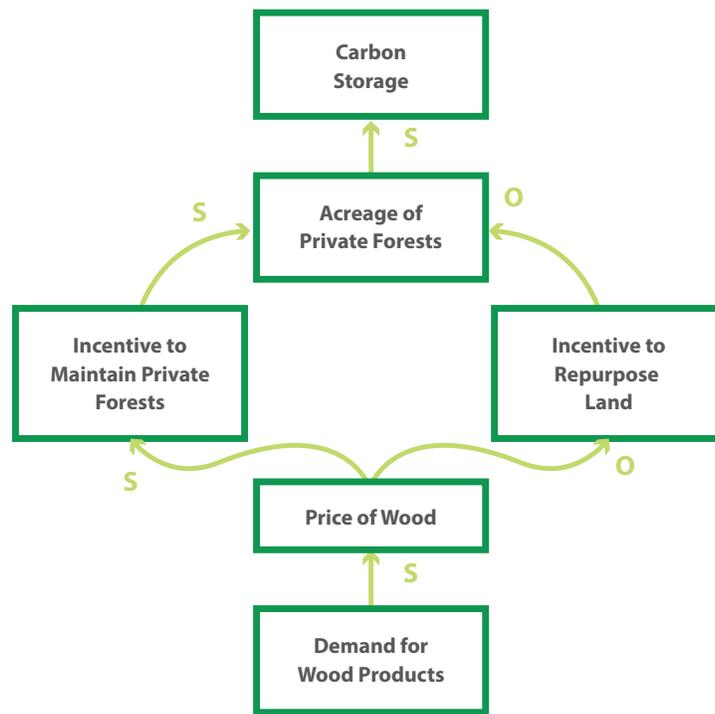
The *life cycle diagram* of a wood furniture set illustrated in Figure 1 follows the path of the materials (wood) used in the furniture, from the source, through the several steps of production and use, and then to disposal. Each of these steps in the life cycle has its own set of impacts that can be studied with the help of a *causal diagram*. In this exercise, we look more closely at the impacts relating to the first two steps of this life cycle.

Impacts of Demand for Wood

Some people have the impression that developing demand for wood products might cause deforestation because it gives landowners an incentive to cut down trees, which would lead to less carbon stored in forests. However, favoring wood from *sustainable forests* actually decreases greenhouse gas emissions. In this exercise, we use a causal diagram to look more closely at how increasing demand for sustainably harvested wood products affects forests.

When we look at the long-term cause-effect relationships that impact land use, we can see why demand for sustainable wood products is an important part of protecting forests. The causal diagram in Figure 3 illustrates these long-term relationships. Use this diagram to answer the questions regarding the impacts of Demand for Wood Products on Carbon Storage.

Figure 3: Causal diagrams can clarify the impact that demand for sustainable wood has on forests.





The Impacts of Demand for Sustainable Wood (4 of 4)

3. As you consider the impact of the Price of Wood, keep in mind that landowners look at the long-term costs and benefits of their decisions when considering whether to maintain a forest or to look for other ways to generate income from the land (such as selling it for development or agriculture). The diagram shows that an increase in the Price of Wood will increase owners' Incentive to Maintain Private Forests. What might be the landowners' logic for continuing to manage a sustainable forest in response to high wood prices?
4. The diagram also suggests that a decrease in the Price of Wood would increase landowners' Incentive to Re-purpose Land. Explain how lower wood prices might cause landowners to look for other ways to generate money from their land.
5. Explain the varying impacts that Incentive to Maintain Private Forests and Incentive to Re-purpose Land would have on the Acreage of Forested Land.
6. If the net price for wood exceeds the profit made from, for example, cotton, what is a cotton farmer likely to do?



The Impacts of Demand for Sustainable Wood (1 of 2)

1. According to the diagram in Figure 3, how will an increased Demand for Wood Products affect the Price of Wood?

The S-arrow indicates that an increase in Demand for Wood Products will lead to an increase in the Price of Wood.

2. Compare the arrows in the life cycle diagram in Figure 1 to the arrows in the causal diagram in Figure 3. Describe what is indicated by each of the following arrows:

- a. Figure 1: Sustainable Forestry → Lumber Production

In the life cycle diagram, this arrow refers to the transfer of materials from one stage of the life cycle to another. In this case, the wood is moving from the raw material cycle (Sustainable Forestry) to the first stage of production (Lumber Production).

- b. Figure 1: Lumber Production → Pressure Treatment of Lumber

This arrow shows the wood moving from the first stage of production (Lumber Production) to the second stage of production (Pressure Treatment of Lumber). Note that a causal diagram could be drawn for each of these stages of production.

- c. Figure 3: Demand for Wood Products → Price of Wood

In the causal diagram, arrows refer to the cause-effect relationship between the variables of the system. Since this arrow is an S-arrow, the two variables move in the same direction. This arrow shows that an increase in Demand for Wood Products will lead to an increase in the Price of Wood.

- d. Figure 3: Price of Wood → Incentive to Re-purpose Private Land

In this case, the arrow is an O-arrow, indicating that the variables move in opposite directions. So, an increase in the Price of Wood would lead to a decrease in the Incentive to Re-purpose Private Land. The arrow also indicates that a decrease in the Price of Wood would cause an increased Incentive to Re-purpose Private Land.

3. As you consider the impact of the Price of Wood, keep in mind that landowners look at the long-term costs and benefits of their decisions when considering whether to maintain a forest or to look for other ways to generate income from the land (such as selling it for development or agriculture). The diagram shows that an increase in the Price of Wood will increase owners' Incentive to Maintain Private Forests. What might be the landowners' logic for continuing to manage a sustainable forest in response to high wood prices?

If the price of wood increases, and the landowner has reason to believe that there will continue to be opportunities to sell sustainably harvested wood in the future, then the expected future income from wood sales provides an incentive to maintain the forest rather than pursue other ways to earn money from the land.

4. The diagram also suggests that a decrease in the Price of Wood would increase landowners' Incentive to Re-purpose Land. Explain how lower wood prices might cause landowners to look for other ways to generate money from their land.

If the demand for wood products is low, resulting in a low price for sustainably harvested wood, then landowners may be inclined to seek other opportunities to earn money from their land. Often, these opportunities involve cutting down the forest and then shifting the land toward a different use, such as development or agriculture.



The Impacts of Demand for Sustainable Wood (2 of 2)

5. Explain the varying impacts that Incentive to Maintain Private Forests and Incentive to Re-purpose Land would have on the Acreage of Forested Land.

The financial incentives to maintain private forests will mean that current landowners will not convert their land to some other use. In addition, other landowners may even shift to sustainable forestry if enough economic incentives exist. This would increase the acreage of private forests. If forest owners have a strong incentive to convert the land to a different use, then a loss of forest area would result.

6. If the net price for wood exceeds the profit made from cotton, what is a land owner likely to do?

If steady markets for sustainable wood lead to greater profits from wood than from cotton, then landowners growing cotton will be more likely to convert land to growing trees. This would lead to more forests and additional carbon storage on the land.