

MANAGEMENT OF FORESTRY ENTERPRISES

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Summary

Forests have been a source of various useful products and services-resources-that have changed as societies changed. Forests are now recognized as dynamic, changing with natural disturbances, growth, and people's manipulations. People have used different resources, both as the forest changed and as human technologies, customs and values changed. Sometimes overuse has depleted the forest resource, causing several human responses: conserving the remaining resource, increasing the amount of the resource, using substitute products and services, migrating to areas of more plentiful resource, or importing the resource.

Forest management is recognized as a hierarchical system, with policy, "forest management" (in the narrow sense, see below 1.1), and silviculture being increasingly more site-specific levels in the hierarchy. The forest is also biologically studied as an "ecosystem". Management at all levels can be effective through modern management processes-especially rational, iterative decision-making.

Modern technology and communication is resulting in the emergence of a common set of values for forest management around the world, expressed in such documents as the Montreal Process Criteria for Sustainable Forestry. These contain several robust criteria for managing forests: protecting biodiversity, providing products, maintaining forest health, conserving soil and water resources, sequestering carbon, providing socio-economic benefits, and providing institutional frameworks for these criteria.

The same human responses to resource depletion described above are being used to address these criteria, with different responses successfully addressing different criteria. There are two approaches to increasing the resource: intensive plantations and "integrated" management (providing timber, biodiversity, and other values on the same area). Integrated management helps stem the current migration of people to cities as countries develop socio-economically. As policies develop which favor different responses, forest management (in the narrow sense) can help make the resource use more effective within each region and forest area; and silvicultural operations, pathways, and landscape management can specifically apply the management and policies to site-specific conditions.

1. The Forest as Many Resources

1.1. The Changing Values of Forests

Unlike agricultural fields or pastures, a forest does not grow one type of product that has been consistently needed for thousands of years. Instead forests have been a source of a variety of products and services used by different cultures and generations. For example, some cultures have relied heavily on forests for fuelwood, while others use coal or oil and ignore fuelwood. Sometimes the valued product is overused and becomes scarce-and there is a lag time before it again becomes abundant. Medicinal herbs that are collected too intensively may need time to reestablish. In forests that are overharvested for fuel or otherwise cut intensively, wood may be scarce until the trees regrow. Sometimes several things are valued in the same forest that may be compatible, such as medicinal herb collecting and bird watching. At other times they may be conflicting, such as wood use and protection of species using unharvested forest habitats. Sometimes natural events or human actions cause a permanent loss of a potential value, such as the extinction of a species. Rare forest species, such as the passenger pigeon and ivory-billed woodpecker, were once not valued, and so were allowed to become extinct. Sometimes new things emerge as values, and things once considered resources lose their value. Yew wood was once valued for bows in Europe, and small lodgepole pine trees were valued for constructing Native American homes in the past, but not at present.

A resource is a source of supply and support for human endeavors. A forest is not a single resource, but a dynamic mixture of many present and potential resources.

Managing a forest entails both sustaining many, often conflicting values and responding to changing values-as new values emerge and other things lose their value. The term "Forest management" is often used in two contexts:

- The general term for the human manipulation of forests from all perspectives-from broad-based policies to detailed manipulations of individual plants (i.e., forest management in the "broad" sense).
- The sub-discipline of forestry which is concerned with coordinating activities over areas of several hundreds to many thousand acres. This sub-discipline is more area-specific than "forest policy" but more generalized than "silviculture" (i.e., forest management in the "narrow" sense).

1.2. Approach of this Paper

This paper addresses overall forest management in the broad sense by discussing forest policy, forest management (in the narrow sense), and silviculture. It first describes the biological nature of forests, followed by a historical perspective of forest management-how forest use and conditions have changed and how people have managed those changes. It then gives an overview of the present approach to management of forests-what are considered values, what are their abundance, and how are they changed through policy, management (in the narrow sense), and silvicultural operations. This paper is intended as an overview, with the four subsequent papers addressing the four

components of resource abundance, policy, management, and silviculture in more detail.

2. Changing Understanding/Changing Resources

2.1. The Nature of Forests

Biologically, a forest is a terrestrial ecosystem dominated by trees. On the other hand, a forest is more than just trees; it contains a forest soil, forest understory plants, forest microbes and forest animals. Its ecological processes are characteristic of a tree-dominated ecosystem, as opposed to a grass- (e.g., prairie) or shrub-dominated ecosystem. As a result, a forest is still a forest for a period of time following the temporary removal of the trees by some disturbance process. However, it only remains a forest while in a treeless condition if the other features of a forest still dominate, and the processes of tree replacement are operating.

Forests are dynamic, changing in structures and species composition through growth, disturbances, and species migrations. These changes, however, generally proceed at a slow rate relative to people's life spans-and certainly their memories. Throughout most cultures, human activities in forests were so frequent and communication across areas was so poor that the impact of natural disturbances which occurred only every few decades were overlooked, although these could have profound effects on the forest structure and species composition for the succeeding decades and centuries. As a consequence, most cultures have misperceived forests as stable and static; this misperception has dramatically affected forest management.

All forests can provide wood, habitat, and other general resources; however, forests in different parts of the world contain different plant and animal species and grow at different rates and so provide slightly different values. Approximately six biogeographically distinct groups of species exist in different parts of the world. Within the past 10,000 years, the extent of the world's forests have both increased and decreased dramatically, first with glacial retreat and climate changes following the most recent Ice Age and then with human cutting, clearing, burning, and regrowing the forest. New forest communities have emerged as plant and animal species migrated thousands of miles crossing continents and floristic realms.

Superimposed on this slow, but dynamic, change in species composition is the more rapid change in forest structures (Figure 1) that proceeds as trees are destroyed by minor or stand-replacing disturbances and regrow. A forest in a given area can change in structure in one or several decades-rapidly enough to change between human generations but slow enough to give the illusion of stability.

Each structure provides habitat for certain species (Figure 1) as well as providing other resources, such as grazing areas and open lands for crops in the open and savanna structures, and wood for fuel, building, and tools in the closed forest structures (dense, understory, and old growth). Different geographic areas with different climates naturally contain more of some structures than others and so provide more of some habitats than others. Arid regions contain dense, understory, and old growth forest structural types primarily along rivers and streams, and grade into savannas and permanent or semi-

permanent grasslands as the slopes became drier. Moist, warm regions contain large expanses of dense, understory, and old growth forest structural types, with savanna or open structures more common where natural or human disturbances have recently occurred.

FORESTS EXIST IN A VARIETY OF STRUCTURES SOME SPECIES DEPEND ON EACH STRUCTURE

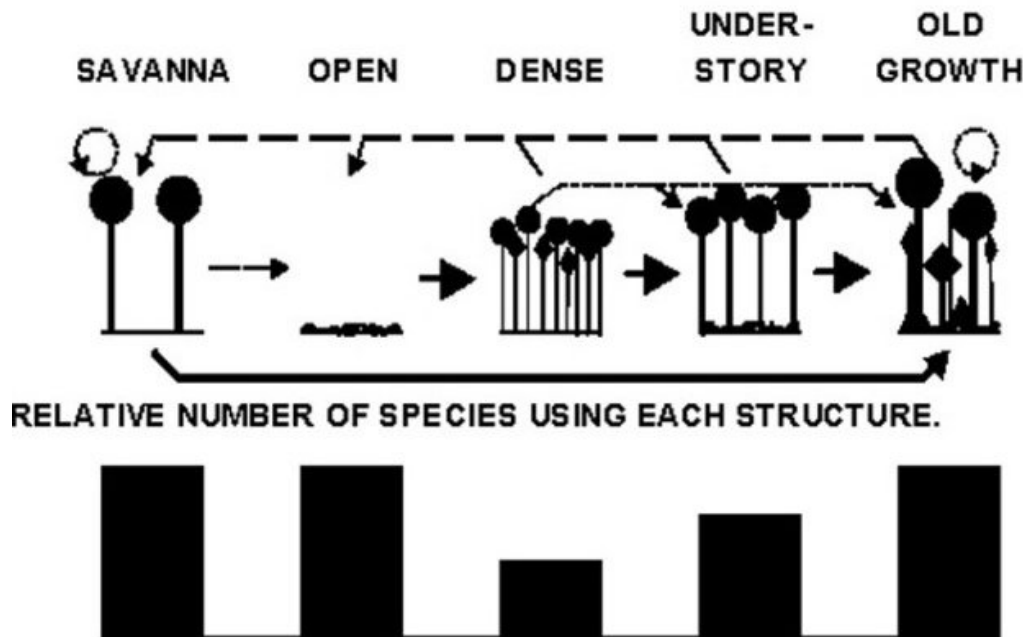


Figure 1. Forests naturally contain a variety of stand structures. The structure in each area changes with disturbances and regrowth. Some species depend on a specific structure for habitat.

2.2. Historical Perspective

2.2.1. Early Uses

Human societies with distinct norms, organizations, and ways of living have developed in a variety of climates with a variety of forest species and different natural relative abundances of the different forest structures. For example, Central American Mayan and Southeast Asian Khmer (Angkor Wat) cultures developed in moist climates, probably carving farms and cities out of thick forests largely in the dense, understory, and old growth structures. Egyptian, Hitite, and Babylonian cultures, on the other hand, developed in dry climates with large open (and non-forested) areas and less abundant closed forests (dense, understory, and old growth structures) isolated in moist topographic positions.

Nearly all human societies have made use of the forest structures and products as resources to varying extents. The exact uses of each society probably depended on evolving cultural influences and on the condition of the forest. The forest was used as a

source of wood fuel by nearly all early cultures; however, in dry areas the forest was also regarded as a threat-and sometimes intentionally burned near living areas to prevent wildfires from destroying the villages. The dense forest was used as a place of refuge for hiding during times of peril, but was also destroyed or avoided at other times since it could provide hiding cover for enemy ambushes. The forest provided habitats for plants and animals that could be sought for food; but at times the forest was burned to provide more open and savanna habitats where wild and domestic animals and food plants would thrive better. Different forest structures provided other products as well. Open, savanna, understory, and old growth forests provided medicinal herbs, while dense structures provided small trees for tools, shelter, and fuel. Before sophisticated tools existed to cut large trees efficiently, these small trees were often a greater resource than the larger ones.

Forests in specific locations were also maintained in certain structures for flood, erosion, and avalanche protection just as other structures were maintained for fire and ambush protection, commodity use, and food provision. Some areas were also identified for intrinsic values such as religious or recreational uses.

2.2.2. Resources Change

Forests have always changed with species migrations, natural disturbances, and climate changes. For the past several thousands of years, people have also changed forests as they used them. These changes have had several effects on people:

- the amount of the different resources has changed-sometimes increasing, sometimes decreasing;
- the use of some resources has conflicted with the use of other resources;
- new resources, or uses of the forest, have emerged and old ones sometimes disappeared.

People affected the forest resources both as the resources were used and as the structures that provided the resources increased or decreased in abundance. For example, over-harvesting forests for fuelwood in areas of rural subsistence agriculture caused both a decline in the fuelwood resource and a decline in the closed forest structures and the medicinal herbs and other plant and animal species that needed these structures.

Uses of different resources conflicted with each other in several ways. Conflicts arose when the same material could be used for different, mutually exclusive purposes; for example, wood could be used for either fuel or building fences or shelters, but not both. Conflicts also arose because a forest area could be useful for different purposes when in different structures; open structures were useful for livestock grazing, but the livestock often prevented regrowth of trees, causing fuelwood shortages.

Uses of the forest changed with time as well. When trees were depleted, local people often turned to other sources of fuel-animal dung or fossil fuels. In some cases, these alternatives continued to be preferred even after trees had regrown and again became available. Technologies also changed uses; for example, better tools allowed larger trees

to be cut for fuel and shelter, thus making these trees more of a resource. Similarly, domestication of animals reduced the use of wild animals for food. The use of steel, concrete, and other products have reduced the use of wood in construction, especially in ships, airplanes, and other specialty areas. Technology and other factors also allowed wood and other forest products, as well as services such as recreation, to be transported longer distances, thus increasing or decreasing the use of local forests.

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Biographical Sketches

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