TRENDS IN RESOURCES PROVIDED BY FORESTS

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Contents

Summary

Forest resources represent many competing uses in society. The allocation of forest resources depends primarily on the society's value for each use. The problem with allocating forest resources among its different uses lies in differences in societal values across the globe for a single use, across uses and even within political boundaries. These differences in values held by societies across the world are at the heart of the allocation problems for forest resources. While some forest resource uses may be complimentary, some are competing. In addition, many forest resource values are difficult to determine due to the lack of a market mechanism that can easily assign values and allocate resources to maintain them. In the past, timber products have provided the majority of the value for forest resources. In the future, new values that compete with timber products will need to be determined to allocate forest resources efficiently.

1. What is a Forest Resource and Why

There are many forest resources that are valued by society. Among them are biological diversity, productive capacity, forest health and vitality, soil and water conservation, and carbon sequestration. These values are determine by society's wants and needs. As our wants and needs have changed over time so have forest resource values.

Population and economic growth, particular income levels, are the key factors affecting forest resource values. As population and economies grow and prosper so have our values changed regarding forest resources. Continued increases in population and economic prosperity are likely to reinforce current trends in forest resource values in

many parts of the world.

Another factor that is changing values is the growth of the "global village". Aggregated individual tastes and preferences make up societal values. As we become a global community through better communication many new values are introduced to different societies.

At the same time, forest resources can be traded to meet values associated with different regions. Wood products are an example of trade activity where values in another area are sufficiently high to allow products to be produced for use in a different region. Not all forest resources are easily traded however. Biological diversity is site specific. Trade mechanisms can be developed to conserve in-place biological diversity however. A system of credits, such as already existing pollution credits, could allow such site-specific production to be valued by others in a different region.

There is no single value that describes a forest resource across the globe. For example, forest resource values in developing nations reflect their society's wants and needs, which may be different than those wants and needs found in developed economies. Soil and water conservation may be viewed as a more valuable resource in developing countries than in economically advanced nations. The observed differences in values reflect each nation's economic development and population.

It is difficult to subscribe a single value for a global community that reflects the value of global forest resources. The large number of value systems across the globe makes any valuation of global forest resources problematic. Climate change mitigation, plant and animal biodiversity values vary markedly in different areas of the world, even though they represent global forest resources. Subsequently, managing these global resources is complicated due to the extremely varied nature of values across the globe.

What follows is a discussion of the different forest resources, their definition, use and future outlook. In several instances, case studies are used to illustrate the resource's importance in describing the different forest resources. The following sections first define these forest resources, their historical values, and conclude with a presentation of present and future trends.

1.6. Forest-based Biological Diversity

Biological diversity defined broadly includes every living organism on earth. It is seen as a vital resource to people's economic and social development. Forests, in particular, are viewed as biologically diverse since forests contain many living organisms from the plant and animal kingdoms. The abundance of plant and animal life in a forest system makes them a valuable source of food, shelter and medicines that are important to human life.

Biological diversity is also viewed as a storage or safe haven for genetic diversity. Genetic diversity maintains viable populations of species. Genetic diversity permits life to adapt to changing environments. Because we live in a changing world, biological diversity is appreciated as a forest resource because of its present and unknown future

values. The resource's value lies in the potential it may have in the future as a source of new medicines as well as its current role in maintaining ecological balance.

The values associated with biological diversity are tempered by the reality that it is difficult to assess the importance of maintaining every single species in the plant, animal and other kingdoms. If one species goes extinct, as has occurred in the past, the world does not collapse, but rather adjusts to the loss. There is a critical level however where extinction of groups of species reduce future options and-if enough become extinct-will jeopardize the quality of life on earth.

As economies advance, many of the benefits from this forest resource have been replaced by technology. There exists, however, significant areas where forests contain unknown biological diversity and possess unknown future values. The potential to develop new medicines or food sources should be valued so that it maintains these significant areas.

So important are the biological resources contained by forests that the United Nations Environment Program (UNEP) promulgated the Convention on Biological Diversity. It is an international legal instrument for the conservation and sustainable use of biological diversity. The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding (*There are many websites containing information on the Convention on Biological Diversity. A search of key words "biological diversity" produces numerous sites. The above information on the convention is taken from http://www.biodiv.org/*.).

Since 1988 when work on biological diversity began, there has been a growing consensus that biological diversity is a key element in sustainable management of the earth's resources. As such, management of the forest resource of biological diversity plays a vital role in sustaining human life. For the global village, biological diversity's value in society has increased. It is the first in a series of global resources (a resource that impacts all people across the world) to receive attention by international bodies.

Case Study: Butterfly farming in Costa Rica. Butterfly farming is an interesting example of biological diversity as a forest resource valued by society. The case study illustrates how values from an economically advanced society can filter its way to nations with large areas of natural forests. It also shows how transferring biological diversity to another region may lead to damage to local diversity. As such, butterfly farming has developed the economic infrastructure to enhance conservation efforts, and also illustrates limitations of market-based approaches.

A key to the success of butterfly farms is the availability of wild, viable populations of pupae to supply butterfly houses located in different regions and nations. There are thousands of species of butterflies, beetles and other insects in a single square kilometer of forest in Central or South America. The diversity found in these forests is key to

butterfly farming enterprises and butterfly farming is key to conserving large areas of natural forests.

Butterfly houses have increased in popularity recently. In Great Britain there are more than 65 butterfly houses and the butterfly exhibit at the San Diego Wild Animal Park is visited by over two million people a year. The benefits from these exhibits are great. Butterfly exhibits educate millions of visitors about the importance of invertebrates and the critical roles they play in fragile tropical forest. They act to reinforce positive values associated with biological diversity in both nations. The exhibits will continue in popularity and expand into other zoos and parks. The farms that supply these exhibits provide indigenous people local self sufficiency by promoting their ability to farm butterflies, ship pupae, and market them to a zoological exhibit. More importantly, from a forest resource perspective, they promote biological diversity in tropical forests by demonstrating the value (as captured by revenues associated with butterfly farming) of diversity of plants and animals in these forests.

Butterfly farming however has resulted in negative externalities. The introduction of exotic species to a new environment may result in competition for habitat with local species. Hence the transferability of the value for biodiversity requires an infrastructure to guarantee no other negative values are introduced.

1.7. Productive Capacity

Society also places value on a forest's productive capacity. The productive capacity of a forest relates to how a forest captures sunlight and processes it into usable nutrients, building soil productivity and contributing to the production of useful products, environmental services and benefits. Solar energy and the process of photosynthesis provide the energy for the forest to grow and maintain its broad array of resources.

The issue of sustainability is at the heart of maintaining the forest's productive capacity. With growing populations and expanding economies, managing the productive capacity of forests is valuable to maintain humankind's wants and desires. Augmenting the capacity of a forest to produce wood products takes on added value when less forest land is reserved for production of timber products. Concentrating timber production on fewer acres while demand for these products grows can only be sustained by improving the productive capacity of forests. Forest management in the U.S. is an example where harvesting constraints have both shifted the areas where harvest take place and investments have increased the productive capacity of existing forests.

Timber values play a critical role in allocating land use to timber production and improving the productive capacity of forests. In some areas, tree plantations with the purpose of producing timber goods may provide the most economically efficient means to satisfy timber demand. However, native forests managed for timber and other products still play the major role in providing timber outputs (*Work presented by Bare (this series) suggests about 33% of the world's industrial roundwood is produced by plantations. Outside the U.S., plantations may account for 15% to 20% according to the Center for International Trade in Forest Products Global Trade Model. Differences in these estimates may be due to definition differences of what constitutes a plantation*

versus a native forest.). As plantation areas grow in the future they will replace some of the native forests used for timber production. It is unlikely however that plantations can efficiently capture a major share of timber output in the near future since their establishment involves higher costs than managing native forests for a diverse set of outputs.

Maintaining high timber values will lead to more plantation establishments and greater management intensities of native forests. Tastes and preferences favorable to wood products must continue to maintain high timber values. Otherwise the forest's productive use value will decline changing societies needs and wants for the forest resource and eliminate the economic incentive to establish and expand plantation areas.

Case Study: Scandinavia versus the U.S. South. Traditionally, people's needs for housing and fuel make forests a valuable source of wood materials. Harvesting these products however has raised concerns of sustainability.

Has harvests exceeded the growing capacity of the forest to maintain its productive resource? Is the amount of new woody material produced by a stand of trees lower than the amount removed through harvests and how does it influence the system's productive capacity?

Boreal forests are confined mostly to the northern hemisphere. They are found in Scandinavia, the former Soviet Union, Canada and Alaska. These forested areas contain a large stock of standing timber. The boreal forests in Scandinavian countries have been managed over a long period of time. Forests resources of Finland and Sweden have been expanding since the 1970's.

During the last twenty years forest growth has exceeded forest drain. In 1991, forest growth in Sweden was estimated to be 90 million cubic meters per year. Forest drain for Sweden was 65 million cubic meters per year.

For Finland there is a similar situation with forest growth estimated to be 80 million cubic meters and forest drain reaching 55 million cubic meters per year. The management of the productive capacity of forests has resulted in an expansion of the amount of wood fiber per year over previous decades.

In contrast, the southern forests of the U.S. are facing mounting pressures on their resource. Recent studies on the growth/drain ratio in the South suggest that coniferous removals are exceeding growth. The average growth to drain ratio for several forest survey units was 0.74.

While the southern case is in stark contrast to the Scandinavian situation, an important concern raised by several groups revolves around the effect excess removals would have on the forest's productive capacity. Removals are a response to economic conditions. While the South will experience higher harvests, it is also projected that they will increase their management intensities on forests to maintain their productive capacity. Additional management intensities are likely to increase forests productivity but will only occur if timber values remain high.

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Biographical Sketch

John Perez-Garcia is an associate professor in forest economics at the College of Forest Resources, University of Washington. He received his B.S. in forest management from Rutgers University in New Jersey, his M.S. in agricultural economics from the University of Puerto Rico, and his doctorate in forest economics from Yale University"s School of Forestry and Environmental Studies. He works with the Center for International Trade in Forest Products at the University of Washington analyzing the interaction between international trade in forest products, trade policy and the environment using a global economic model of forest product trade.