# FOREST PRODUCTS Their Sources, Production,

# and Utilization



ITS

H



#### A. J. PANSHIN Professor of Forestry; Michigan State College

E. S. HARRAR

Professor of Wood Technology, School of Forestry Duke University

### W. S. BAKER

Chief, Technical Administration, Oregon Forest Products Laboratory

P. B. PROCTOR

Technical Director, Oregon Forest Products Laboratory

McGRAW-HILL BOOK COMPANY

## FOREST PRODUCTS

#### Their Sources, Production, and Utilization

BY

#### A. J. PANSHIN, PH.D. Professor of Forestry, Michigan State College

E. S. HARRAR, PH.D. Professor of Wood Technology, School of Forestry Duke University

#### W. J. BAKER, M.S.

Chief, Technical Administration Oregon Forest Products Laboratory

#### AND

P. B. PROCTOR, PH.D. Technical Director, Oregon Forest Products Laboratory

FIRST EDITION

McGRAW-HILL BOOK COMPANY, INC. NEW YORK TORONTO LONDON 1950

#### PREFACE

Forests constitute one of the most valuable assets that may be possessed by a nation. Their inherent worth is based on the products and benefits they yield continuously when managed as crops and given sufficient protection against fire and other destructive agencies. Wood-producing and wood-using industries rank high in the economic life of nations favored with adequate and productive forests. Although wood is the major raw material of the forest, a great variety of other products from trees and associated vegetation has permitted the establishment of many highly specialized industries. Since forests are a renewable resource, industries based on continuous conversion of forest products contribute to a stable foundation for the economic development of communities.

The range of usefulness of forests is not, of course, confined to the utilization of material products. Water conservation, protection of soil against erosion, recreational facilities, and a multitude of other advantages associated with forests are also important. Forest managers, while striving to obtain the maximum yield of marketable products, should also recognize the other benefits and services that forests can render to a community and to a nation as a whole. Consideration of these latter benefits, however, is not within the scope of this book.

Because of the diversity of products and the numerous methods and processes employed in their conversion, a complete exposition of forestproducts utilization would fill many volumes. Space limitations, particularly in connection with a textbook, necessitate a compromise between the breadth of subject matter covered and the extent to which individual topics may be considered. In preparing this text, therefore, the authors have attempted to place major emphasis on the more important phases of forest-products utilization. Basic concepts have been stressed; detailed costs and statistics have been largely excluded because they are usually obsolete before a book comes off the press.

It has been said that a textbook may be likened to a pair of crutches; it assists the tyro until he can walk alone in his chosen field. Once basic principles are mastered, he can, through further study combined with practical experience, become proficient in any specialized field that may attract him. This book contains basic information. The selected references at the end of each chapter point the way to further specialization.

#### CONTENTS

PAGE

PREFACE	v
PART I—ECONOMICS OF FOREST UTILIZATION CHAPTER 1. Timber Resources and Their Importance in the Economy of the United States 2. Wood Residues and the Related Problems of Wood-utilization Research 3. The Relation of Wood Properties to Wood Utilization	3 14 40
PART II—WOOD PRODUCTS	
4. Round Timbers	55 83 104 114 133 174 210 232 240 248 268
PART III-CHEMICALLY DERIVED PRODUCTS FROM WOOD	
<ol> <li>Pulp and Paper</li></ol>	287 346 369 377 403
PART IV-DERIVED AND MISCELLANEOUS FOREST PRODUCTS	\$
20. Naval Stores	417 454 469 483 495
INDEX	