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Introduction to Forests and Renewable Resources

Seventh Edition

Grant W. Sharpe John C. Hendee Wenonah F. Sharpe

INTRODUCTION TO FORESTS AND RENEWABLE RESOURCES

SEVENTH EDITION

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INTRODUCTION TO FORESTS AND RENEWABLE RESOURCES SEVENTH EDITION

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*In Memory of Clare W. Hendee,
1908–2001.
Formerly, Deputy Chief of the
U.S. Forest Service and forestry
instructor at the University of
Maryland; co-author of the fourth,
fifth, and sixth editions of this book;
wonderful father, grandfather, and friend.
“Do the right thing anyway.”*



(Courtesy of USDA Forest Service)

PREFACE

It is said that the only constant in the world is change, and certainly policies and practices in the conservation and management of forests and other renewable resources are proof of this observation. This seventh edition of *Introduction to Forests and Renewable Resources* embraces these changes in the United States and beyond.

In Part I, the centrality of forests to the human enterprise is evident in Historical Uses, as well as in the story of the United States's awakening to the necessity of forest conservation and environmental protection. Policy is shown to be shaped by the pressures of events and ideas, underscoring its susceptibility to change. Policy today must respect major environmental protection laws and incorporate public input.

Part II deals with the distribution, management, and protection of forests, beginning with an overview of North American Forest Regions. Forest Ecology follows, wherein the focus shifts to the natural processes operating on trees to influence their growth in forest ecosystems.

The central management tool of forestry—silviculture and its several varied applications—and its evolution in meeting the emerging mandates for biodiversity and ecosystem management, comes next. A section on restoring and maintaining forest health reminds us that past practices have not always had good long-term results. Closely allied with this issue, the next three chapters in Part II address other forest health issues: Damage from Insects and Mammals, Disease and the Elements, and finally, the complex issues of Fire Management, an

increasing focus in the United States under a new 10-year national fire plan.

Renewable resources associated with forests are examined in Part III. Gerry Wright's absorbing chapter on Wildlife Conservation and Management, and Mike Falter's discussion of Watersheds and Streams, are followed by Kendall Johnson's chapter on Rangeland Resources. These three chapters give full coverage to important forest and natural resource topics, thereby improving our understanding of important current issues.

Part III concludes with Outdoor Recreation and Wilderness Management, in which Steve Hollenharst joins the text's authors in addressing outdoor recreation benefits, providers, and management techniques. Next, the beginning and growth of the wilderness movement and principles of wilderness management are discussed.

Moving out of the forest and into the marketplace in Part IV, we start off with Harvesting Trees and associated considerations, going next, with contributions from Tom Gorman, to a complete coverage of Forest Products, stressing the role of efficiency and innovation in both these areas. A chapter on Economics illustrates principles of economic analysis applied to forests and renewable resources and how federal and state assistance programs seek to stimulate private forest productivity and conservation. Finishing up Part IV, Mike Vasievich covers traditional and new methods of Measuring and Analyzing Forests, including evolving computerized techniques and internet applications now affecting management.

Part V describes how all the activities are applied by federal, then state governments, and on private lands, including the timber industry and those private but nonindustrial owners who control a major portion of U.S. timberlands. These chapters present vital information for those confused over who owns what and how they manage it, and the emerging influence of green certification of forests and forest products. Also in Part V, Mike Bowman describes Urban Forestry, including the rewards and problems of trees, and in some instances, forest ecosystems existing side by side with high-density populations. In the final chapter of this section and of the book, we discuss the importance of International Forestry, including the organizations involved, global warming, and the advent of global markets and their effect on forests and renewable resources today.

This text, through its six previous editions, has been likened to an encyclopedia in that it has always had not only a broad coverage of the forestry enterprise, but also a comprehensive index and useful appendices. These features remain. The list of resource legislation, and the metric conversion factors, tree mammal and bird names, professional societies for natural resource personnel and influential environmental groups, still serve the inquiring student and general public, as does the glossary. New to this edition are numerous Internet references to information sources, a list of literature cited in each chapter, and a bibliography of suggested additional readings. At the request of instructors, study questions are included.

We are confident this seventh edition will introduce tomorrow's natural resource managers to the expanded scope of their responsibilities. Furthermore, this edition will assist those in related disciplines, as well as the general public, in understanding the complexities of forest and renewable resource conservation and management. We trust this edition will advance the stewardship of forests and renewable resources wherever it is used.

ACKNOWLEDGMENTS

A book on such a comprehensive field as forests and renewable resource management requires a good deal of help from our colleagues. As in the sixth edition, we called on several individuals to draft chapters on topics beyond our expertise, and they are listed here and in the particular chapters to which they contributed. Other colleagues contributed specialized material to supplement our efforts. Nevertheless, having reworked every chapter many times, we accept full responsibility for the technical accuracy of this seventh edition.

For contributing individual chapters we thank the following colleagues: Chapter 9, Wildlife Conservation and Management, Dr. Gerald Wright, National Park Service, Cooperative Park Studies Unit and Professor of Wildlife, University of Idaho; Chapter 10, Watersheds and Streams, Dr. Mike Falter, Professor of Fisheries, University of Idaho; Chapter 11, Conservation and Management of Rangeland Resources, Dr. Kendall Johnson, Professor and Head, Department of Range Resources, University of Idaho; the first half of Chapter 12 on Outdoor Recreation and Wilderness Management, Dr. Steve Hollenhorst, Professor and Head of Resource Recreation and Tourism Dept., University of Idaho; Chapter 14, Forest Products, Dr. Tom Gorman, Professor and Head, Department of Forest Products, University of Idaho; Chapter 16, Measuring and Analyzing Forests and Renewable Resources, Dr. Mike Vasievich, USDA Forest Service, Human Dimensions Unit, USDA Forest Service, East Lansing, Michigan; and Chapter 20, Urban Forestry, Mr. Michael Bowman, USDA Forest Service, retired and presently Urban Forester, Lewiston, Idaho.

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Grant W. Sharpe
John C. Hendee
Wenonah Finch Sharpe

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Forests:

Historical Uses and Future Values

Chapter Outline

Introduction

Human Use of the Forest

Emerging Uses and Values

Forests for Growing People as Well as Trees

Building the Country with Forests

Forest Industries in Colonial Times

Building a Wooden Navy

Forests and the Early Villages

Industrial Revolution Finds the Lumber Business

Subsidizing Farms and Transportation with Land and Forests

Future Values

Summary

Literature Cited

Additional Readings

Study Questions

INTRODUCTION

Even as forests recede in size, they move closer to center stage in matters of global concern. Demand for wood products is higher than ever and continues to increase. Furthermore, attention is being focused on forest resources in new and unprecedented ways. Scientific research is developing new uses for wood as well as discovering the importance of forests and forest ecosystem processes to the global climate and the atmosphere. The understanding that forests are more than trees—that they are ecosystems whose health is reflected in the quantity and quality of water emerging from them and the biodiversity they support—has made some headway against exploitive attitudes in many parts of the world, our own included. We are also rediscovering the connection among forests, outdoor experiences, and the spiritual and emotional well-being of urbanized populations. Amid all this we must remind ourselves that millions of people still burn wood to cook their food and to keep warm, and that in many developing countries forests are still slashed and burned to provide land on which to grow food.

HUMAN USE OF THE FOREST

Even though we might think of our ancestors primarily as cave dwellers, the long prehistory of humans is deeply involved with forests and the diverse riches to be found there. Not only does it seem likely that we descended from tree-dwelling primates, but when the move to the ground was accomplished, the forest and its edge continued to function as a place of safety and as a source of food, fuel, clothing, and materials for shelter. Primitive dwellings with pole frames, as shown in Fig. 1-1, often had a thatch of grasses or bark or the skins of animals stretched over them. Later, logs and timbers were used. The forest has always provided wood for human use.

Nuts, berries, fruits, buds, and roots, as well as fish and game animals, were to be found in, or in association with, forested areas. The first tools, as well as the first weapons, were possibly splinters or branches. The discovery of how to keep and use fire, the idea of the wheel, and the concept of the lever are among the concepts that grew from our use of wood. From the stone-ax handle and the branch that served as a crude spit, through the period of wooden ships to the innumerable forest products of the present, hu-

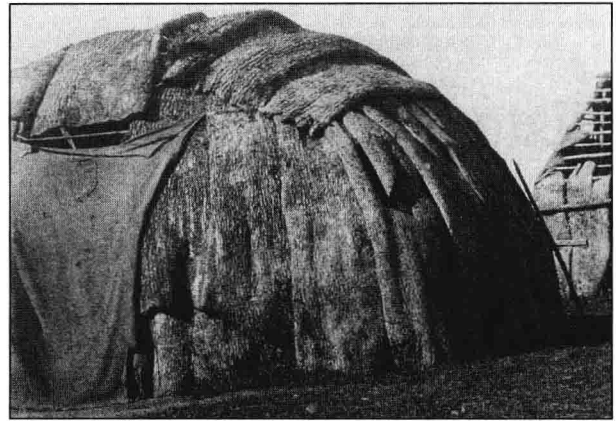


FIGURE 1-1

A wigwam of poles and ash bark built in 1899 by Chippewas, Lac Courte Oreille Reservation, Wisconsin. (Courtesy of the Smithsonian Institution)

mans have coupled their inventive genius with the materials from the forest to make life both easier and more complicated.

Water represents another, and even more immediate, need of humans, but without the covering forest, watersheds cease to produce a regulated flow of clear water, and navigable channels may become silted in. Forests serve in this way wherever they exist.

In this new century and millennium, wood remains highly valued for its beauty, warmth, and reassuring “naturalness.” Although many substitutes exist, wood itself appears indispensable in some situations. As it has yielded up its secrets to science, use of the chemical and structural components of wood fiber has undergone a rapid evolution in recent decades, and the results are pervasive, although often unrecognized. Besides paper in all its complex and vital forms, residues and chemicals from wood and various treatments of wood provide components for items ranging from photographic film to chewing gum and vitamins. Lignin, a basic component of wood, may some day yield food value for humans, if we can unlock the secrets that allow some animals to convert it to energy through their digestive processes.

Despite this highly technological use, part of the world continues to depend on wood for fuel and shelter; and shifting cultivation, which can deplete both forests and soils, is still found in developing countries, where it is intensified by population growth (Fig. 1-2).



FIGURE 1-2

Wood is the most accessible and cheapest source of energy for rural populations in developing countries. These rural Pretoria South Africans are bringing in water, and *acacia* branches for fuel. (Photo by R. J. Poynton; courtesy of National Academy of Sciences)

Given the productivity of the forest for domestic use, it is not unreasonable to believe that it must have been equally important in early defense and aggression. Weapons, fortifications, concealment—these and other uses are apparent in historical accounts, but it is the role of timber in naval activities that we see most clearly. Until the advent of the iron ships in the mid-nineteenth century, a supply of naval timber was an absolute necessity for nations seeking world trade and power. Concern over the scarcity of high-quality naval timbers in northern Europe in the sixteenth and seventeenth centuries prompted the planting and protection of desirable species. When one considers the amount of timber needed to build and maintain merchant vessels, let alone the huge, fragile naval fleets that rotted even as they were being built, or burned and sunk in battle and broke up as a result of storm or navigational damage, the political and strategic significance of certain forests becomes evident.

Trees and their associated plants and animals (assemblages that we call *forests*) from ancient times have figured prominently in animism and other religious expressions. The size, strength, and longevity of trees, added to their beauty and their bounty, inspire respect and even affection. Yet fear has tinged human attitudes toward the forests, too; at various

times they were seen as the haunt of pagan gods or of Christian devils as well as savage beasts. In the new world, vengeful natives were added to this list. Forests serve as hiding places for illicit activities and for fugitives even today, as well as sanctuaries for those seeking privacy and solitude for more conventional reasons.

Emerging Uses and Values

The word *forest* originated in the idea of an area where the common people might not go. *Silva forestis* meant woods lying outside those for common use, or wooded areas reserved to protect the beasts of the forest and their habitat. At first this was done to protect the hunting grounds of Norman kings and nobles; later the reason was financial returns from use taxes and “exits,” as forest products were called (Young, 1979). For Europeans, one of the great advantages of getting out from under feudalism and its lingering effects may have been the right to fish and hunt in the forests of the new world. This privilege is so much a part of our heritage that we take it for granted. Out of this use of the forest, the phenomenon of recreational use emerged in the twentieth century, and seems likely to continue and grow in the twenty-first. In the United States and