

The Economic Problems  
of Forestry in the  
Appalachian Region

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## PREFACE

THIS BOOK is aimed at defining the field of the economics of forestry and outlining the economic problems of forestry as background for research. Its ultimate purpose is to aid in solving the forestry problems of the people by encouraging better understanding and more pointed research in attacking these problems. The book deals specifically with the Appalachian Region — the five southern Appalachian states of Kentucky, North Carolina, Tennessee, Virginia, and West Virginia — in the years adjoining 1940. But the theoretical issues proposed have wider applicability, and the point of view taken may be of general interest to those concerned with forest-resource management. In a sense, therefore, the Appalachian Region and the time context chosen are used merely for convenience in providing concrete illustrations of principles.

The approach, however, is regional. An attempt is made to view the forestry problems of each locality against the background of the economy of the whole region. Likewise an attempt is made to view the problems and the needs for research in each branch of the field of forestry economics in relation to conditions in the entire field as they appear from the regional level. It is assumed that the relative importance of problems and the relative need for different lines of research will be judged to a large extent on the basis of regional considerations — and, it should be added, of regional considerations of the long run rather than the short run.

The field of forestry economics is still largely unformed. It is an advantage that there are no well-established precedents that must either be followed or be overcome with great difficulty, but it is a disadvantage to the single worker that the field is so largely uncharted and that so much of it remains to be discovered and developed. The work of exploration lying ahead is not a job for one person or for one research organization. The writer of this book cannot do more than sketch the merest outlines of much of the material with which it deals.

The definition of a field of research itself requires research in

that field. Research and definition of the field tend to develop together. There are advantages in looking out ahead of current development and in charting the field, if only tentatively. But insufficient knowledge makes it difficult to advance the charting process considerably beyond the stage of current research development.

The task of problem analysis is a case in point. Research and problem analysis go hand in hand: each is improved as the other is improved. The type of research in question here is not the compilation of facts, but research in a fuller sense. For example, a major forestry problem is reputed to be the misuse of land: the use of it for forest production where some other use is more economical, or vice versa. But the existence of this problem may not definitely be confirmed or analyzed until the best use of land is known, and this, in turn, calls for research.

In view of the limited development of research in the economics of forestry and the preponderance of mere fact compilation in such research as has been done, the present analysis is of necessity both tentative and incomplete. This fact is underscored in such branches of the forestry-economics field as marketing and income, where investigation has been especially meager.

This book is limited in another sense, in that it deals with research only from the regional or narrower than regional viewpoint. It does not deal with aspects of the economics of forestry involving interregional, national, or international considerations. It cannot, therefore, treat such matters as interregional competition in an exhaustive manner, and it must disregard altogether such questions as international trade, tariffs, and national and world policy.

W. A. D.

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## INTRODUCTION

## INTRODUCTION

### FIELD OF THE ECONOMICS OF FORESTRY

THIS ENTIRE BOOK serves as a definition of the economics of forestry. It is best to let that definition unfold gradually. However, it may be helpful at the outset to indicate summarily the content of forestry economics<sup>1</sup> and some of the principal characteristics of the field.

### CONTENT OF THE FIELD

In society as we know it, mankind has many wants. Man fills these wants by producing goods and services, using for that purpose the productive factors — land, labor, and capital — which he combines and operates in accordance with such technology as he has developed. But man cannot totally fill his wants, because the supply of productive factors is not sufficient. He is therefore obliged to “economize” these factors: to allocate them among their alternative uses.

Economics may be regarded as the science of the allocation of productive factors and the application of productive technology, in the light of consumers' wants, to maximize human satisfaction.<sup>2</sup> Forestry economics would then be that branch which is especially concerned with the allocation and application of forest resources (productive factors and technology).

In this book the field is regarded as including the economic aspects of the use of forest land and the genetic production of forest products as well as the economic aspects of the further production (extraction, processing, and distribution) and the consumption of forest products insofar as these are closely related to forestland use and forest production. These terms are used broadly. The term *forest land* is intended to be interpreted in such a way

<sup>1</sup> The writer is indebted to Mr. Paul E. Malone, formerly of the United States Forest Service, for helpful suggestions concerning the approach to this section. For some brief definitions of forestry economics, see Appendix.

<sup>2</sup> Some considerations pertinent to evaluating human satisfaction are discussed later in this introduction.

that the question of the utilization of land may be regarded as a part of the economics of forestry where forestry is one of the possible alternative uses. The term *production* is meant to encompass all the productive processes that lead to consumption of forest goods and services, not least among them being the generation, growing, and culture of the forest (forest production). The term *forest products* includes not only such physical goods as trees, logs, wooden articles, resin, forage, domestic stock, and wild life; but also such services as aesthetic and other recreational attractions and the storage and regulation of water.

The economics of forestry as outlined here may seem to cover more than its proper ground. It may be argued that the manufacture of products is not legitimately a part of the economics of a genetic industry, but falls more properly within the sphere of industrial economics; or it may be felt that the question of alternative uses of land is the province of "land economics," which is concerned with all types of land, rather than forestry economics, which is concerned primarily with forest land. But the overlapping of fields upon many subjects is perfectly proper and may help the progress of research. There are few subjects which can be claimed as the exclusive possession of any one field of study. The economics of forestry itself is compounded of a variety of physical, biological, and social sciences. Its nucleus is the economics of forest production; but to understand the elements of production requires a consideration of marketing, prices, processing, and consumption as well. The economics of forestry shares these subjects with other fields of study and considers them only insofar as they bear significantly upon forest production.

The view taken here of forestry economics excludes, however, so far as possible, those aspects of forestry belonging chiefly to branches of social science other than economics. This interpretation is probably narrower than is customary. It is quite usual, in fact, to include within forestry economics both the sociological and the economic aspects of forestry.<sup>3</sup> There is a close relation between these two fields which makes it difficult to draw a separating line between them. Nevertheless, in the present study, it is con-

<sup>3</sup> Social Science Research Council, Subcommittee on Scope and Status of Research in Forest Economics, *A Survey of Research in Forest Economics* (Soc. Sci. Research Council Bull. 24; vii + 52 pp.; New York, 1936), p. 4.

sidered appropriate to isolate the economic aspects as far as possible.

### ECONOMICS A LINK BETWEEN THINGS AND PEOPLE

The science of economics, informally speaking, is concerned with the use of productive factors and technology in satisfying human wants. Economics takes as its subject, on the one hand, resources such as forests, labor, managerial skill and experience, credit facilities, logging and milling methods and equipment, and the means for commodity distribution. On the other hand it considers the wants of the people who stand ready to consume lumber and wooden articles, forest-recreation services, and other products. It takes these two elements of human activity, the producing and the consuming, and studies the principles whereby, in the process of value and price formation, the outputs in the various lines of production are equated to the demands for consumable goods and services, and whereby the consumable product of human activity is distributed among the factors responsible for its production.

To say that economics is concerned with value and price is not to say that it is concerned, necessarily, with dollars and cents. It derives its principles in those human motives out of which arises a standard for evaluating the relative worth of different commodities and lines of action. This standard is the power to satisfy human wants by goods and services with a minimum of pain and labor.

Thus, in a sense, economics is a study of the link between man's physical environment on the one hand, and his labor and enjoyment in it on the other. In the same sense, economics is a link between the naturalistic sciences and psychology. Its relation to the former is of interest here. Let us suppose that a bridge is proposed across a certain body of water. The question of whether it is physically possible to build this bridge is an engineering question, as is the question of how to go about constructing it. But the question of whether to build the bridge is an economic one; it is a question of evaluating alternative means of transportation, among which the bridge is one. Again, suppose that a new variety of vegetable is envisioned, having special qualities. Whether this variety can possibly be developed is a question for the biologist, as is the question



of how to develop it and subsequently how to cultivate it. But the question of whether to develop it for use, and whether it will be used, is an economic one.

Biology and engineering are the principal naturalistic sciences linked with the economics of forestry. They are the sciences concerned with the physical task of producing trees and with harvesting, processing, and transporting them. With respect to these sciences on the one hand and human social psychology on the other, the function of forestry economics is a coördinating function — to evaluate the methods and results of the biologist and the engineer in terms of human satisfaction.

In research, the naturalistic branches of forestry are coördinate with the economics of forestry. As an applied science, and in its pure-science phases as well, the economics of forestry customarily builds upon and interprets the work of the biologist, physicist, or chemist. Sometimes the latter may carry on from principles developed by the economist. But it is the economics of forestry which, in the last analysis, must provide the link with human motivation. It is the task of forestry economics to determine the optimum stand of timber after the biologist has determined the range. It is the function of economics to investigate which of several alternatives defined by the engineer or biologist is the most acceptable — which of them contributes to the greatest human satisfaction. It is a function of economics, also, to aid in evaluating the worth of research results and, by the same logic, to aid in evaluating proposed studies.

Since the ultimate objective of all forestry research is to help solve problems of the people — to help maximize human satisfaction — it follows that all forestry research has in it elements of economic analysis as well as of biological or physical analysis. Only studies of methodology may lack this dual character, and they too, when applied, take on the dual form.

The essentially economic character of forestry research is obvious in many cases. Take for example a study of planting methods. The purpose of this study is to find the best method for given conditions. Obviously the best method is not necessarily the one requiring the least effort or the one resulting in the highest survival of trees. The best method is that producing the greatest excess of survival over effort. To find a common denominator for

survival and effort and measure the amount of the excess is a problem in economics, calling for the use of economic techniques. The engineering and biological phases of the study are concluded when effort and survival are determined. Regardless of the individual who carries the study to termination from that point, the research involved is economic, and not physical or biological.

Some types of forestry research contain applications of economics which are so simple that they are taken for granted or are not recognized as such. Another example in the field of forest regeneration is a proposal to determine the best kind of trees to plant for timber on a given site. Of the kinds available, it is found that only shortleaf pine grows well; the others do very poorly. That shortleaf pine is best appears obvious, and it appears that this conclusion has been reached solely within the field of biology and without reference to economics. Actually, however, behind this conclusion lay an appraisal of the usefulness of the products which would result from the plantation. This economic appraisal was automatic and was taken for granted. If the only kind of tree that would survive well had been scrub oak, a tree whose value for timber is in some doubt, the economic character of the problem would have been more easily recognized; or if there had been a choice among alternatives, the economics would have been more readily recognized. Furthermore, although the question of the best tree to plant has been answered, the question of whether to plant it has not been answered and cannot be answered by either biology or engineering.

In the study cited, it was possible to take for granted what would have been regarded as an economic commonplace, and to let biology alone find the answer. To carry this practice far is risky. It may lead to the conclusion that what is biologically most successful or physically most feasible is therefore best for man — as, for example, that the fully stocked forest or the most rapidly growing trees or the most complete control of forest pests is the best for man. Further, what is best for man may even be lost as an objective: what is best for the forest, or the trees, or the soil may become the objective.

Some types of forestry research, on the other hand, appear not only to have an obvious economic character, but even to be exclusively economic. Such, for example, are certain studies in mar-

keting or in income. Disregarding methodological research, it will be found that these studies are no more exclusively economic than are any studies with the human objective. They may have in them a larger proportion of economic analysis, but they are still based upon biology and engineering. They must either take as given or investigate the technology of forest products, transportation, milling, communication, storage, packaging, and the like.<sup>4</sup>

The point made, then, is that economics — firmly rooted in biology and engineering — plays an essential part in nearly all forestry research. This has nothing to do with the question of the administration of research projects. It is assumed that individual projects should be led by biologists or economists according as the techniques chiefly involved are those of biology or economics. Regardless of administration, there must be close collaboration between the two groups of workers. It is a principal thesis of this book that fuller use of economic techniques can advantageously be made in forestry research. One purpose is to show where those techniques can be used. Another purpose is to demonstrate the usefulness of the "economics approach" and the "economics viewpoint" in forestry research. The approach is a system of research methods; the viewpoint is that of human welfare.

#### SOCIAL ECONOMICS AND PRIVATE ECONOMICS

It is possible to take one of two viewpoints toward economic analysis. On the one hand such analysis may be aimed at solving the problems of the individual person or firm or industry. The objective here, in general, is to maximize private profit. On the other hand analysis may be aimed at solving the problems of communities of people or of society as a whole. The objective here is to maximize the general economic welfare. These two types may be synonymous; often they are not.<sup>5</sup>

The position to be taken in this book is that the economics of forestry is concerned in large measure with social, not necessarily private, objectives. In part the necessity for this position arises from the character of forest resources and of forestry. In part it

<sup>4</sup> John D. Black, ed., *Research in Marketing of Farm Products—Scope and Method* (Soc. Sci. Research Council Bull. 7; 221 pp.; New York, 1932), pp. 4-5.

<sup>5</sup> Bernhard E. Fernow, *Economics of Forestry* (xii + 520 pp.; New York, 1902), pp. 1-4.

arises from the exercise of scientific disinterest<sup>6</sup> where public and private points of view are incompatible.

To accept social interest as the major concern of the economics of forestry, however, is not to disclaim the study of private enterprise. Nor is it to deny the feasibility of forest production under the private-profit system. Indeed, the economics of forest production by the individual firm — that is to say, private forest management — is a large segment of the economics of forestry.<sup>7</sup> The objective here is the organization of the factors of production available to the individual manager — the land, forest growing-stock, labor, and equipment and other capital — in such a way as to maximize net income.

In its study of the individual firm the economics of forestry holds, however, to its central function: the evaluation of alternative lines of action as means of satisfying human wants. It is in no sense either bookkeeping or accounting, nor does it, in general, employ the procedures developed in those fields. Much of the formalism of the accountant, where it is more than just an aid to arithmetic, has arisen in response to legalistic and other institutional requirements sometimes foreign to the progress of scientific inquiry.

In its social aspects the economics of forestry is concerned with the values of forestry and the costs of forestry to society, whether it be the community or the world. A principal inquiry of the economics of forestry is how forest resources (productive factors and technology) may be apportioned and used as a part of the apportionment and use of all resources for the maximization of the general economic well-being or human satisfaction. The objective is not necessarily to maximize the net return from forests, but to maximize the general net return. Neither is the objective for the community to receive the greatest possible net income from forests, but for it to receive the greatest total net income compatible with the welfare of other communities, the forest contributing as it may to this greatest total.

It is apparent that in taking the social approach the economics

<sup>6</sup> Disinterest in the sense that the welfare of no single group in society is regarded as more important than that of other groups. A bias, however, in the sense that the social welfare is arbitrarily given priority above the individual welfare.

<sup>7</sup> Ralph W. Marquis, *Economics of Private Forestry* (viii + 219 pp.; New York and London, 1939).

of forestry is obliged to look beyond forestry to the other segments of the economy and to see forestry in relation to these other segments. This is necessary because forestry is only one of many branches of production, all of them to some extent competing for the use of the same land, the same labor, and the same capital; and all of them turning out products to be consumed by the same society. Thus a second coördinating function of economics is added to that described in the preceding section: the function of evaluating action within a single field or area in the light of conditions in other fields and areas, the function of appraising the problems of forestry in their relation to one another and to the balance of the economy. This is the function of economics because the common denominators needed for such an appraisal are of an economic order.

This necessity for dealing with many considerations outside the specific field of investigation is not peculiar to economics or the economics of forestry. It is a characteristic of most applied sciences. The forester making studies in the field of planting uses as equipment the data, laws, and techniques of a variety of physical and biological sciences, including not only forestry in a limited sense, but also soils technology, plant physiology, chemistry, and engineering. The forester making studies in the field of fire protection uses methods and knowledge proper to such fields as meteorology, physics, and even psychology. The forester making studies in the field of economics is no more of a generalist than these others.

### OUTLINE OF SUBJECT MATTER

To complete this tentative definition of the economics of forestry, the subject matter with which it deals will be outlined. The field is here divided into five main branches: forest land, forest production, industry, distribution, and consumption. Many general topics within the field — for example, income, international aspects, government programs — are given no special mention. The finer subdivisions of each subject, too, are omitted.

#### I. Forest-land economics

##### A. Land use

##### 1. Competition of forests for the use of land

2. Competition among the forest uses
  3. Forest-land classification
  - B. Land institutions
    1. Tenure
    2. Taxation
    3. Public or private regulation or other programs
- II. Economics of forest production
- A. Forest enterprise
    1. Initial decisions with respect to use of capital
    2. Forest administration and protection
    3. Forest labor and employment
    4. Forest insurance and credit
    5. Supplementary relationships with other enterprise
    6. Forest valuation
  - B. Forest management
    1. For timber and other tree products
    2. For watershed purposes
    3. For forage
    4. For wild life
    5. For recreational and aesthetic products
- III. Economics of forest industry
- A. Industrial organization and operation
    1. Location
    2. Integration
    3. Institutions and policies
    4. Labor and employment
    5. Technology, efficiency, and competition
  - B. Industrial processes
    1. Logging and other extraction
    2. Manufacture
    3. Transportation
- IV. Distribution and prices of forest products
- A. Marketing
    1. Geography and transportation
    2. Agencies
    3. Methods
    4. Labor and employment
    5. Private or public institutions
  - B. Prices
    1. Determining factors
    2. Product interrelationships

## V. Economics of consumption of forest products

## A. Demand

1. Relation to time
2. Relation to price and other factors

## B. Use and requirements

1. Choice among types of forest product
2. Choice between forest and other products

## CHARACTER OF THE ECONOMIC PROBLEMS OF FORESTRY

## GENERAL DEFINITION

Some people dislike the word "problem." They feel that to deal with "problems" is to be unduly concerned with the dark side of things — like the problem monger, who possesses a species of pathological attachment for the dismal. Also they feel that "problems" are too commonly used to conceal vagueness of thought. Perhaps it is unfortunate that no other word of common acquaintance, but without these invidious associations, comes to hand as a substitute for "problem." However, most of the difficulty to which the word may be subject arises only in the absence of a precise definition. The need for such definition is apparent, particularly in view of the variety of connotations that are open to the user of the word.

Of course, to define a problem is not necessarily to remove its dismal connotation. Whoever is concerned with the course of social action is likely to take as the goal of such action the betterment (however defined) of existing conditions. If betterment is the goal, then the starting point must be considered less good, which is to say that we are now contemplating a situation which, by comparison with some alternative, is unsatisfactory.

## ALTERNATIVE DEFINITIONS

Basically, a problem is a question posed for solution. Hence, it is anything perplexing: a troublesome situation: a condition the existence of which is regarded as undesirable and the means for improvement or correction of which are sought. This last is the sense in which the word will be understood here.

Problems may be defined either *subjectively* or *objectively*.

In defining problems subjectively, a person uses a changeable set of rules to decide whether conditions are or are not problems. What particular rules are used to judge a given condition depends upon two factors: first, upon the number and kind of sets of rules which that person carries in his kit, as determined by his past experiences; second, upon the relation of the given condition to that person, such as whether and how the condition affects himself or any individual or group materially or emotionally related to him. Thus, in subjective definition, whether a given condition is judged to be a problem depends upon who does the judging, even assuming that everyone is fully rational in his application of rules.

In defining problems objectively, a person uses a single set of rules previously determined. In this case, whether a given condition is judged to be a problem depends, ideally, only upon the set of rules: it does not matter who does the judging, assuming that he is fully rational in his application of rules. The objective definition of problems will be followed here.

Within the field of problems objectively defined, numerous alternative sets of rules offer themselves. These rules all state the standards against which judgment will be made. Standards may be of various types. For example, some may relate to *things*. One may adopt as a standard the bright and shiny condition of metal parts and pieces used for all purposes. Under this standard a problem consists in the dirtiness or rustiness of such metal. Dirt, tarnish, and rust constitute the problems to be dealt with. A program to solve these problems would include such things as protection of machinery from the weather by means of permanent structures and canvas covers; filing down or replacing old, rusty nails; and maintaining brass rails and name plates in well polished condition. The standard used here is a *physical* standard.

In forestry, physical standards may be used in problem analysis. Maximum volume of timber per acre is such a standard; maximum yield per acre per unit of time is another; prevention of soil loss, another. Here the problems are, first, understocked forest stands; second, failure to achieve maximum physical output; third, loss of soil from forest land. The standards upon which these problems are judged are like the metal-polishing standard in that they deal with a physical goal, set up without reference to cost. Here the physical goal for forestry is maximum output



from each unit of the fixed factor, presumably possible only at some loss in unit output of other factors of production and only at the cost of general maladjustment, wherein identical factors of production earn widely different rates of remuneration (assuming that these are based upon marginal product) in different occupations.

This reference to physical standards in forestry is of more than academic interest. Physical standards are actually implicit in much work done in such fields as silviculture, forest-fire protection, forest influences, and many others within forestry; and their use has had a profound effect upon the orientation of both research and action programs in those fields. In the last report of the National Resources Planning Board dealing with forestry,<sup>8</sup> the major objective of public works in the forest-management field is stated to be "more and better timber" — although elsewhere<sup>9</sup> it is said that "the general objective of a national program of forest-land use is to . . . meet current and future needs for forest products and services," and that "attainment of this objective does not require, nor would it be economically justifiable to seek, maximum timber production from *all* forest land." (Italics not in the original.) Again, with reference to the timber harvest, Fernow states that "in a well-developed forestry system every stick is expected to be utilized."<sup>10</sup> And again, V. E. Johnson says, "The aims of forest management are to obtain the maximum results from forest areas in the production and growth of the forest and the fullest possible utilization of their products."<sup>11</sup>

Fairness demands, of course, that distinction be drawn between physical standards pure and simple and those standards really intended to reflect economic values, but where the economic yardstick is so unmanageable that resort is had to a rough physical expression of the point of economic adjustment. Thus the report of the fire-control committee at the 1930 Washington conference of district foresters of the United States Forest Service<sup>12</sup> sets up

<sup>8</sup> U. S. Nat'l Res. Planning Bd., *Public Works and Rural Land Use* (vii + 167 pp.; Washington, 1942), p. 123.

<sup>9</sup> *Public Works and Rural Land Use*, p. 90.

<sup>10</sup> Fernow, *Economics of Forestry*, p. 170.

<sup>11</sup> V. E. Johnson, "Post-War Forestry Problems of the Pulp and Paper Industry," *Forestry Chronicle* 20:1: 46-57 (1944), p. 50.

<sup>12</sup> U. S. Dept. Agr., Forest Service, *Committee Reports Approved by the Wash-*

physical standards for fire control, in terms of the maximum allowable percentage burn for each type of forest. These standards, however, were based upon rough judgment of some of the economic factors bearing upon intensity of fire control: (1) timber value, present or potential; (2) destruction of site value by fires; (3) the difficulty of reestablishing the forest after fire; and (4) the creation of future fire hazards. The two most valuable forest types, white pine and spruce, were assigned a percentage of 0.1. The committee then "set up a scale representing the relative areas which can be burned in each type with equal loss."

Other standards for problem analysis, dealing with *people* rather than things, may be concerned with *spiritual* or *cultural* values. Training and participation in religion is such a standard. Under this standard people's laxity of attention to religious values and religious forms constitutes a problem. Moral conduct as a standard defines the problems of immorality, unmorality, and non-morality. Standards of education are partly of this same category, and under these standards illiteracy and the various other degrees of cultural incompetence may be problems. If the agrarian "good life"<sup>13</sup> is set up as an objective of social policy, then the existence of a materially poor subsistence-farming class may not be regarded as a problem. It would, however, be regarded as a problem if full productive employment were taken as a standard.

In forestry, examples of spiritual and cultural standards may be found in a number of instances. Aesthetic values are one. The goal may be determined of creating forest stands that are satisfying for people to look at or to play in or to live in or near. Forest stands of low aesthetic value in this case constitute a problem. Again, the goal may be management of forests in such a way as to encourage among people a high level of social consciousness and sympathy and an appreciation of their identity in a commu-

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*ington Conference of District Foresters and Comments by the Forester* (101 pp.; Ogden, Utah, 1930), pp. 50-54.

<sup>13</sup>"Should the nation have more or less people living on the land? Undoubtedly the need is for more people, but not for more commercial farmers. The need is for more people with the rural philosophy of life, more real homes, more economic security, more children, more loyalty to the family and to the national ideals. The land is the foundation of the family, and the family is the foundation of the State." O. E. Baker, and T. B. Manny, *Population Trends and the National Welfare* (28 pp., processed; Washington, 1935), pp. 1-2.

nity and nation of varied physical and human resources. Failure of forest policy to approximate these ends would then be a problem. Fernow remarks that

the immaterial influence of the forest is claimed to extend in at least four or five . . . directions [one of which is] upon the ethics of a people. This . . . influence is one which we cannot measure or even argue with any determinable force, but which we ourselves may feel more or less strongly, according to the degree to which our emotions in general are susceptible.<sup>14</sup>

Such spiritual and cultural standards will not be used directly in defining the problems to be analyzed in this book. Nevertheless it will not be possible or desirable to shun them completely.

What may be regarded as an offshoot or degeneration of the spiritual standard is the *emotional* standard, wherein the forest is endowed with human qualities, and its own welfare, or wellness, set up as the goal. In a sense, this is a physical standard. It has been employed in much thinking about the problems of forest conservation, both by laymen and by professional foresters.

There is something in each of us that instinctively cries out against the destruction of forests, no matter for how useful an end. And when this instinctive, often illogical, love for tree cover is strengthened by some economic justification, the result has ever been an emotional urge to keep intact and inviolate those wide stretches of forest that were once our home and very life.<sup>15</sup>

The language of the emotional standard is illustrated in the following: "A healthy condition exists in central Kentucky where only a slight wound has been inflicted on the forests in that area. It can be healed before it develops into a gangrenous condition."<sup>16</sup> Fernow cites the public overemphasis upon conservation problems of game and fish as "a good illustration of the fact that emotion rather than reason, sentiment rather than argument, are the prime movers of society."<sup>17</sup> The emotional standard will be discarded for present purposes.

<sup>14</sup> Fernow, *Economics of Forestry*, pp. 65-66.

<sup>15</sup> Arthur N. Pack, *Forestry an Economic Challenge* (161 pp.; New York, 1933), pp. 10-11.

<sup>16</sup> Harry Nadler, *Report on the Timber Situation in the State of Kentucky* (36 pp., processed; U. S. Dept. Agr., Forest Service, 1942), p. 15.

<sup>17</sup> Fernow, *Economics of Forestry*, p. 9.

Another sort of standard dealing with people is the *economic*, which has to do with the value and price aspects of human behavior. One may set up the standard of maximum net profit to an individual firm during a year or a period — for example, the combination of productive factors available to a forest enterprise in such a way as to maximize the net returns to its owners. Another standard might be the maximization of returns to forest enterprise in general; another, the maximization of the net product of forest land. This sort of standard, an economic standard, will be employed to define the problems analyzed in following chapters.

#### A DEFINITION FROM THE ECONOMIC POINT OF VIEW

A problem will here be defined in terms of the following standard: maximum total economic welfare. The term, economic welfare, is used in the sense developed by Pigou, who defines it generally and provisionally as “that part of social welfare that can be brought directly or indirectly into relation with the measuring-rod of money.”<sup>18</sup>

To avoid such ambiguity as might consist in the word welfare, and to by-pass insofar as is possible and not detrimental the general issues involved in welfare economics, the concept of real income will be used as a substitute. Before this substitution may be accepted, several provisions must be made. While economic welfare certainly is closely correlated with real income in goods and services, it would be unreasonable to assume that the latter is a perfect index of the former. Income is not the equivalent of economic welfare, but its “objective counterpart.”

The two concepts, economic welfare and the national dividend, are . . . coordinate, in such wise that any description of the content of one of them implies a corresponding description of the content of the other.<sup>19</sup>

The bridge between economic welfare and real income is constructed chiefly upon four piers. The first of these is the consideration of disutility in income production. Strictly speaking, economic welfare is associated, not with the total product com-

<sup>18</sup> A. C. Pigou, *The Economics of Welfare*, 4th ed. (xxxii + 837 pp.; London, 1938), p. 11.

<sup>19</sup> Pigou, *Economics of Welfare*, p. 31.

prising income, but with the excess of satisfaction over dissatisfaction entailed in producing income. The second is the size and quality of the population. Changes in income may fail to have the anticipated effect upon economic welfare if they are accompanied by counteracting changes in population numbers or in the capacity or efficiency of the people as consumers. The third is income distribution. If the marginal utility of money to individuals increases as their individual incomes diminish, then it may be presumed that a given change in income tends to produce a larger effect upon welfare of lower-income groups than upon that of higher. Total welfare of all groups, then, as it is affected by total income, will be conditioned by income distribution; and any possible increase in income or shift in its distribution will tend to produce a larger effect upon welfare as it favors lower-income groups. The fourth principal pier in the bridge between income and welfare is the content of that income. The content referred to here is the type or quality of goods or services which, in changing, disturbs total money income and the price level in equal degree and has no marked effect upon personal distribution. With these provisions, a problem may be defined as a condition which results in a loss of real income.

#### QUALIFICATIONS

In order for this definition to be useful in a realistic appraisal of economic problems, some qualifications are necessary. In part, these qualifications relate to matters of theory; in part, to the limitations of the regional approach taken in the present discussion; and in part, to the institutional barriers to literal interpretation of theoretical tenets.

For example, in speaking of income, what social or areal unit shall be chosen? While we have barred the individual enterprise as the unit and have insisted upon taking the social point of view, nothing has yet been said about the boundary to be drawn, beyond which we will not go in the analysis of income. Two types of boundary are in question here. One is the boundary enclosing the chains of economic phenomena which, once set in motion, may have repercussions upon the size of the income under consideration. Here the position will be taken that there is no possibility of establishing such a boundary, and that limitations placed upon

the conclusions of the present study as a result of its restricted scope must be accepted as inevitable. The other boundary is that enclosing the geographic area for which income is to be measured. It might conceivably be placed at the limits of the region studied; or it might be located so as to include the entire globe. If the factors and technology of production within the region were, and would continue to be, in such adjustment with the factors and technology of the outside that no cross-boundary exchange would be necessary in order to maximize regional income in an absolute sense, then even if maximum regional income in this sense were not compatible with maximum income over a broader territory, it might be argued merely from the standpoint of the region that maximum regional income should be established as a standard. But it is virtually inconceivable that no cross-boundary exchange is necessary to maximize regional income, and improbable that without such exchange the income over a broader territory could be maximized. Considering this, and in view of the fact that the boundary of the region dealt with here is purely arbitrary, there appears to be no reason to take a unit less than the nation in measuring the size of income. In many cases, where interactions and outside alternatives are of negligible importance, it will be sufficient to consider income within the region alone, or within the community, or even for the single individual in his present occupation. But national income will still be used as a minimum ultimate criterion. Furthermore, to go beyond the nation is deemed unnecessary for present purposes.

Another qualification concerns the period of time to which the concept of maximum income shall relate. It is necessary to define both the length of this period and its position in the general time scale. Maximum income, so far as that concept is relevant to an analysis of actual problems, exists only in the future. We begin with the stated objective of describing problems, defined as the failure to achieve maximum income during some period as yet undetermined. If that period should be determined as the present point of time and if, again, present income should prove to be already maximized, then the statement that no problem exists would conclude the inquiry. Or if present income should prove not to be maximized, then the statement that a problem does exist would, for all practical purposes, conclude the inquiry, since in

the present instance we are concerned with laying the basis for action and not with historical description. The same considerations bar the determination of any point or period of past time.

The question, then, relates to the length and location of the future period to be determined. To answer this question, the following principle may be adopted: that any future time will be considered only insofar as the income at that time has present pertinence or importance. If a ratio or series of ratios may be conceived, expressing the relative net value of the objective of maximum income at successive points of future time beginning with the immediate future, then these ratios may be used to determine the length and location of the future period in question. If, further, the maximization of immediate income has present value (which may be accepted as an assumption) and if the ratio or ratios just described are all greater than zero,<sup>20</sup> then they determine an infinite period beginning with the immediate future.

The ratio here conceived is two steps removed from the family of concepts related to the rate of interest. First, it is the relative value placed upon an ideal without any counterpart in the present. For present purposes this distinction may be dismissed on the ground that there is no logical distinction between an ideal and any other future event, and that the absence of a present counterpart is a matter of degree subject to quantitative expression. Second, the ratio is that between two values which are permissibly different, not only in point of time, but also in amount, for each value in question is the net value of raising to a maximum some quantity of income less than maximum — that is, it is a value measured by the amount by which income, as determined by the existence of problems, falls short of a maximum, due allowance being made for any costs attributable to the raising of income. This is obviously a variable quantity. However, regardless of variations in this value, the condition that the ratio shall be greater than zero will be fulfilled, if problems remain, so long as a finite rate of interest exists, whether negative, zero, or positive. This proposition with regard to the rate of interest may reason-

<sup>20</sup> The validity of the concept of such a ratio depends upon the value of zero not occurring. If, in a series, a negative value occurs more than once, the time period determined may be infinite, and its discontinuity alone will not affect the propositions to follow.

ably be accepted and hence, with it, the proposition that we are concerned in problem analysis with the maximization of income over an indefinite period beginning in the immediate future.

The net social value of action based upon problem analysis is expressible in terms of the problem gap just described: the net amount by which income, as determined by the existence of problems, falls short of a maximum. The maximum in question here is that achieved through action and is not necessarily the absolute maximum. The immediate goal of any action designed to follow problem analysis is to maximize the indefinite series of problem gaps commencing with the immediate future. The size of these gaps, and not the size of the income series, measures the value of such action. However, it is obvious that in judging the relative desirability of alternative courses of action expected to produce alternative series of maxima and gaps, it makes no difference whether a comparison is made between the series of maxima or the series of gaps: corresponding series will in either case fall into the same relative ranks among their alternatives and, furthermore, will show the same absolute differentials of advantage or disadvantage as compared with alternatives. That is to say, we may state as a social goal against which to judge the existence of problems, either that a series of problem gaps be maximized or that a series of incomes be maximized (in an absolute sense, subject to the qualifications being discussed). The latter concept, being simpler, will be adopted here.

Attention may be turned briefly to the question of the rate of discount to be applied to a given quantity of income at any point of time in order to make the whole series additive, since it is the sum of the series as of some reference date, and not the absolute value of its members, that concerns us. It may at first be thought that this question is not relevant to problem analysis — that it is relevant only in judging the relative merits of alternative courses of action to *follow* problem analysis, or in measuring the value of such action. If any given factor or combination of factors, without reference to the point of time, always affected income in one direction, this would be true. But it is not true where, as is actually the case, factors exist which tend to alter the distribution of income over time. In such a case the answer to the question whether the existence of a certain factor constitutes a problem



may actually depend upon the rate of discount. This is particularly true in the case of factors that alter the rate of use of resources difficult to replace or that reduce the rate of use of any resources. Only this need be said about the actual rate of the discount itself: that for present purposes it seems reasonable to assume that the rate is positive and low.

The two chief matters discussed thus far under the heading of qualifications have concerned the sphere — of place and of time — within which the definition given to a problem shall be regarded as operating. Other qualifications need now to be mentioned, bearing upon the interpretation to be placed on the concept of maximum real income, set up as the standard by which to judge the existence of problems. If, in a freely competitive society, all units of all factors of production were fully employed in combinations which permitted marginal products of units of equal quality everywhere to be equalized, and if the social functions modifying the environment of economic activity were fully developed and effective in bringing to full fruit the productive potentialities of the people and their capacity to consume, then it would be reasonable to call the resulting real income a maximum. Shall this be the maximum for the judgment of problems, or shall something less be accepted?

Here the position will be taken that the goal described is one to be held in mind, but that it is at best a distant goal and in many particulars unattainable. The long-run character of the goal makes it necessary in many cases to judge current rates of progress rather than current final achievements. The processes of education and of general cultural development must not be expected to accomplish more than a gradual disintegration of the barriers of ignorance and custom. The unattainable character of the goal necessitates making allowance for what are likely to be permanent imperfections or at least chronic ailments of the economy — a lack of complete rationality (not altogether to be frowned upon where emotional values are involved), a lack of complete fluidity in the face of sporadic economic development,<sup>21</sup> the imperfect divisibility of units of the factors of production,<sup>22</sup> and, more important, the persistence, and indeed growth, of mo-

<sup>21</sup> Pigou, *Economics of Welfare*, pp. 167-171.

<sup>22</sup> Pigou, pp. 158-166.

nopolistic elements that bid fair to attach themselves permanently to the economy.

#### APPLICATION OF THE PROBLEM DEFINITION TO FORESTRY

The definition of a problem now stands, and no further qualifications are needed in order to apply it to the task of forestry-problem analysis. Some cautions, however, are called for.

The standard of judgment is maximum total income, not maximum income to forestry or to forest land, labor, or capital. It is not accurate to speak of the maximum contribution of forests to national income or to social welfare, sometimes described as a goal. Rather, the goal is the contribution of forests and forestry activities to maximum income or welfare. This proposition reinforces what has already been said about problem interrelationships (p. 8).

In practice the distinction between maximum national and maximum forest income is important. The objectives of increasing the acreage of forest land, of intensifying its management, of subsidizing forestry, and of stimulating the consumption of forest products at the expense of other products all have aspects favorable to an increase in income of factors associated with forest enterprise, and all may detract from the aggregate of general income. Another practical case in point concerns price. High returns to the owners of timber products have long been an implied objective in forestry circles, because of their all-important relation, real or imagined, to "good forest management." High price is the special keynote of much literature concerning management of the farm woods.<sup>23</sup> If we lay aside the implication that price manipulation is a good means of encouraging forest management in the public interest (which may be seriously questioned), there appears to be some doubt whether the encouragement of high prices for a basic raw material such as timber would in the long run have any but an adverse effect upon the national real income,

<sup>23</sup> See, for example:

John W. Keller, *Making Farm Woodlands Pay* (Pa. Dept. Forests and Waters Bull. 42; 19 pp.; Harrisburg, 1926).

Wilbur R. Mattoon, "Timber Selling from the Farm to Consumers," *U. S. Dept. Agr. Yearbook for 1926* (Washington, 1927), pp. 714-716.

U. S. Dept. Agr., "Farm Timber Sold Too Cheap," *Weekly News Letter* 2:20 (Washington, Dec. 23, 1914), pp. 5-6.

however well it might serve the temporary interests of timber owners and even of forest labor. Indeed, if the demand for timber products is fairly elastic,<sup>24</sup> some lowering of the price might be expected to result both in individual and in social benefit.

It is conceivable that forest income must be sacrificed even heavily to the maximization of general income. But whether sacrifice or benefit, the right combination will presumably be achieved when the factors of production within the forestry field are in adjustment among themselves and with the balance of the economy.

Here is a question with important practical aspects. A goal of maximum national real income has been set up, a goal to be achieved coöperatively by all segments of the economy. The economy is then viewed, for purposes of convenience, as being composed of a forestry segment, and another segment containing the balance of activity. This latter, nonforest, segment may be thought of as moving gradually toward the goal described, through the elimination of successive problems. Some sub-segments may move slower than others and even, for a time, retrogress, but the whole movement may be regarded as that of an average condition and may be assumed to be in a forward direction — that is, in the direction of the goal. It may be supposed that the forestry segment, also, moves forward. If its progress toward the goal is slower than that of the other segment, then the chief objective of forestry policy remains as before — to speed progress toward the goal. But if the progress of the forestry segment, either actually or potentially, is much more rapid than that of the nonforest segment, or if the forestry segment is, at the time of the problem analysis, relatively much farther along toward the general goal than the rest of the economy, complications arise. There appear, in fact, two goals for the forestry segment: the first, for the long run, the combination of factors which would maximize general income if the factors in the nonforest segment were also combined

<sup>24</sup> "The price of wood, and its relation to the prices of other commodities, is the controlling factor in determining the amount of timber consumed . . . In the language of economists the consumption of wood is very elastic." W. E. Hiley, *The Economics of Forestry* (xiii + 256 pp.; Oxford, 1930), p. 33.

The elasticity of demand for timber products is discussed less definitively and more carefully (and with more specific reference to the situation in the United States) by Marquis, *Economics of Private Forestry*, pp. 53-59.

and constituted for maximum income; the second, for the short run, the combination of factors which would maximize general income *currently*, factors in the nonforest segment being combined as they are. It is obvious that to maximize a series of incomes beginning from the present, attention must be given to the second, short-run, goal if too rapid progress would result in lowering the early values of the series more than later values might be raised, the rate of discount considered. In its development, the forest economy must keep pace with other segments. And yet, to do so at the expense of its recuperative power — that is, at the expense of general income in the future — must be avoided.

What, for example, is to be the development of forest enterprise, characteristically one of the more competitive enterprises, in a general economy characterized by monopolistic tendencies? It is probable that any too pronounced decrease in the price of wood as a raw material would merely tend to aggravate monopolistic elements in other segments of the economy, and that the trend toward greater efficiency in the forest segment, if it were to result in lower price, might need to be restrained in the interest of long-run welfare. On the other hand, to encourage the introduction of monopoly into forest enterprise is hardly the solution, even in the short run, of the inequities that now exist. Rather, the solution must be found in measures applied within the rest of the economy, to curtail monopolistic elements.

It is to be expected that solution of many forestry problems must be found within the rest of the economy. This would be true merely because of the complex interrelationships that exist, but it is especially true because forestry is, after all, only a small part of the whole economy (see Appendix). The general conditions of supply and demand for the factors of forest production, even the factor of land, are overwhelmingly determined by events that take shape beyond the realm of forestry itself. In order to see forestry problems in their proper perspective, it is necessary to keep constantly in mind that forest production is a minor economic activity. However vital may be this small cog in the economic machine, it will not do to overemphasize the importance of the little defects that may exist therein.

## DEFINITION OF FORESTRY PROBLEMS REVIEWED

The standard set up for forestry is optimum contribution to maximum national real net income over an indefinite period beginning in the immediate future. Those elements of the forestry situation that interfere substantially with achievement of this goal are the economic problems of forestry. The fields of forestry within which these problems operate are the fields of land use, forest production, industry, distribution, and consumption,<sup>25</sup> with their sub-fields, as already defined (pp. 8-10). The form they take is maladjustment, expressed in inefficient application of factors to productive processes — that is, in (1) underemployment of factors (their failure to be used fully) and (2) misdirection of factors (their failure to be used in the most productive way). The consideration of the application of factors subsumes (1) the social allocation of factors to the various fields of production, of which forest-product production is one (the determinants of this process are largely exogenous to forestry); (2) the allocation of factors among productive enterprises within the forestry field (the determinants of this process are largely endogenous to forestry); and (3) the combination of factors within productive processes (the determinants of this process are largely endogenous to the individual forest enterprise).

## ECONOMIC PROBLEMS OF FORESTRY CLASSIFIED

A broad outline of problems, arranged according to the classification of the forestry-economics field set down in the first section of the introduction is given below, and will be followed in much of the problem analysis. The outline is not intended to be exhaustive. It is suggestive, and emphasizes some items of regional importance.

## I. Problems of forest-land use

## A. Uneconomic allocation of land and cooperating factors of production to major uses or combinations of uses

<sup>25</sup> In the field of consumption the economics of forestry is still concerned primarily with production aspects, as is problem analysis in forestry economics. For example, such questions as consumer preferences and advertising to alter preferences, insofar as these bear upon the allocation of factors to production, and the question of income from forest-product production as it bears upon the level of

- B. Uneconomic allocation of forest land to forest uses
  - C. Problems in land tenure
    - 1. Uneconomic size of land holdings
    - 2. Operation of the pattern of ownership or holding of rights to deter full use of forest resources
    - 3. Uneconomic use of farm woodland resulting from the conditions of farm tenancy
  - D. Forest taxation as a factor in the misuse of forest land
  - E. Problems arising from public conventions or programs
    - 1. Conventions regarding land use
    - 2. Conventions regarding resource management
    - 3. Educational programs of agricultural institutions
    - 4. General public programs of action or research
- II. Problems of forest production
- A. Problems of public forest administration
    - 1. Interrelationships between public administration and over-cutting of privately owned timber
    - 2. Undercutting of publicly administered forests
      - a. Through overly conservative policy
      - b. Through the nature of cutting requirements
    - 3. Problems in multiple-use forest management
  - B. Problems of private forest management
    - 1. Problems associated with farm ownership
      - a. Forces of custom and habit
      - b. Owners' lack of information
      - c. Owners' poverty
      - d. Small size of operations
    - 2. Problems associated with small, nonfarm ownership
      - a. Absenteeism
      - b. Problems common to all small holdings
    - 3. Problems associated with industrial ownership
      - a. Unfavorable position of forests in administration of industrial capital
      - b. Owners' lack of social consciousness and responsibility
      - c. Absenteeism
    - 4. Failure of the private good to correspond to the public good

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living of income recipients, are a legitimate concern of the forest economist. But the question of consumption standards as related to the allocation of consumers' funds to various alternative purchases is not his immediate concern.

- C. Problems in the silvicultural condition of forests
    1. Low density of forest stands
    2. Low quality of standing timber
    3. Unsatisfactory representation of tree species
    4. Unsatisfactory age and size characteristics of timber
    5. Deteriorated forest sites
    6. Denuded forest land
  - D. Special problems in the management of forests for other than timber or tree products
  - E. Protection problems
    1. Fire
    2. Insects, disease, and other harmful agencies
  - F. Forest labor problems
    1. Underemployment
    2. Misapplication of labor to productive processes
    3. Under-remuneration of labor other than that resulting from underemployment or misapplication
- III. Problems of forest industry
- A. Logging problems
    1. Logging chance as an element in low economic productivity
    2. Logging equipment problems
  - B. Processing and storage problems
    1. Inefficient equipment
    2. Inefficient methods of processing, handling, or storing
    3. Inefficient financial methods
    4. Problems of plant location
    5. Institutional problems
    6. Problems of protection from destructive agencies
  - C. Problems peculiar to vertically integrated production
  - D. Labor problems
    1. Underemployment
    2. Misapplication of labor to productive processes
    3. Under-remuneration of labor other than that resulting from underemployment or misapplication
  - E. Problems arising from public programs of action or research
- IV. Problems in the distribution and prices of forest products
- A. Transportation problems
    1. Defects in physical systems
    2. Defects in equipment

3. Defects in financial organization
  4. Maladjustments arising from tariff rates
  - B. Maladjustment on the side of the product
    1. Kind of product
    2. Quality of product
    3. Quantity of product
  - C. Maladjustment in sellers' contact with the market
  - D. Maladjustment in buyers' contact with the market
  - E. Price inequity resulting from other market imperfections
    1. Monopolistic elements
    2. Imperfect knowledge of the product
    3. Disadvantageous financial position of buyer or seller
    4. Institutional deterrents to marketing
  - F. Absence of a legal market transaction (theft)
- V. Problems in the consumption of forest products
- A. Maladjustments arising in the rival relationship between wood and other goods
  - B. Maladjustments in use of wood by timber owners
  - C. Maladjustments in wood procurement by industrial agencies
  - D. Maladjustments resulting from the dynamic character of demand
  - E. Maladjustments arising from public programs

#### PRIMARY AND SECONDARY PROBLEMS

It should be noted that the problems considered in the present instance are limited to primary problems — that is, those representing conditions in need of adjustment — as opposed to secondary problems, which are those of research or action designed to facilitate such adjustment. For example, it may be assumed that the existence of a certain acreage of denuded forest land impedes maximization of income. Denuded forest land, then, is a primary problem. It is not known whether natural or artificial restocking of this land is to be preferred, or, in either case, what particular technique of regeneration is best; and therefore research is called for. Ignorance of the best technique, on the part of research groups, is a secondary problem. Ignorance of the means by which a program of reforestation may be inaugurated, after the best technique has been determined, is also a secondary problem, upon which, again, research may be needed.



Such secondary problems directly motivate much research. Nevertheless, it is toward the solution of primary problems that the research is ultimately directed. Furthermore, primary problems are all-inclusive; secondary problems are subtended to them and not parallel to them. Given acquaintance with the scope of a field and the extent of knowledge in the field, outlining a research program then requires only an understanding of primary problems.

**THE ECONOMIC PROBLEMS OF FORESTRY  
IN THE APPALACHIAN REGION**

## CHAPTER I

### FORESTRY PROVINCES OF THE APPALACHIAN REGION

THE APPALACHIAN REGION which provides the setting for this book consists of the five states of Kentucky, North Carolina, Tennessee, Virginia, and West Virginia. This is a purely arbitrary region, bounded by political lines; it is in no sense a natural region.<sup>1</sup> In geography, the five states have in common a backbone of mountain ranges, the Southern Appalachian Highlands. This is their chief common physiographic feature, and the one from which their name as a region has been chosen. Far from being uniform, the Appalachian Region is, in fact, an aggregation within one boundary of some of the most widely diverse conditions to be found in the eastern United States.

#### THE REGION AS A WHOLE

The diversity of conditions in the region is of considerable advantage to the present analysis. Although it makes for some difficulty in presentation of materials, it offers contrasting problems for study and creates a varied field for research.

Contrasts and diversity characterize nearly every phase of the region's life. Its culture varies from the decadent rural feudalism of some of the old agricultural areas to the brash, adolescent industrialism of the Carolina piedmont or the Kanawha valley — both of them in contrast to the frontier culture of the highlands. Racially, also, great differences are to be found: the high proportion of Negroes in tidewater and in the Mississippi valley; the Anglo-Saxon stock of eastern Kentucky; the southern and southeastern European element of the mining areas; the mixed groups of the urban centers. Essentially rural and agricultural, the region nevertheless contains some of the most important bituminous coal-mining areas in the nation and is a leader in several types of urban industry. Great industrial centers like the northern pan-

<sup>1</sup> Wallace W. Atwood, *The Physiographic Provinces of North America* (xvi + 536 pp.; Boston, 1940), pp. 5-19.

handle of West Virginia contrast with areas of highly decentralized industry like the piedmont. In agriculture, there are the subsidized latifundia and the prosperous commercial farms of central Kentucky and Tennessee on the one hand; the tiny, impoverished subsistence units of the highlands on the other. In forestry, there are wide areas of nearly continuous timber in industrial and public ownership; other areas nearly devoid of trees; and still other areas, as in the west, where the forest consists largely of farm woodlands. In the east is a great pine belt; the center and west are predominantly hardwood areas. The subtropical longleaf pine grows in southeastern North Carolina; the subalpine spruce and fir, on the summits of the Blue Ridge and Alleghenies.

Both the cultural and the natural contrasts of the region follow in part its contrasts in physiography: high mountains, mountain valleys, plateaus, foothills, plains, and alluvial and coastal lowlands, soils of high agricultural value and soils of little or none, areas of coal deposits and of water power and of chemical resources, and areas totally lacking these things.

Through its physiography, indeed, it is possible better to understand the pattern of life of the region. Some order may be made out of the chaos of its diversity. Roughly speaking, the physiography of the Appalachian Region is bilaterally symmetrical about a central axis running northeast and southwest along the common border of the five states. This axis is the great valley — in the southwest the Tennessee River Valley, in the center the ridge and valley areas of southwest Virginia, in the northeast the Shenandoah Valley. On each side of the great valley is a range of mountains. Along the east side are the Smoky Mountains and the Blue Ridge of North Carolina and Virginia; along the west side are the Cumberland and Allegheny plateaus, which make up the chief mountainous portions of Tennessee, Kentucky, and West Virginia. Flanking these mountains are two belts of relatively low, rolling country: on the east the piedmont, on the west the interior low plateaus. Finally, at the two extreme ends of the region, east and west, is the coastal plain, a low, flat territory. This plain extends along the Atlantic coast in Virginia and North Carolina, sweeps southward and westward beyond the boundaries of the

region, and then northward, to reappear in the Mississippi valley of western Tennessee and Kentucky.<sup>2</sup>

These physiographic sections, or provinces, of the region may serve as useful geographic units in the description and analysis of conditions there. Since the natural features of each province are relatively uniform as compared to the heterogeneity of the region as a whole, the physical and cultural character of each province, to the extent that this character is associated with physiography, also is relatively uniform. It is therefore possible to conceive of this physical and cultural character and to understand it for the individual province, where to do so for the region in its entirety would be difficult in the extreme.

For the purposes of this book the Appalachian Region has been divided into five provinces: (1) Coastal plain, confined to the eastern end of the region; (2) Piedmont; (3) Highlands, comprising the Blue Ridge areas east of the great valley and the plateaus on the west; (4) Great valley; (5) Interior province, comprising the interior low plateaus, the Mississippi uplands or coastal plain, and the central-lowland fringe in northern Kentucky.

In order to make it possible to compile statistics for these provinces from such sources as the census, province boundaries have been located arbitrarily on county lines (Figure 1). These provinces are here termed "forestry provinces," not because they have been delineated with special reference to the forestry situation, but because they are believed to conform in general to the broad geographic pattern of forestry conditions in the region and will be used in describing and analyzing these conditions.<sup>3</sup>

<sup>2</sup> Nevin M. Fenneman, *Physiography of the Eastern United States* (xiii + 714 pp.; New York and London, 1938), p. 2.

<sup>3</sup> The description of forestry provinces is based partly upon the writer's observations and partly upon library sources, among which are the following:

U. S. Works Projects Administration, Federal Writers' Project, *Kentucky, a Guide to the Bluegrass State* (xxix + 489 pp.; New York, 1939).

———, *North Carolina; a Guide to the Old North State* (xxxiv + 601 pp.; Chapel Hill, N. C., 1939).

———, *Tennessee, a Guide to the State* (xxiv + 558 pp.; New York, 1939).

———, *Virginia, a Guide to the Old Dominion* (xxix + 699 pp.; New York, 1940).

———, *West Virginia, a Guide to the Mountain State* (xxxi + 559 pp.; New York, 1941).

Isaiah Bowman, *Forest Physiography* (xxii + 759 pp.; New York and London, 1911).

## COASTAL PLAIN

The coastal plain is comprised of seventy-four counties in eastern Virginia and North Carolina — an area of about 32,000 square miles. By and large, the province is nonindustrial, but with great possibilities for things that soil and climate will produce: farm crops and forests.

## PHYSIOGRAPHY

Geologically, the coastal plain is the youngest province of the Appalachian Region. It is the emerged portion of the continental shelf, composed of a deep layer of unconsolidated alluvial deposits of sand, gravel, clay, and marl. The coast is fringed with barrier beaches, and behind these, extending to the mainland, are sounds and tidal marshes. The outer portion of the mainland, or tidewater, is low and flat. Here the rivers have cut broad channels, which in their lower reaches are tidal estuaries. Swamps and marshes occupy much area in the divides between these main drainage lines. Above tidewater, the land is gently rolling and rises gradually toward the west, to reach an elevation of between three and five hundred feet above sea level at the inner margin of the province. Along this margin bedrock appears near the surface, and the streams flowing out from the piedmont are broken by rapids or falls. This is the "fall line."

The rivers of the coastal plain all flow east or southeast into

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Fenneman, *Physiography of the Eastern United States*.

Atwood, *Physiographic Provinces of North America*.

Howard W. Odum, *Southern Regions of the United States* (xi + 664 pp.; Chapel Hill, N. C., 1936).

J. Russell Smith, and M. O. Phillips, *North America* (xiii + 1008 pp.; New York, 1940).

U. S. Dept. Agr., Interbureau Tech. Services Committee, Appalachian Region, *Atlas of Agricultural Information, Appalachian Region* (loose-leaf, pp. not numbered, processed; Washington, 1942).

U. S. Dept. Agr., Appalachian Regional USDA Committee, Technical Services Subcommittee, *Toward Planning for Rural Resources in the Appalachian Region* (iv + 90 pp., processed; Washington, 1943).

Charles E. Gage, *American Tobacco Types, Uses, and Markets* (U. S. Dept. Agr. Cir. 249, rev., 129 pp.; Washington, 1942).

Harry Nadler, *Report on the Timber Situation in the State of Kentucky* (36 pp., processed; U. S. Dept. Agr., Forest Service, 1942).

Reference is made also to data in Tables 3, 4, 8, 10, 11, and 33.

the Atlantic. The Potomac forms the northern boundary of the province. This river, the Rappahannock, the York, and the James all flow into Chesapeake Bay and are accessible directly to open water. The rivers of North Carolina, on the other hand, have typically shallow approaches, with full development of the barrier-beach formation.

Coastal-plain soils show the widest possible variation — in texture from gravel and sand to clay, and in composition from almost purely mineral to almost purely organic. Great soil differences from one locality to the next are common. Generally speaking, however, soils in their natural state are of low agricultural fertility. Upland soils are thoroughly leached and need artificial fertilization. Those patches of lowland soil which have inherent fertility can scarcely be used without drainage. Forests, on the other hand, grow well on most sites.

#### RURAL LIFE

The first English colonists in America settled in this province. They founded an agrarian civilization based on commercial crop production. Tobacco was the mainstay of this civilization. Soon rice and indigo were developed in the southern areas. Later cotton was introduced in North Carolina and southeastern Virginia. Around these crops was built a plantation system, with its large and widely spaced farm units. This rural society was oriented toward the east — toward the water and water commerce and trade with the Old World. Each commercial farm, with its boat landing and its life line stretching across to England, was a complete community. Land transportation was slow to develop. There was little need for centers of trade and industry at home so long as trade abroad was the all-important feature of the economic life. The surface of the land was essentially undifferentiated, except that some areas could not be farmed and others were held idle, to rest awhile from overwork in exploitative cropping.

This historical picture is significant because, in its broad features, it is still true today. Population of the coastal plain is chiefly rural: 85 per cent, outside Richmond and the Hampton Roads area, as against 69 per cent for the whole Appalachian Region.<sup>4</sup> The population is widely scattered, and only one large

<sup>4</sup>Statistics in this chapter relate to the year 1940 unless otherwise identified.

commercial center has developed within the province. Human activity remains essentially undiversified. Exportation of farm (and forest) raw materials and importation of manufactured goods is still typical, the exchange being made rather with other sections of the United States than abroad. To its long-standing stock in trade, cotton and tobacco, the province has added truck crops, now a major product of eastern Virginia, especially the eastern shore and the Norfolk area. These crops have ready access by truck, rail, or water to northeastern markets and to Baltimore, the principal canning center.

The coastal plain has inherited from its plantation past a large Negro population. Forty-one per cent of the whole population is Negro, 44 per cent of the rural-farm population. In eastern shore Virginia 58 per cent of the people are Negroes. Many of these coastal-plain Negroes are sharecroppers, many of them in the truck-crop sections are farm laborers. More than any other province in the region, the coastal plain is burdened with the "dual load" and the "dual drain upon resources,"<sup>5</sup> both natural and human, of a bi-racial civilization: duplicated schools and other community facilities, held to a low standard because funds must be spread thin; the sharecropper and the overseer systems; the waste that attends insufficiency of capital and of wisdom in management. Its warm climate produces vigorous farm crops and forests but produces no similarly beneficial effect upon its people.

#### URBAN CENTERS

With its physical and economic monotony, the coastal plain has developed few great population centers. Without water power or mineral resources, it has held no special attractions for industry, although its forest resources support pulp mills and sawmills. The Hampton Roads area is the only significant urban center lying distinctly within the province, Richmond being on the border and partaking more of the character of the piedmont (Figure 2). Norfolk (population 145,000), Portsmouth (50,000), and Newport News (35,000) are situated at one of the finest harbors on the Atlantic coast, a naval and shipbuilding focus and a busy port. This is the region's main water outlet to the east, North Carolina being without good port facilities. Coal, the chief commodity, is

<sup>5</sup> Odum, *Southern Regions of the United States*, pp. 15 and 19.



brought by railroad along an easy downhill route from the bituminous mines of the highlands.

Norfolk, however, like other eastern Appalachian commercial centers, is primarily of regional and not of national significance. The mountain barrier isolates it effectively from the interior of the nation, and it may be expected never to achieve a place as a port comparable to that held by coastal cities farther north or farther south.

#### FORESTS

Besides its agricultural soils and climate, forests are the other chief natural resource of the coastal plain. Forests occupy 63 per cent of the total land area. The quantity of usable saw timber in the province — 36,700 million board feet — is 37 per cent of all the saw timber in the region, while the acreage of forest land is but 20 per cent of the regional total. Saw-timber stands are growing annually at an average rate of 230 board feet per acre, the highest rate in the region.

Forests in which pines predominate are of greatest extent. Most of this pine forest is loblolly pine (Figure 3), fast growing and highly merchantable (when of sufficient size) for lumber, pulpwood, and other products. Pond, shortleaf, longleaf, and Virginia pines also are found in the province. The other major forest type is the bottom-land hardwoods, which occupies poorly drained areas throughout the province. Here the principal kinds of trees are black and water tupelos, sweet gum, and cypress. Oaks and hickories, in some places as a distinct hardwood type, elsewhere mixed with the pines, abound on the uplands.

Nearly a fifth of the coastal-plain forest is in private holdings of five thousand acres or more. Only the highlands province has a greater concentration of private forest ownership. At one time or another, most of the forest has been logged on a large scale for lumber. Vigorous natural regeneration has restocked most of these tracts with second growth, though subsequent cutting has greatly deteriorated the condition of much woodland. Fifty-eight per cent of the forest area is in stands merchantable for saw timber, while 10 per cent of it is in trees too small or too sparse to be merchantable for any timber product.

The coastal plain is the focus of the region's pine pulp industry.

Six mills are located here (Figure 5). The province's chief forest industry, however, is sawmilling. Forests are still extensive enough and well enough stocked to warrant the operation of large sawmills, which is not generally the case within the Appalachian Region.

#### THE FUTURE

The oldest province in point of settlement, the coastal plain is in many respects the least developed. In some respects its potentialities are greatest. Vast stretches of wasting land await a call to some productive use — agricultural development through drainage or fertilization, or forest culture to capitalize upon excellent growing conditions. Some industrial growth based upon farm and forest resources is to be expected. The canning industry is still immature. Neither pulp mills nor other wood-using industries have developed their potentialities. In accomplishing such aims, the province is faced with a great task of social readjustment. But it is favored by natural conditions, especially its level land, where soil erosion, elsewhere a great drain on the economy, is minimized, and where good transportation can bring all resources within ready reach.

#### PIEDMONT

The piedmont extends northeast and southwest through central Virginia and North Carolina, between the fall line and the Blue Ridge. It embraces seventy-three counties, with a total land area of 34,000 square miles. As a province, the piedmont is less uniform than the coastal plain. It has a southern industrial area and a northern farming area, and within each of these a considerable variation in economic conditions. The piedmont differs from the coastal plain, also, in that soil erosion is a major factor in land use. Soils impoverished by erosion transmit their poverty to the people who depend on the soil for their living. And along with soil impoverishment has come a loss of ground-water supplies.

#### GEOLOGY AND SOILS

Geologically a part of the Appalachian highlands, the piedmont is gently to heavily rolling, its surface tilted up toward the northwest and reaching elevations of from 500 to 1200 feet along its

western border. Along the base of the Blue Ridge, isolated monadnocks protrude above the general horizon. The greater elevation of the piedmont affords it a less debilitating climate than that of the coastal plain. Rivers flowing eastward toward the coastal plain cut gradually deeper into the face of the land, and near the fall line flow through valleys deeply cut below the general surface. On their way east, these rivers accumulate a heavy burden of reddish soil from eroding fields.

Piedmont soils originated in place, through decomposition of the underlying rock. This is primarily crystalline rock and has produced a heavy-textured soil of inherently good fertility. Today, however, farm crops and forests are growing in large measure upon what was once the subsoil, the original, fertile topsoil having disappeared.

#### AGRICULTURE

Agriculturally, the piedmont is composed of three broad areas: a cotton area in the south, flue-cured tobacco in the center, and an area of fruit, grain, livestock, and general farming in the north.

The cotton and tobacco areas, as one-crop areas, bear a resemblance to similar sections of the coastal plain, except that the former are also industrial areas and therefore, as a whole, more rounded in their economic development. Agriculture in these areas inherited from the coastal plain a system of rotation between farm crops and wild vegetation, wherein small patches of land are cropped intensively for a few years until they are worn out, and are then abandoned to brush and eventually trees, while the farmer moves on to fresh or rested patches. This system is especially typical of tobacco production, a process making the heaviest possible demands upon the soil. Throughout the tobacco area are extensive tracts of brush and woods, while production is confined to relatively small fields. In some places the rotation of forest lands has developed into something more permanent and on a wider scale — that is, abandonment of entire farms and even of entire rural communities.

Some of this process of land abandonment is under way also in the northernmost of the three agricultural areas. Here it is confined largely to the eastern portion, where soils are poor. In the entire belt of infertile soils running from Fairfax to Campbell

County (Figure 1), the acreage of cleared farm land has been shrinking at the rate of  $1\frac{1}{4}$  per cent annually for the past thirty to forty years.<sup>6</sup> West of this belt the countryside changes from predominant woodland to open fields and pastures. Here dairying is a common farm enterprise, and milk is produced for the Washington market. Along the base of the mountains, in the fertile and sheltered coves, apples are the chief crop. In the section between Albemarle and Loudoun Counties are large estates, whose owners pursue a traditional English country-gentleman existence and raise horses as a diversion.

#### INDUSTRY

In a continuous belt extending from Campbell County, Virginia, to Gaston County, North Carolina, on the South Carolina line, are fifteen counties in each of which the value added to gross income by manufacturing industries in 1939 exceeded ten million dollars. Textiles, tobacco products, and furniture are manufactured here. This is the outstanding industrial area of the Appalachian Region. Yet it contains not one great metropolitan center, only four cities of more than 50,000 population; and only one (Charlotte) of slightly more than 100,000. Raw materials for this industrial area are the three principal rural products: cotton, tobacco, and lumber; and the industry itself is decentralized and rural. While many factories are located within Lynchburg, Danville, Winston-Salem, Greensboro, Durham, High Point, and other centers, a great many are not in urban areas at all. Each village has its textile mill or its furniture factory. Tobacco manufacture is only slightly less decentralized. In the North Carolina section of the piedmont, where most of this industry is found, 36 per cent of the population lives on farms, the lowest percentage for any comparable area in the region; while 28 per cent of the population is classified as rural nonfarm, the highest in the region. Three factors are chiefly responsible for the rise of industry in the piedmont: power, at first direct water power, now electric power, diffused through every community; labor, an ample supply, long willing to work for a low wage; raw materials, tobacco and cotton

<sup>6</sup> William A. Duerr, T. C. Evans, and G. E. Morrill, *The Forest Situation in Piedmont Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 13; iii + 83 pp., processed; Asheville, N. C., 1943), p. 10.

from nearby fields, furniture woods from the Blue Ridge and the coastal plain and from adjacent forests.

Outside this extensive industrial belt are several urban centers of importance. Raleigh, Petersburg, and Richmond have a varied industry, in which tobacco manufacture looms large. Richmond, with a population of 193,000, is the largest city of the province. At the northeast corner is Alexandria and a dense suburban fringe tributary to Washington. Altogether, there are eleven towns in the piedmont with a population of 25,000 or more, which is about a third of the total number of such towns in the region.

#### FORESTS

Fifty-four per cent of the land surface of the piedmont is wooded. For the most part, these wooded lands occur as small and isolated patches scattered thickly throughout the province. Nearly two-thirds of the piedmont forest is farm-owned, and most of the remainder is held by other small-scale private owners. In central Virginia, lands in several of the deteriorating farm areas were bought by the Farm Security Administration and later turned over to the Virginia Forest Service to be managed as state forests.

The pine cover types — shortleaf, Virginia, or loblolly pine, mixed with oak, hickory, and other hardwoods — are the major forest types. In many places the oak and hickory predominate, and there is a considerable area of nearly pure hardwood stands intermingled with the pine woods. Hardwood is apparently on the increase. It is often passed over by wood cutters in favor of the pine, and the latter is not growing fast enough or reproducing aggressively enough to replace the inroads of commercial use.

Since nearly all the piedmont forest is of old-field origin, representing the woods phase of the land-use cycle (either active or suspended), it is to be expected that much of this forest is young and its trees small. This condition is heightened by intensive use, wherein trees are harvested just as soon as they become usable, and many stands are kept trimmed down to the smallest merchantable size of timber. More than half of the forest area is at present unmerchantable for saw timber. The entire forest contains 20,600 million board feet of sawlogs, an average of 1,780 board feet per acre (as compared with 2,870 feet in the coastal plain). About four-tenths of this quantity is hardwood, six-tenths soft-

wood. Because of its low stocking and small size, what standing timber there is is growing fairly rapidly. The average growth on saw-timber areas is 190 board feet per acre per year. Unlike the situation in the coastal plain, however, the possibilities for increasing this growth rate through forest management are severely limited.

The piedmont is a veritable beehive of small-scale wood-cutting activity. In some sections in the north, where other land resources have failed, the little patches of woodland are a major source of livelihood. Central Virginia, flanked on both sides by pulp mills, is one of the chief pulpwood-producing sections of the region. Fuel-wood cutting is a major occupation, accounting for thousands of man-days of work throughout the province. Cutting the wood used to flue-cure the tobacco of the central piedmont is itself a major industry. There is a legion of small sawmills operated by farmers and part-time mill men, and a few larger ones run as a full-time industry — about 3200 altogether. This is a heavier concentration of sawmills than is to be found in any other equal area in the United States.

#### OUTLOOK FOR THE ECONOMY

While the coastal plain is young in its opportunities for development, the piedmont appears to have rounded out its youth and to be ready for adjustment to maturity. Both in industrial and in rural life this is a difficult adjustment.

In industry it will involve a realignment of resources so that industry may continue to serve the economy without at the same time exploiting the communities and the working people whose openness to exploitation has keynoted the province's vigorous industrial youth.

In the field of soil resources the acceptance of maturity has been long postponed. Adjustment will involve recognition of social responsibilities toward land management. More balanced and conservative farm systems and a more wise and stable relation between forest and farm lands will come with maturity.

#### HIGHLANDS

If the coastal plain and piedmont are at stages of youth and near-maturity, the highlands, in many aspects of its rural life, is

an aged province. Its old age is the unflowering age of the suspended frontier. Opportunities for change and development are here, but they involve the whole creation of a new life, and this will be slow and hard. The highlands are now in process of changing from the old to the new, and the present is a time of considerable social disorganization. There are resources aplenty upon which to build a new life, however — minerals, power, forest and grazing lands, a little agricultural soil, and a population teeming in every narrow valley and cove.

#### GEOGRAPHY AND PHYSIOGRAPHY

The highlands province consists of two separate divisions. The western division is the Appalachian Plateau, covering all of West Virginia except a tier of counties along its east side, the entire eastern end of Kentucky, three counties in southwest Virginia, and nine counties on the Cumberland Plateau of Tennessee. The eastern division is comprised of the Blue Ridge and Smoky Mountains: all of North Carolina west of the piedmont, and three counties each in Tennessee and Virginia. The total land area of the highlands is 47,000 square miles.

Throughout most of the western, plateau division the original plateau characteristics have been almost completely altered through geologic erosion. The land is deeply dissected, leaving narrow ridges, step hillsides, and narrow valleys. Lands with slopes of about 50 per cent make up a large share of the surface. The Cumberland Plateau in Tennessee is more nearly a plateau than the other areas of the province. The eastern boundary of the division is the clearly marked Allegheny Front, the summit of which stands at an elevation of about 2000 feet in Tennessee and Kentucky and rises to occasional heights of more than 4000 feet in West Virginia. Along the western boundary the plateau merges gradually with the interior lowlands.

Soils in the plateau division have developed chiefly from sandstone and shale. They are typically shallow and of low agricultural fertility and are frequently very stony. The underlying rock is composed of strata of sandstone, shale, conglomerates, bituminous coal, and limestone. Because these strata are nearly horizontal and are frequently exposed on the sides of the deeply cut ravines, coal may be mined very easily and cheaply.

The eastern, Blue Ridge division in Virginia and northern North Carolina is a rolling, high plateau, with a steep rim of escarpments. Farther south, mountain ranges appear along the western boundary, and then spread out, to occupy most of the central and southern portions of the division. Many of the mountain tops exceed 6000 feet in elevation, and among them are the highest in the eastern United States. Outside of the rolling plateau in the north and the few basins and wider valleys in the south, most of the land is steep and inhospitable for agriculture.

Soils in the Blue Ridge division have been formed from parent rock similar to that in the piedmont. They are, however, less deep and fertile and contain much stone. In the underlying rocks are a great variety of minerals such as feldspar, mica, copper, iron, manganese, and zinc, which support a small mining industry in some localities.

Thus, one major difference between the two divisions of the highlands is the presence of coal in the west, its absence in the east. Otherwise they have many features in common, particularly a mountainous and broken topography. Transportation and communication are major difficulties. The highlands are difficult to get into, difficult to get out of, and difficult to move around in. It is this situation chiefly that was responsible for the long isolation of highland people and the perpetuation of frontier life and ways of the Revolution into the twentieth century.

#### HIGHLANDERS

The rural postal system, the wars and their draft of men, mining and logging operations in need of labor, the industrial boom in Detroit and other northern cities, public education, automobile roads, and the radio have changed highland life in the past four decades. But they could not in so brief a period propel the highlander through the full century and a half of his anachronism. The highlander is still a breed different from the rest. He is not a farmer in the accepted sense. He is a woodsman, but not a logging enterpriser or a lumberman. He is cultured, but of a culture now strange and no longer accepted, a culture not based upon, and indeed foreign to, formal education.

The highlander is a founder of large families, and his little em-



pire has become crowded. There are sixty-one people to the square mile in rural areas, as compared with forty-nine to the square mile for the other provinces of the Appalachian Region. Actually the highland population is packed into only a very small fraction of its square miles. Where farming is concerned, only the narrow threads of bottom land and the few level tops, together with those precarious hillsides that still have a little fertility left on them, will produce food. Add to this picture soil depletion and forest depletion, and the answer for the rural highlander is very apt to be poverty. For with little or nothing to sell, he can buy little; he must make his own or do without.

Where the highlander works in the mines his lot in good times may be considerably more prosperous. In poor times, unless he returns to the soil for a subsistence, his lot may be decidedly worse.

#### MINING AND MANUFACTURING

Coal, with its associated oil and gas, is outstandingly the greatest natural resource of the province. The Appalachian Plateau has been called the Plateau of Vulcan.<sup>7</sup> Many hundreds of mines are dotted over a large share of its area. These mines vary in size from the little fuel pit at the highlander's back door to the immense establishments of southern West Virginia, one of the nation's principal bituminous-producing areas. The larger mines, with railroad connections, are clustered there, and in northern West Virginia, and in southeastern Kentucky, along the Virginia line. Coal is unquestionably the mainstay of this region, but, as in the case of the great lumber industry which has come and gone, there is serious question how much real welfare it has brought to the people. The business of extracting coal is theirs, and part of the business of converting it to power or hauling it laboriously out through the hills. But the power that it produces is largely used elsewhere, where the industrial environment is less confining; and the returns to ownership go elsewhere. The breath of exploitation blows cold over Vulcan's Plateau.

Mining alone has produced few large towns. Bluefield, Morgantown, Fairmont, and Middlesboro all have less than 25,000 population; Grafton, Hazard, and Harlan have fewer than 10,000.

<sup>7</sup> Smith and Phillips, *North America*, p. 263.

Most mining is done at little "camps," company towns containing a few hundred people.

Among the larger centers, Wheeling with its neighboring industrial area along the Ohio River is a part of the Pittsburgh district and produces chiefly steel and glass products. The Ohio River is a major artery of transport for the heavy products of the region, and has produced, besides Wheeling, three more of the seven cities in the province with a population in excess of 25,000: Parkersburg, Huntington, and Ashland. The Kanawha, tributary to the Ohio, is another industrial river. The area adjacent to Charleston is a center of chemical industry. The Blue Ridge section has only one urban focus: Asheville, one of whose principal businesses is recreation and the tourist trade — an important industry in this, the scenic part of the highlands.

#### TIMBER RESOURCES

With a little over 60 per cent of its land surface in forest cover, the highlands is a close second to the coastal plain as a wooded province. The highlands is the outstanding reservoir of hardwoods in the Appalachian Region. Hardwood types of forest occupy most of the wooded area, and hardwood trees account for almost nine-tenths of the total quantity of standing timber. Chestnut, once the foremost lumber tree of the province, has now almost all been killed by the blight, and what remains of the dead trunks is usable mainly for producing tanning extract and pulp. The chief type of forest on the lower or drier sites is a mixture of oaks and hickories, interspersed with occasional stands of shortleaf, pitch, or Virginia pine. Higher or cooler sites support a forest of beech, sugar maple, hemlock, and other northern species. Eastern white pine, also, occurs fairly frequently, especially on the Blue Ridge plateau. Yellow poplar, perhaps the most prized hardwood resource of the highlands, abounds in sheltered coves and grows in nearly pure stands on abandoned fields. At the highest mountain summits, remnants of the spruce-fir type of forest are found.

Large-scale commercial lumbering has terminated in most parts of the province, after many decades of successive creamings of the best trees. Here the leavings, of poor quality and slow growth, are unattractive save to the small, local gatherers of wood, the portable sawmills. Much forest land, however, is still in lumber-

company or land-company ownership, and a great many other large tracts are held by mining and related interests. Privately owned tracts of 5000 acres or more comprise 28½ per cent of all the forest, a greater concentration of ownership than in any other province. The federal government, also, is a large holder of forest land, with 12 per cent of the total.

The slow natural rehabilitation of highland hardwood forests emphasizes the deterioration that has attended their use. Stands cut for lumber now contain predominantly inferior trees. Wide areas surrounding the mining camps have been cleared for mine timber and support only a stubble of brush and sprouts. Coal mining calls for great quantities of wooden supports of various types, most of which can be made from trees of almost any kind or size. Mine-timber cutting is surpassed only by cutting for charcoal wood in its opportunity to clear the forest. About four-tenths of the forest area is merchantable for saw timber, and the average stocking of saw timber in the province is 1080 board feet per acre of all forest land.

A few large sawmills in West Virginia and eastern Kentucky, and many small ones nearly everywhere, are the chief wood-using industry. Tanning-extract plants and pulp mills are major wood users in western North Carolina. The production of hardwood veneer is of some importance.

#### DEVELOPMENTS AHEAD

For highland people, further vast changes in ways of life are inevitable. Many of these changes will be slow; some may come rapidly. World War II may prove to have been the greatest disperser of the frontier. But there is reason to believe that education, a slow process, will be the chief instrument of change — education for better living, for care of health and diet, for wise management of natural resources, for enterprise in developing local non-exploitative industries, and inevitably, education leading to a search for more hospitable places to live and work.

The life of much of the province will continue to revolve around coal. The chemical industry may have a future locally, but coal as a source of power, and power from mine-mouth plants, will, it appears, continue to be produced chiefly for use elsewhere. For another great source of power and of industrial activity — the

water resources — development and wiser management are in prospect, for the highlands are the principal origin of water supplies within the region. The difficulty and the social responsibilities of both water and forest management in the highlands suggest the likelihood of substantial growth of public land ownership.

### GREAT VALLEY

Between the Allegheny Front and the Blue Ridge, extending through the Appalachian Region in a northeast-southwest direction, is a belt of long, parallel valleys and ridges some thirty to sixty miles wide. This belt includes nine counties in eastern West Virginia, twenty-five in western Virginia, and twenty-four in eastern Tennessee. The province passes along the boundary of Kentucky and of North Carolina, but does not enter those states. Its total land area is 26,000 square miles.

### PHYSIOGRAPHY

Geologically, the ridge and valley belt had its origin when the bedrock, with its layers of sandstone, shale, and limestone, was folded and wrinkled by lateral pressure, so that the layers were no longer horizontal, but more nearly at right angles to the horizon. Subsequent weathering and erosion wore into the soft limestone and shale relatively quickly, while the harder sandstone strata remained as long, parallel ridges between the limestone and shale valleys. A relatively broad limestone valley, the Shenandoah, occupies the eastern side of the province in northern and west-central Virginia; and another major limestone valley, that of the Tennessee River, occupies most of the Tennessee portion of the province. These two large valleys are connected by a strip of ridges and narrower valleys in southwest Virginia, the valleys in some cases alternating between limestone and shale. Along the western side of the province as far south as northern Tennessee is a belt where ridges predominate and the valleys are narrow and mostly of shale rather than limestone. Agriculturally, this is the poor part of the province.

Soils in the limestone valleys are a fertile silt loam, with fairly frequent rock outcrop. Soils derived from shale and sandstone are relatively infertile, and on the ridges and hills are thin and stony.

The great valley is arched lengthways. Its summit is near the center, at the headwaters of the Tennessee River. Here the elevation is about 2500 feet. At each end of the arch, at Chattanooga and at the Maryland line, the elevation is 600 to 700 feet.

North of the Tennessee drainage, the New River cuts northward and westward through the ridges and into the Appalachian Plateau, its waters reaching the Ohio and the Mississippi. Beyond the New River, drainage flows toward the Atlantic Ocean by way of the Roanoke, James, Shenandoah, and Potomac rivers.

#### FARMING

The Tennessee and Shenandoah valleys, with their good soil, have long had a prosperous agriculture. Wheat, corn, livestock, dairy products, and apples are the chief farm commodities. Favorable natural conditions, a scattering of small towns for a local market, and easy transportation have prevented the farm abandonment typical of many Appalachian areas, and indeed of the western area of the great valley itself.

In this western area, soils, except in the isolated limestone basins, are relatively unproductive; transportation is difficult; and communities are undeveloped. Some farmers have made a success of fruit growing on the ridge sides, where air drainage is good. The area is capable of producing apples in much greater quantity than markets will absorb, and at times has done exactly that. Much land has been returned to forest.

#### TENNESSEE VALLEY AUTHORITY

The southern half of the great valley is drained by the Tennessee River and so is a part of the special domain of TVA. The Tennessee Valley Authority's area extends also into the highlands and the interior province, but since the valley of East Tennessee is a principal center of its activity, to mention TVA at this point is appropriate.

The TVA is part of the agricultural and forest picture of the province because, as a social experiment in planned management of resources, land utilization is one of its foremost interests. To produce power from water on a permanent basis, a principal project of TVA, calls for control of erosion. This, in turn, calls for vegetative protection of watershed lands: a forest cover, a good

sod, or full productivity of tilled crops on conservatively managed fields. Here fertilizer is a principal requirement. TVA produces the fertilizer by means of its water power. Again, hydroelectric dams result in inundating a vast acreage of valley lands, naturally the most fertile for agriculture. The fertilizer and power manufactured can be used to raise the productivity of farms on higher land and thus make up, at least in part, for what has been taken away. Meanwhile both upstream and downstream flood control is furthered.

The TVA is also part of the industrial picture of the province because it is a creator of cheap power in large quantity. And its system of dams along the Tennessee River is intended to provide a nine-foot channel from Knoxville to the Ohio.

#### INDUSTRY

The Tennessee portion of the great valley has two industrial centers of fair size: Chattanooga (population 128,000) and Knoxville (112,000). Here such products as textiles, hosiery and other wearing apparel, iron and steel products, machinery, footwear, and leather goods are manufactured. But electric power, the keynote of industrial development in the Tennessee Valley, is a great decentralizer of industry, and smaller centers dot the area thickly. At Kingsport, Bristol, and Johnson City are several industries using wood as raw material and producing such commodities as chemical products, pulp, and tanning extract. Alcoa is an aluminum center using a very great amount of electric power.

Farther north along the great valley industrial decentralization is still typical. Only one town, Roanoke, exceeds 25,000 population. Rayon from imported spruce or cotton linters, cement from limestone and shale, steel products, and quarried limestone and marble rank high in the industrial output. Decentralization has been encouraged by the plentiful supply of labor in rural areas.

#### FORESTS

The great valley as a whole has about the same proportion of its land in woods as does the piedmont: 53 per cent. This woodland, however, is much less evenly scattered than in the piedmont. Most of it is in the rough and ridged western section, along the Blue Ridge on the east, and on the isolated ridges in the larger

valleys. The national forests extend into all these nonagricultural areas, and the federal government now owns more than a fourth of all forest land in the province. Nearly half of the national forest in the region is in the great valley. This province and the highlands together account for 94 per cent of the national-forest area. Much of the privately owned forest in the great valley is farm woodland. In southwest Virginia these farm woods typically occupy the ridges between the cleared valleys. Most land in the larger valleys is cleared for agriculture, but woodlands are dotted here and there.

The hardwood type of forest — mostly oak and hickory and their associates — predominates. Stands of Virginia pine, however, occur widely in southwest Virginia and the James River Valley; shortleaf and pitch pines are fairly common in the Tennessee portion of the province; and red cedar is scattered liberally over those limestone areas where it has been permitted to remain.

Except for the fact that the mining influence has been negligible, the forest of the western ridges has received much the same treatment in the past as has the forest of the highlands, and is in similar condition today. Farther east, the woods of the ridges are for the most part of inferior and even scrubby growth. Many woodlands in the better farming sections, on the other hand, are in reasonably productive condition. Some farmers have a sentimental attachment to their woods. They take joy in preserving the trees, and thus get much less financial benefit from them than might be possible otherwise.

Stands merchantable for saw timber occupy 35 per cent of the forest area. The quantity of saw timber on all forest land averages 1010 board feet per acre, of which three-fourths is hardwood, one-fourth softwood.

#### THE FUTURE

The resources and the development of the great valley are perhaps better balanced and more favorable to a prosperous future than of any other province in the region. Outside of the western ridge areas are well-knit rural and small urban communities, their people accustomed to a living standard based on an active agriculture and industry. The climate is, on the whole, stimulating to

human activity, and natural surroundings are conducive to human contentment. Limestone soils, nearby coal, electric power, forest opportunities on the west and on the east, good routes for commerce, and a vigorous population foreshadow further growth of the economy. Industry, of both centralized and decentralized types, is likely to absorb an increasing share of the labor force, at the expense of farming.

### INTERIOR PROVINCE

The interior province occupies the entire western end of the Appalachian Region, west of the Appalachian Plateau. It contains nearly three-tenths of the land in the region, and more than a fourth of the population, and is the largest of the provinces. Its land area is 56,000 square miles — 29,000 square miles in Kentucky and 27,000 in Tennessee. In its land use, the interior province is very largely agricultural. Its economy is primarily agricultural, secondarily commercial and industrial. Forest resources are small as compared with the other provinces of the region.

### LAND AND SOILS

East of the Tennessee River, rock formations underlying the province are similar to those of the Appalachian Plateau: alternating layers of sandstone, shale, limestone, and dolomite. The coal layer appears only in the western coal field of Kentucky. Two great limestone domes which once marked the bedrock formation have been worn down into basins. One of these is the bluegrass basin of Kentucky, centering upon Lexington. The other is the central basin of Tennessee, with Nashville as its focus. These two basins, together with the southern highland rim and the pennyroyal plain, have the best agricultural soils, derived from nearly pure limestone, the soils in some sections being high also in phosphate. The land is mostly level to gently rolling. Elsewhere, silicious limestone, shale, and sandstone have formed the soils, and fertility is much lower. Here, too, the land is more strongly rolling. The knobs area and western coal field, as well as parts of the western highland rim adjacent to the rivers, have a broken or hilly topography.<sup>8</sup>

<sup>8</sup> For a map of the physiographic areas here mentioned, see *Atlas of Agricultural Information, Appalachian Region*.



West of the Tennessee River, the geology is that of the coastal plain. Underlying materials are unconsolidated sands, clays, and marls. These, however, have been covered with a mantle of loess, fifty to one hundred feet deep near the Mississippi River, thinning gradually toward the east, and disappearing near the Tennessee. At both the eastern and western borders of this part of the province the land is rough and broken. Elsewhere it is gently rolling. Although the calcium content of the soil has been leached away to a depth of about ten feet, soils are inherently fairly productive for agriculture.

Soil erosion, however, has done much to lower the productivity of land throughout the interior province. In the west, the structure of loessial soils subjects them peculiarly to erosion losses; while in the east, topography and cropping methods have produced heavy losses in many areas. Climate is another factor in erosion. Winter weather is alternately that of the corn belt and of the cotton belt. Alternate freezing and thawing and occasional heavy winter rains upon unprotected soil lead to erosion. Heavy grass sod, such as is produced abundantly in the limestone basins, is a great soil protector.

#### AGRICULTURE

As the meeting ground of several agricultural regions, the interior province exhibits much variation in types of farming. The cotton belt extends into southern and western Tennessee and the southwestern tip of Kentucky. The corn belt fringes over into western Kentucky. The province's greatest crop is tobacco, most of it grown in the Kentucky half: Burley in the bluegrass and south-central areas of the state, fire-cured and dark air-cured types, with some Burley, farther west. Livestock and dairy products are produced in the pasture areas, and truck crops along the river in the west. The bluegrass area is noted for its horse-raising estates, largely subsidized by industrial capital from the northeast.

In general tone, the agriculture of the western part of the province resembles that of the coastal plain. Here one-crop systems — cotton, tobacco, and truck — dominate the farming picture. Negroes comprise more than a fourth of the rural-farm population, and in southwest Tennessee more than 40 per cent. Close to

60 per cent of the farms are tenant-operated. In the eastern part of the province, in those areas where limestone has lent prosperity to agriculture, there is some resemblance to the farming of the great valley, save that the prominence of tobacco makes for a higher proportion of tenancy. While in the Shenandoah Valley tenants operate about 20 per cent of the farms, in the bluegrass area they operate nearly twice that proportion.

#### MANUFACTURING AND COMMERCE

The Ohio and Mississippi Rivers, along the fringe of the province, and a few of the tributaries of these rivers, delineate most of the industrial development. This development has been furthered by these routes of transportation and more recently by excellent systems of land transport. The people have proved to be an adaptable industrial resource. But beyond these factors, the interior province has few outstanding advantages in industry. It is not an industrial province comparable to the piedmont or the great valley. Nor is it a producer of industrial raw material comparable to the highlands. There is some electric power and a little coal. But farm soils are the chief resource; and the growing, transporting, and processing of farm crops the chief industry. Considerable centralization is the rule.

Thus Louisville, the largest city in the province, with a population of 319,000, produces close to 40 per cent of the value of products manufactured in the province. Its chief industries are the manufacture of tobacco, distilling of whiskey, and meat packing. The city is a railroad-tie and wood-treating center and, along with Cincinnati, is a principal lumber market for the whole western portion of the Appalachian Region. Memphis (population 293,000) is a principal cotton market and a center for the manufacture of cotton cloth, clothing, and cottonseed products. At one time Memphis was the world's largest hardwood market; today furniture, flooring, and other wood products are manufactured there. Across the Ohio River from Cincinnati, and forming a part of the Cincinnati industrial area, is a group of towns with a total population of about 130,000. Chief among these are Covington and Newport. Owensboro is the distribution center for the western coal fields and manufactures textiles and electrical supplies. Padu-

cah has locomotive repair shops and boat works. These are the chief centers along the province's river fringe.

Within the province, away from its urban fringe, are but two cities of more than 25,000 population. Nashville (167,000) is the capital of Tennessee and has an important rayon industry. Lexington (49,000) is a tobacco market, trading center, and the capital of the Bluegrass.

#### WOODLANDS

Less than one-third of the land area of the interior province is wooded. The woods of the province are concentrated to a considerable extent in the eastern pennyroyal, knobs, and western coal field, and in the general region of the Tennessee River. These are the rougher and more broken lands, where agricultural development has been barred, or has been attempted but has failed. The location of wooded patches here is determined by topography and soil. In the limestone basins and other superior agricultural areas some good farm land is given over to woods simply as part of the plan of farm organization. But in the bluegrass area, for example, one may travel for miles without seeing a patch of woods larger than a fence corner. Nearly 53 per cent of all the woodland in the province is on farms — a larger proportion than in any other of the major divisions of the Appalachian Region except the piedmont.

Oaks and hickories mixed with a variety of other hardwoods make up the bulk of the forest. In the Tennessee and Mississippi river bottoms are bottom land-hardwood stands similar in composition to those of the coastal plain. The shortleaf pine-hardwoods type of forest is of scattered occurrence. In several localities, particularly the central basin of Tennessee, stands of red cedar are of some importance.

The forest is more lightly stocked than in any other province. Saw-log volume averages 920 board feet per acre; and the whole province, with 19 per cent of the region's forest land, has but 11 per cent of its saw timber. Fair stands of saw timber are to be found in parts of the western coal field and along the Tennessee River. But on the whole the woods have been rather thoroughly picked over for merchantable material. In recent times the cutting of railroad ties has loomed large as a timber use, and the province

still contributes heavily to the tie markets at Louisville and other railroad centers.

#### OPPORTUNITIES

Like the valley of East Tennessee, the interior province may be expected to undergo further changes as a result of TVA. Abundant fertilizer will have its greatest influence in the western part of the province; while electric power will affect both agriculture and industry over a wide area. It is possible that the Ohio River has already expressed its major influence upon the industrial pattern, and that further expansion will throw the balance of activity somewhat more evenly over the province than is the case today.

In land use, some increase in pasture, and possibly also some increase in woods, is to be expected. There are areas of intermediate fertility, such as the shale sections of the bluegrass, where land use is much in doubt. If pasture-management systems can be devised to keep these areas in sod, the pasture use will predominate. It appears possible, however, that the fight to make such areas conform to the land-use pattern of neighboring limestone soils may prove unprofitable, and that some energy may be turned in the direction of forest management.

## CHAPTER II

### PROBLEMS OF PEOPLE AND THE LAND

ALL FORESTRY PROBLEMS are problems of the people — and of the land. They are problems of the people by definition: what does not concern people is not a problem. They are problems of the land in that forests are a land resource. They are problems concerning the relationships of people and land — not only because a large segment of forestry-problem analysis has to do with rural people, who derive their living chiefly from the land; but also because urban people, as well as rural (Table 1), are concerned with the capacity of forests to provide industrial raw materials, consumers' goods, protection to vital resources like water and soil, a place for recreation, and income to labor and to capital.

The term *people and the land* is in this chapter used in a restricted sense. It is intended to apply specifically to the characteristics of the people as individuals and as social communities, to the structure of the local economy as it is evidenced in the manner of living and level of living of the people, and to the direct so-

TABLE 1  
POPULATION OF THE APPALACHIAN REGION, BY STATE,  
PROVINCE, AND CLASS OF RESIDENCE, 1940

STATE OR PROVINCE	ALL CLASSES	RURAL		URBAN
		Farm	Nonfarm	
Kentucky	2,845,627	1,257,899	738,401	849,327
North Carolina	3,571,623	1,656,501	940,947	974,175
Tennessee	2,915,841	1,271,944	616,691	1,027,206
Virginia	2,677,773	983,359	749,739	944,675
West Virginia	1,901,974	531,452	836,230	534,292
All states	13,912,838	5,701,155	3,882,008	4,329,675
Coastal plain	2,206,181	939,986	540,287	725,908
Piedmont	2,661,802	1,074,176	696,337	891,289
Highlands	3,480,736	1,363,180	1,386,331	731,225
Great valley	1,766,961	677,682	505,023	584,256
Interior	3,797,158	1,646,131	754,030	1,396,997
All provinces	13,912,838	5,701,155	3,882,008	4,329,675

cio-economic outcome of the relation of people and land as factors of production — insofar as these matters affect, and are affected by, the forestry situation.

#### PREVIEW OF PROBLEMS AND THEIR GEOGRAPHIC PATTERN

To speak in this restricted sense of the problems of people and the land is to bring to mind at once the problems of the highlands. This province is without doubt the focal point of more problems of the type with which this chapter is concerned, and of more acute problems, than the rest of the Appalachian Region. Of all areas within the region, and indeed within the United States, probably the social and economic problems of none have received such general attention or been the subject of such a profuse literature<sup>1</sup> as have those of the southern Appalachian highlands.

In the highlands are found the extremes of unproductive land, of overcrowded population, of retarded development of transportation and communication, of maladjusted people and communities and industry, that limit the opportunities for personal and cultural development and for making an adequate living. And for that reason it is in the highlands that those forestry problems that arise in the capacities and attitudes and levels of living of the people are to be found in most serious form. By the same token, the need for forestry to contribute its share to increasing the welfare of people is most urgent in the highlands; and this proposition is given weight both by the present low level of welfare and by the prominent place forestry appears to hold, not only in respect to land use but also in respect to the field of alternative opportunities for productive human effort.

But the place of the highlands in the region's problems of people and the land may easily be overemphasized. It may be made to appear that in the field of problem analysis the Appalachian states are virtually synonymous with the Appalachian highlands. A beneficial antidote to such overemphasis consists in bearing in mind that the territory outside the highlands contains more than seven-tenths of the region's rural people and three-fourths of all its people, more than seven-tenths of its forested

<sup>1</sup> Everett E. Edwards, *References on the Mountaineers of the Southern Appalachians* (U. S. Dept. Agr. Library Bibliog. Contributions 28; v + 148 pp., processed; Washington, 1935).

land and three-fourths of all its land. The problems of these people and this land are less striking, less dramatic, and less well publicized than those in the highlands province; but they are of their own right vital and noteworthy. Some of them, indeed, are serious particularly because they are viewed with comparative complacency in public opinion. Many problems of the people and the land as they concern forestry, especially, are submerged beneath the general level of popular interest established by agriculture and industry. If problems are judged in terms of the discrepancy between reality and opportunity, then the comparatively high degree of opportunity for forest income that exists in a number of the nonmountain areas suggests the presence of problems of the very first order.

Therefore the following discussion of problems of people and the land, while it will give great weight to conditions in the highlands, will by no means be concerned exclusively with that province. It will be understood that many problems found in their most acute form in the highlands exist also in greater or less degree throughout the remainder of the region. And it will be understood that some problems are encountered chiefly outside the highlands.

The *high ratio of population to resources* is, above all, the problem of the highlands. But it is a problem, also, of many depleted agricultural areas elsewhere in the region, notably in the piedmont province. *Underemployment* of rural people, in part a concomitant of overpopulation, and a major attendant upon the exploitation of both people and forests in the region, is a problem that, at least periodically, confronts nearly all rural sections. Related *maladjustments in agriculture and forestry* follow a similar geographic pattern. Problems peculiar to the *mining economy* are, of course, concentrated largely in the mountain sections of West Virginia, eastern Kentucky, and southwest Virginia, though they occur also in western Kentucky and in other spots outside the limit of the highlands. The problems of *rural-industrial relations*, found in most areas of the region, are especially acute in the southern piedmont and in the Tennessee and Kanawha valleys. *Social maladjustments* characterize particularly the communities of the highlands, where they take the form of social disorganization that has resulted from isolation and restricted opportunity,

followed by the sudden, unbalancing encroachment of outside influences. But in the rural textile areas of the piedmont, too, social maladjustments have arisen from rapid change in the mode of life and in the focus of industrial activity. Wherever they occur, such maladjustments have their repercussions on the forestry situation. Problems of the Negro are found in the eastern and extreme western parts of the region, but to a negligible extent in the highlands. Over the entire region the problems of *education* and *public health* are of major significance. Their relation to forestry is especially close in the mountain areas.

Before discussing such specific problems as these, it will be well to turn attention to two of the Appalachian provinces, the highlands and the piedmont. These two provinces contain examples of some of the region's most difficult problems of people and the land. A brief study of their historical development and present situation will serve as useful background.

#### THE HIGHLANDS PEOPLE

Problems, of whatever sort, are here regarded as such only where they impinge upon the welfare of the people. Problems are those conditions that affect the people adversely, and — aside from those arising from acts of God, which are not problems in a constructive sense — they stem also, in the last analysis, from the people themselves. Some problems, like the destruction of forest resources, are largely a result of the actions of past generations. Others, such as the problems of competition in a monopolistic economy, are the outcome of the behavior of social groups far removed in point of occupation and possibly in point of geography from the group primarily affected. Still others consist in currently created, local maladjustments in the organization of enterprise. And finally, there is the sort of problem arising from, and consisting in, the character and local social organization of the very people whose problem it is — an inbred problem, a small and vicious circle: self-perpetuating and, if it can be solved, in a great measure self-solving. This is the sort of problem which, though surely not peculiar to highland areas, is especially prominent there. In its most pronounced aspects it takes the form of retarded economic, cultural, and personal development, which acts not only as a direct drag upon further development but



also as a bar to the introduction of those innovations and influences, whether from within or without, that would be beneficial.

It is not possible justly to characterize the people of the highlands as a class. They vary as do the people of any area. Possibly they vary more, within the general pattern of their culture, than is true of the people of most areas. If the primitive is the rule, the far advanced does exist as an exception. If narrowness, ignorance, shiftlessness, ruthless cunning, licentiousness, and cruelty are found among the traits of character of the people, their opposites are found also, and intermediate traits more commonly than either extreme. The only brief characterization of the highlands that approaches truth is that they are a distinct social environment within the Appalachian Region, a "landlocked empire" which has, through generations, retained an individuality and, in a degree, a solidarity and a commonness of culture, founded in feudalism and the frontier, perpetuated through isolation, and degenerated through biological and cultural inbreeding and the ravages of poverty. The character of this society is the product in part of its environment and in part of its heritage, which environment has permitted — and, indeed, required — it to retain. Its character is a historical phenomenon, and to explain it requires something to be said, first, of the time and the manner of settlement of the highlands province.

Three periods may be recognized in the history of highlands settlement: that preceding the Revolution — say, until 1780; that extending thence until 1800; and that from 1800 until 1850.

The first of these periods saw very little settlement in the highlands proper, although the region of southwestern Virginia, north-eastern Tennessee, and northwestern North Carolina — in the valleys of the Holston, Watauga, Nolichucky, and Clinch Rivers — had its first permanent settlement before 1760 and received a thin scattering of pioneers from Virginia and North Carolina during the next two decades.<sup>2</sup> The extreme difficulty of mountain travel, the hostility of the Indians, and the absence of great population pressure postponed the opening of the highlands. During this first period, however, the reservoirs of population were forming on the

<sup>2</sup> Theodore Roosevelt, *The Winning of the West*, 4 vols. (New York and London, 1889), I, 170.

boundaries of the highlands, from which settlement subsequently came. There were three principal reservoirs: south-central Pennsylvania, at the foot of the great valley; southwestern Pennsylvania, in the vicinity of Pittsburgh; and the piedmont of the Carolinas.<sup>3</sup> The last area was in turn settled largely from Pennsylvania, by way of the great valley and the Roanoke gap;<sup>4</sup> and in this process of migration, the valley itself became well populated even by 1750. The people involved in all these movements were chiefly of Scotch-Irish and German descent,<sup>5</sup> who had entered Pennsylvania at the port of Philadelphia.

During the second period, following the Revolution, the population of the highlands grew rapidly, fed chiefly by these three reservoirs. This was a period of great westward migration across the mountains. The Wilderness Road, leading from piedmont North Carolina through the Watauga and Holston settlements, Cumberland Gap, and the hills of southeastern Kentucky into the transmontane limestone region, was the principal overland route, from which branches led also into Tennessee. The other main westward route was by way of the Ohio River. While most of the migrants used these routes merely as thoroughfares to the west, many found enroute localities that suited them as homes, and there was a considerable movement of population up the valleys of the principal secondary streams of the highlands. West Virginia and eastern Kentucky, lying somewhat apart from beaten paths, lagged behind in development. The Kentucky highlands probably did not receive their first probing settlement until after 1790, and their first general settlement until after 1800. Imlay,<sup>6</sup> first publishing in 1792, wrote of the mountainous areas in West Virginia, eastern Kentucky, and western Virginia that "the country . . . is the greater part of it mountainous, and . . . exclusive of some small tracts in the upper counties of Virginia upon the Ohio, all of which are occupied, is altogether broken into

<sup>3</sup> John C. Campbell, *The Southern Highlander and His Homeland* (xxi + 405 pp.; New York, 1921), pp. 23-26.

<sup>4</sup> Frederick Jackson Turner, *The Frontier in American History* (375 pp.; New York, 1920), p. 99.

<sup>5</sup> Turner, *Frontier in American History*, pp. 105-106.

<sup>6</sup> Gilbert Imlay, *A Topographic Description of the Western Territory of North America*, 3rd ed. (xii + 598 pp.; London, 1797).

high, rugged, and barren hills, the bottoms excepted, and in all probability will not be inhabited for centuries to come." And, referring to the mountains of eastern Tennessee and western North Carolina he stated that that territory was "little better" than the one just described.<sup>7</sup>

In the third period of settlement, from 1800 to 1850, the general westward migration of previous decades continued, but by different routes. The highlands was largely by-passed, the traffic moving by way of the Ohio River or by still more northerly routes. Movement *into* the highlands, however, continued, chiefly from central and eastern Virginia and North Carolina. These people were more largely of English stock than the first settlers; and eastern Kentucky, settled during this period, apparently has a larger strain of English than of any other stock.<sup>8</sup> Among the causes of migration during this period were probably the depletion of piedmont farm lands and, after 1830, the general depression of southern agriculture; the cession of Indian lands; the game, timber, and pleasant climate of the highlands, and the discovery of salt in Kentucky and West Virginia, the lack of which had been a strong deterrent to development of these areas.<sup>9</sup> After 1850, no large migrations passed into or through the highlands. Great changes continued to take place in the population, but these were internal changes occasioned by natural reproduction and local migration.

It was not until the latter half of the third period of migration that the highlands began to be shut off from the rest of the world and to become relatively an isolated area. Up to that time the highlands, like the remainder of the old West, had been the frontier; and all the frontier was isolated from the East. Yet it was an area of movement and this movement was nearly as free, and roads nearly as good, in the highlands as in the open lands to the west. The pooriness of the highland roads was, relatively, a slight deterrent to travel, for all travel was difficult. But as the new frontier moved still farther west, as the population and wealth of the immediate transmontane area increased, and as improved roads were built within that area and through the piedmont, the

<sup>7</sup> Campbell, *Southern Highlander and His Homeland*, pp. 40-41.

<sup>8</sup> Campbell, *Southern Highlander and His Homeland*, p. 65.

<sup>9</sup> Turner, *Frontier in American History*, pp. 17-18.

highlands gradually became cut off from the rest of the region.<sup>10</sup> It remained a frontier, while the new frontier was rapidly receding westward. By 1850, its isolation was nearly complete; and this isolation has continued in effect until recent years, when road-building and development of communication and educational facilities began to alter ways of life.

Since 1850 the principal change in highland living has come as a result of the natural increase in population. Exceedingly large families have always been the rule. Succeeding generations have called for the further and further subdivision of the original homesteads, or have been obliged to make new farms higher up the creek bottoms or hillsides, on ever poorer lands. The hill soils, originally thin, were quickly depleted. The smallness of farms and overstocking of labor have perpetuated the intensive hand methods of cultivation of the early days. With the depletion of forests, for a time the source of much income, poverty settled heavily over the people.

The mining industry, while it has given a variable employment to thousands of highland people, has, on the other hand, created wide areas of rural slums. Other industry has, in the main, avoided the mountains.

The chief reliance of the population is still the soil — a much poorer soil even than when it was first cleared, and parceled out in much smaller lots in the modern congested frontier. Typical of the frontier, a subsistence economy is the rule. Difficulties of transportation and meager land resources allow little to be produced for trade, above what is needed at home; little, therefore, can be purchased; the goods used at home must be held to a minimum, and many of them must be produced by the family. Labor is the chief exportable commodity, and work off the farm and away from the highlands is a principal source of cash.

With the increase in highlands population, the use of poorer and poorer lands, and the continually more unequal distribution of land resources among the people, distinct social classes have made their appearance. The owners of good bottom-land farms are the highland aristocracy. Those near the "head of the hollow" are the

<sup>10</sup> Mary Verboeff, *The Kentucky Mountains, Transportation and Commerce, 1750-1911* (Filson Club Pub. 26, vol. 1; xiii + 208 pp.; Louisville, Ky., 1911), Chap. IV.

peasantry. J. Wesley Hatcher has emphasized the existence of these classes:<sup>11</sup>

There are varying levels of economic and cultural conditions, of intelligence and morality . . . . On the basis of these differences, separated by cleavages which are deep and wide, there are distinct classes. They maintain different standards of living, speak different languages, accept different scales of values, and maintain different modes of conduct. Distances between the classes are fixed and maintained by well-established custom and definite attitudes. They live and move in different circles. Antipathy rather than sympathy characterizes the relationships among them. Any violation of these social distances is resented. These facts are fundamental to the entire social fabric. . . . There seems to be a close connection between genetic characteristics of the people and soil conditions. In the competitive shuffle the more vigorous and alert managed to get possession of the vantage points, while the less highly endowed were shunted off to the less desirable locations.

Since nearly every community is made up of all social classes, the chances for community solidarity — unity in constructive action — are greatly limited.

Hatcher recognizes three distinct classes of people:<sup>12</sup>

The first of these classes is to be found in the valleys of the creeks and rivers, where the soil is richest, exposure to the sun is fullest, vegetation rich, water supply abundant and sweet, and lines of communication relatively easy and many. Geographic factors quickly get expression in economic and social conditions. The house is large and commodious. If built of logs, they are carefully hewn, well fitted . . .

The people work hard and live simply, but in clean surroundings. They have opinions on politics, religion, and morality.

The living conditions and life of the second class do not differ widely from those of the first. They are pushed up the streams where the valleys are narrower, the hills and mountains are higher and steeper, the soil is poorer and thinner; consequently the variety and yield of vegetation are greatly reduced. As a result, the returns from the investment of capital and labor are less, and the conditions of living are much poorer. Houses are smaller and less comfortable . . . . There is less food . . .

<sup>11</sup> W. T. Couch, ed., *Culture in the South* (xiv + 711 pp.; Chapel Hill, N. C.: University of North Carolina Press, 1934), pp. 381-382.

<sup>12</sup> Couch, *Culture in the South*, pp. 382-387.

The labor by which the families live is more slavish. But . . . there is a margin beyond bare necessity.

### The third group

has been shunted to the starvation points, where slopes are steepest, soil is poorest and thinnest, exposure to sun least favorable, water supply worst, easy accessibility impossible. Here there is no incentive to labor, no margin for thrift, no basis for confidence or hope, no stimulation to aspire to higher standards or to respect the customs and values of outside society. No wonder feral men are here bred. Both physical and psychical isolation have done their worst. Incentive to anything better is lacking. It is here that the log house of one room, with one or no window, without fireplace or stove, and with clay floor is to be found. . . . It is here that the handleless skillet serves as cooking utensil, hand basin, tub for family wash, vessel for toilet purposes, and dish for whatever may be offered as food.

The people live in poverty, filth, and ignorance. The house is crowded with children; the yard appears to teem with dogs; but there is no cow or pig or chicken in sight.

Here are problems of people and the land in the most literal sense. These problems consist in a low level of life and culture and in the barrier to improvement presented by living and cultural conditions. It is reasonable to suppose that these conditions themselves, together with the resistance to outside influences that they imply, and the compelling character of internal social cleavages, will make it difficult to gain general local support of any new program for managing the land resources of the highlands in the people's long-run interest.

### THE PIEDMONT PEOPLE

In the piedmont, as in the highlands, poverty is the chief problem of the people and of the land. There is not enough good land to go around. And the capacity of forests to fill the gap has been greatly lowered after generations of misuse. These are the chief points of similarity between the two provinces.

Beyond these points a comparison of the piedmont with the highlands reveals much dissimilarity. The piedmont was originally an area of agricultural and forestry opportunity. To a great extent it is still the latter, for long-run forestry potentialities are not so

readily harmed through land mismanagement as are those of farming. In a comparatively brief period considerable areas within the piedmont were exploited of their farm-land resources, in a manner strikingly similar to the exploitation of forest resources in most areas. Unlike those of the highlands, the people of the piedmont have not largely stayed upon the land in the face of a depleted livelihood. Many have stayed, and the present situation is the immediate problem of these people. But the province was not isolated; there was opportunity to move — away from the piedmont altogether or into local industrial communities that were springing up on every side. Because there was an escape valve, the problems of man-land ratio, of poverty, and of social deterioration never became so serious as they did in the highlands.

The piedmont is a longer-settled area than the highlands. Something has already been said (p. 62) about its early settlement from the north, by way of the great valley. Most of its settlement, however, came from the east, from the coastal plain. Because in those times North Carolina was commercially isolated, having no first-rate ports and being tributary in its trade either to Virginia or to South Carolina,<sup>13</sup> the piedmont of Virginia developed earlier.<sup>14</sup> The development in piedmont Virginia was, in general form, typical of the entire province. To trace this development briefly is instructive, as background for an understanding of problems.

While the first permanent white settlement in Virginia, at Jamestown, was founded in 1607 and during the next few decades the frontier was pushed well back along the principal rivers, it was not until the early eighteenth century that the first thin scattering of pioneers entered the piedmont of that colony; and it was not until the middle of the century that the district began to be opened up extensively.<sup>15</sup> The barrier to westward migration presented by the coastal plain-piedmont border was largely a matter of transportation: the border was the fall line, and the falls set a

<sup>13</sup> U. S. Works Projects Administration, Federal Writers' Project, *North Carolina, a Guide to the Old North State* (xxxiv + 601 pp.; Chapel Hill, N. C., 1939), p. 58.

<sup>14</sup> Turner, *Frontier in American History*, pp. 96, 99.

<sup>15</sup> James C. Ballagh, ed., *Southern Economic History, 1607-1865*, vol. V in *The South in the Building of the Nation* (xiii + 677 pp.; Richmond, Va., 1910).

Landon C. Bell, *The Old Free State*, vol. I (623 pp.; Richmond, Va., 1927).

limit to river transport, which in those days was the only economical means of transport. Behind transportation, again, lay the overwhelming fact of tobacco as the hub of the economic life. It will be helpful to review the relation of tobacco to land use in coastal Virginia, where the systems were developed that were later brought to the piedmont.

The story of land use — forest and agricultural — in early Virginia is essentially the story of tobacco. This crop was first planted at Jamestown in 1612, and within a short space of years had gained a dominance over the life of the people of Virginia which it was slow to relinquish.<sup>16</sup> Tobacco production enjoyed a marked advantage over other types of economic activity. The English and Europeans who emigrated to Virginia brought with them high standards of living acquired in a mature and integrated economic society and were not prepared willingly to descend to a standard of self-sufficient frontier life. They turned eagerly to the opportunity of producing tobacco for export and of retaining a position in the industrial pattern of the Old World. Tobacco culture was favored by soil and climate, and its trade by the durability and concentrated nature of the product. Tobacco prices in the early days were so high, it has been said, that a man could earn six times as much in the culture of tobacco as in that of any other crop.<sup>17</sup> And by the time that prices and returns had fallen to their later ruinous levels the tobacco economy was so deeply established as to be difficult to change.<sup>18</sup> Change was hampered by the whole form of the social structure that had been erected around tobacco — the dependence, for example, upon slave labor, with its long and ingrained training in tobacco growing and only tobacco growing.

Tobacco culture demanded land in abundance, but was saving of capital and labor; and the latter were scarce, while land was plentiful. Tobacco growing was also wasteful of the soil. The plants themselves absorbed large quantities of soil nutrients, but even more important in soil wastage was the erosion which fol-

<sup>16</sup> Thomas G. Bradford, *Illustrated Atlas, Geographical, Statistical, and Historical, of the United States* (170 pp.; Boston, 1838).

<sup>17</sup> Sara A. Pryor, *The Birth of the Nation* (xvi + 352 pp.; New York and London, 1907).

<sup>18</sup> John Payne, *Universal Geography*, 4 vols. (New York, 1799), IV, 394-401.



lowed the hoeing and shallow plowing of that primitive agriculture. Under this system, farm-land fertility was quickly depleted.

Tobacco was grown in a kind of unplanned rotation with the forest, involving a cycle of farm-land clearing and abandonment. First the forest was cleared, and tobacco planted among the stumps, in the virgin soil. The second year's crop produced the highest yield, and thereafter yields diminished rapidly. "Using no manures, and with the crude and wasteful agricultural methods accentuated by the employment of slave labor, it was found that the best alluvial lands became exhausted in 8 years and those of the inner country [as the piedmont] in 3."<sup>19</sup> After that, the land was still capable of meeting, for a few more years, the less exacting requirements of corn or wheat production. But erosion continued, especially under corn. In five to twenty years after the original clearing the land was abandoned, to be reclaimed by the forest. Twenty years or so thereafter it might be recleared and a new, though less productive, cycle begun.

This, then, was the system of land management inherited by piedmont Virginia when agriculture developed there. After the initial brief period of self-sufficient farming while road systems were being built up, settlers grasped eagerly the opportunity to gain access to the sea and to tobacco commerce.

In the decades following the entrance of commercial agriculture into piedmont Virginia, transportation systems, population, and tobacco moved westward in successive waves. So essential a part of the agricultural economy and society did the system of land clearing, mining, and abandonment become that it persisted long after the Revolution, when wheat and other grains began to shoulder their way into the field of staple crops. So long as there were virgin lands to be had at home and so long as new lands and new agricultural methods were being developed in the West, staple prices were unlikely to rise — and did seldom rise — to the point where it would pay to use fertilizers and otherwise intensify the farming system. Even in the late 1830's it was only at the northern end of the piedmont, where markets and transportation were most favorable, that fertilizing and crop rotation had been introduced on a significant scale.<sup>20</sup> And the introduction of general

<sup>19</sup> Ballagh, *Southern Economic History*, p. 39.

<sup>20</sup> Bradford, *Illustrated Atlas . . . of the United States*.

practices to retard soil depletion is a phenomenon only of recent times.

While piedmont North Carolina developed a little later than piedmont Virginia,<sup>21</sup> and the culture of cotton played a much more important part in farm production, the essential story of land use was the same in the two districts. The plantation system never developed in the piedmont as it did in the coastal plain, the former province being typified rather by the operations of small, independent farmers.<sup>22</sup> Such farmers, however, used equally exploitative methods, and the soils upon which they worked were vastly more susceptible to damage.

Some piedmont areas whose records are known have lost all their topsoil through sheet erosion within a space of thirty years. Today this province is one of the most severely eroded in the United States.<sup>23</sup> In piedmont Virginia about 10 per cent of the land had lost three-fourths or more of its topsoil by 1934; in piedmont North Carolina, about 20 per cent.<sup>24</sup> Because most of the land in the piedmont has at one time or another been cleared for crop production, the presence of a forest stand means little with regard to severity of erosion damage. Indeed, some of the very poorest soils are now in forest cover, having been temporarily or permanently abandoned by farmers who could no longer make a living from them. Few areas in the piedmont have been free from the menace of soil destruction; the fertility, not merely of crop lands, but of forest sites as well, has been greatly impaired.

During the last century, and particularly during the last fifty years, the piedmont has become divided into two parts, northern and southern, whose development has been quite different. The northern part has remained largely agricultural. Seventy-two per cent of the total population is rural.<sup>25</sup> Abandonment of farm lands, which since 1850 has produced a rather steady net decline in the

<sup>21</sup> *North Carolina; a Guide to the Old North State*, p. 36.

<sup>22</sup> *North Carolina*, p. 37.

<sup>23</sup> E. M. Rowalt, *Soil Defense in the Piedmont* (U. S. Dept. Agr. Farmers' Bull. 1767; iv + 63 pp.; Washington, 1937), p. 6.

<sup>24</sup> Rowalt, *Soil Defense*, p. 8.

<sup>25</sup> William A. Duerr, T. C. Evans, and G. E. Morrill, *The Forest Situation in Piedmont Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 13; iii + 83 pp., processed, Asheville, N. C., 1943), p. 8.

acreage of farms and of improved land on farms, has been accompanied by considerable out-migration of the people. Between 1880 and 1930 the total population of piedmont Virginia increased but slightly, and the population of this district, relative to that of the entire state, has been declining since before 1850.<sup>26</sup> Total population in a number of the rural counties has been declining. It is apparent that over a long period of years — say, four generations at least — many northern-piedmont areas have been an inhospitable environment. And because population almost never shifts, geographically or occupationally, readily enough to keep the opportunities of life equalized, these areas of the northern piedmont have been, and are, chronically depressed, the margin of subsistence being held ever tightly against the remaining population. The scarcity of opportunity, both in agriculture and forestry and in industry, together with a long era during which the forces of selection have tended to hold in place the least venturesome and the least capable of the people, has degraded living standards, initiative, and the tone of the social organism. And because it is the quality of the individual and social fiber which, in the last analysis, governs the potential productivity of the natural resources that men manage and use, the degraded areas of the northern piedmont are problem areas.

In the southern part of the piedmont, also, there are rural areas where past development and present problems parallel those just described. But by and large the problems of the southern piedmont are different. Sixty-five per cent of the population is rural, but only 42 per cent lives on farms. Between 1900 and 1930 the population of this district nearly doubled.<sup>27</sup> This phenomenal development is largely explained by industrial growth.

The early prospects for such growth were not bright.

From 1815 to 1835, North Carolina made . . . little economic and social progress. . . The chief cause of the backwardness was its inaccessibility to markets. In 1815 there were only 23 small iron works, 3 paper mills, and 1 cotton mill in the State. . . North Carolina dropped in population from third place among the States in 1790 to seventh

<sup>26</sup> Duerr, Evans, and Morrill, *Forest Situation in Piedmont Virginia*, p. 6.

<sup>27</sup> J. W. Cruikshank, *Forest Resources of the Piedmont Region of North Carolina* (Appalachian For. Exp. Sta., Forest Survey Release 6; iii + 55 pp., processed; Asheville, N. C., 1940), p. 2.

place in 1840. Soil exhaustion, the lure of the West, lack of internal improvements and educational facilities . . . led many people to forsake the State.<sup>28</sup>

After the Civil War tremendous changes began to take place, and after 1880 the changes were swift. The cotton-textile industry spearheaded the industrial advance. In 1880 the number of cotton-textile workers was 3,000; in 1900, 30,000; in 1935, a deep-depression year, 94,000, working in 311 mills located mostly in scattered small towns. The tobacco-manufacturing industry, next in importance, developed in Durham, and is now centered there and in Winston-Salem and Reidsville. The first furniture factory in North Carolina was established at Mebane in 1881. In 1900 there were 44 furniture-manufacturing establishments, employing 1,700 wage earners; in 1935, 118 establishments, employing nearly 14,000 workers. These establishments are widely scattered, with some concentration at High Point, Thomasville, Hickory, Statesville, Morganton, and Mebane.<sup>29</sup> These three industries — textile, tobacco, and furniture — are all largely centered in the piedmont. The fourth industry of the southern piedmont — lumber — is centered farther east, and is made up of a multitude of small manufacturing units located in nearly every community in the district.

Decentralization, indeed, has keynoted the industrial development of the southern piedmont. And therein has arisen one of the area's outstanding problems. The availability of large and well dispersed numbers of exploitable laborers was undoubtedly a major factor in industrialization. This exploitation was accomplished, and continues. It is not merely a matter of wages and working conditions, but also a matter of the conditions of social health attendant on the creation of congested rural communities. These industrial communities have other problems, too, that are of the nature of growing pains. These problems consist in the fact that economic change has occurred too rapidly for cultural progress to keep pace. There is yet much to be done in absorbing these changes in individual and community life and in developing the capacity to assume wise stewardship of all the resources, natural

<sup>28</sup> *North Carolina; a Guide to the Old North State*, pp. 42-43.

<sup>29</sup> *North Carolina*, pp. 72-73.

and human, that have so suddenly been placed in new relationships to one another.

#### RATIO OF POPULATION TO RESOURCES

The Appalachian Region has a dense rural population. This is a reflection of its small farms and its many small mining and industrial communities. Dense population does not necessarily indicate heavy pressure upon resources, but data on population density, taken in conjunction with other data on population, income, and character of resources, are significant of considerable pressure in some areas. In 1940 the region as a whole had a rural population of about 52 per square mile of rural land. The corresponding figure for the remainder of the United States was 23; and for the remainder of the United States east of the Mississippi, 39. Within the region, the highlands province had the densest rural population, and the piedmont next. The figures for each province are as follows:

Highlands	61
Piedmont	56
Coastal plain	53
Great valley	46
Interior	45
All provinces	52

It is scarcely possible, for the Appalachian Region, to demonstrate statistically the extent of population pressure upon land resources in general. However, an inkling of the general situation is provided by the 1940 data on area of land available for crops (cropland harvested, failure, and idle; and plowable pasture) per capita of the farm population.<sup>30</sup> The regional average is 7.8 acres, compared with 17.4 acres for the entire United States. State averages within the region vary from 10.5 in Kentucky, where stock farming is sufficiently prevalent to affect the ratio, to 5.1 acres in North Carolina, influenced materially by concentrations of tobacco, cotton, and mountain-subsistence farms. In all the provinces of the region, the lowest ratios of cropland to farm population are found in the highlands areas and those of coastal

<sup>30</sup> U. S. Dept. Agr., Interbureau Tech. Services Committee, *Appalachian Region, Atlas of Agricultural Information, Appalachian Region* (loose-leaf, pp. not numbered, processed; Washington, 1942).

North Carolina. In the highlands there is an average of 5.6 acres of cropland per capita of the farm population. In the Cumberland Mountains area of West Virginia, Virginia, and Kentucky, and in southeastern North Carolina, the average is about 3 acres per capita.

In the highlands, these few acres of cropland are devoted almost exclusively to raising food for the farm family. Little land is available for producing cash farm products. For cash income, therefore, rural people must rely heavily upon the other land resources: mines and forests. In the non-mining areas the pressure of population upon forest resources is potentially very great — and in all probability well beyond the current capacity of the forests to absorb such pressure. Only the low standard of living of the people prevents the development of an acute situation in the field of timber utilization. As it is, the problem consists in failure to build up and utilize the forest as part of a program of raising living standards and levels of living.

A significant index of the ratio of rural population to resources is the income of rural people.<sup>31</sup> Here, again, no measure of the general situation is available; but the data on agriculture throw a revealing sidelight on conditions. Nearly 61 per cent of the farms in the Appalachian Region reported less than \$600 worth of products sold, traded, or used by the farm family in 1939. Forty-two per cent reported less than \$400 worth. On the \$600 basis, percentages for individual states ranged from 44 in North Carolina to 77 in West Virginia. Outside the coastal plain and bluegrass counties, where per-farm incomes were notably high, only 48 counties out of a total of 370 had as many as half their farms in gross-income brackets above \$600. And only one highlands county had half its farms in these brackets.<sup>32</sup>

The Appalachian states, with 19 per cent of the nation's rural-farm population, produced, in 1939, 10 per cent of the value of farm products sold, traded, or used; and 8½ per cent of the value of products sold or traded. Gross farm income from all products was \$140 per capita of the rural-farm population, as compared with \$286 for the rest of the nation. State averages of gross income

<sup>31</sup> John D. Black, "Agricultural Population in Relation to Agricultural Resources." *Annals Amer. Acad. Polit. Soc. Sci.* 188: 205-217 (Nov. 1936).

<sup>32</sup> *Atlas of Agricultural Information, Appalachian Region.*

per capita ranged from \$102 in West Virginia to \$158 in North Carolina. The value of products sold or traded per capita was \$101 in the region, \$249 in the remainder of the United States.

The location of areas of lowest income is revealed by a study of those counties where annual gross farm income per capita of the rural-farm population falls below \$100. In 1939 there were 137 such counties in the region; and 89 of these were located in the highlands. Extending the low-income class to include counties with per-capita averages of less than \$125, the two outstanding low-income districts of the region appear to be the highlands, with 93 per cent of its counties in this class, and the piedmont, with 38 per cent.<sup>33</sup>

Population density and the general poverty of returns from farming should be borne in mind, and interpreted in terms of the man-land ratio, in the discussion of forest resources in later chapters and in the discussion of the other outlets for rural labor — mining and industry — in this chapter. For poor people, resource conservation is like a luxury: too costly in terms of abstinence from today's essentials, for them to be able to afford much of it. In their poverty, they exploit the available resources for immediate return; resources thus impoverished become the lagging denominator of a high man-land ratio; such a ratio is the essence of poverty — and thus the circle is completed and ever more indelibly drawn.

#### UNDEREMPLOYMENT

The terms *unemployment* and *underemployment* are subject to a variety of interpretations, and for this reason it is necessary first to say something about their meaning. If the term *unemployment* be discarded on the ground that it is covered as a special case of *underemployment*, then the latter concept may be regarded as applying to either individuals or groups, of enterprises or laborers or other productive factors; and as having a maximum range from zero to one hundred per cent. Application of the term will here be confined to labor, unless otherwise specifically stated.

From the standpoint of the organization of productive factors, *underemployment* may appear, superficially, to take two forms. The first of these is loss of effort in periods of idleness, variously distributed over the working day, month, year, or group of years.

<sup>33</sup> *Atlas of Agricultural Information, Appalachian Region.*

The second is loss of effort through misapplication of labor in the productive process. The first form is typical of urban industrial underemployment; the second, of rural nonindustrial underemployment. There is, however, no essential difference between these two forms so far as income and production are concerned, although there is sometimes a difference in the opportunity for correcting the underemployment. Here both forms will be classed together, the first as a special case of the second, in which the economic productiveness of human activity, whether it is hoeing a sterile field or sitting in a rocking chair, is zero.

Again, from the viewpoint of the standard against which underemployment is judged, two forms may be recognized. The first is underemployment with reference to existing employment opportunities.<sup>34</sup> The second is underemployment with reference to a standard period and efficiency of work (this standard, in all likelihood, varying with the occupation and the region, and being based upon workers' innate efficiency and capacity). Here the second concept will be adopted.

So defined, underemployment is merely another expression for the misapplication of the factor, labor, to productive processes. This definition will be accepted in what follows. Underemployment will be regarded as existing if members of the labor force are either putting in less than the standard time or applying their capabilities in other than reasonably optimum combinations with the cooperating factors of production.

Obviously, underemployment in this sense is evidenced by just such conditions as have been discussed under the heading of the ratio of population to resources — high population density and low income. A high population-resources ratio and underemployment are merely two aspects of the same problem.

The migration of Appalachian population and its changes within the region offer further evidence regarding the status of underemployment. Rural areas in the United States have for a long time been sending a stream of new population into urban areas. This is the process which, in the face of much higher rural birth rates than urban, has furthered the urbanization of the United

<sup>34</sup> U. S. Dept. Agr., Appalachian Regional USDA Committee, *Subcommittee Reports, Meeting at State College, Raleigh, N. C., July 29, 1942* (35 pp., processed; Washington, 1942), p. 31.



States.<sup>35</sup> No matter how readily rural population may appear to shift, it is inevitable that there should be a lag in the urbanward movement, resulting in the maintenance of a more or less idle pool of population destined ultimately to find employment elsewhere. The presence of such a pool is itself a phenomenon of underemployment and might be expected to contribute to the depression of rural incomes below the urban level. This situation is found in acute form in the Appalachian Region, first, because the region is so generally and predominantly rural (69 per cent of the population, as against 40 per cent for the rest of the United States) and second, because isolation, especially in the highlands, has resulted in the maintenance of an abnormally large pool. The fact that the Appalachian Region has sent great numbers of people into urban areas suggests the large capacity of the underemployment pool in the region, but does not necessarily indicate that the contents of this pool have been greatly reduced. In fact, evidence points to the conclusion that even in times favorable to out-migration the pool is maintained at a high level because of its large initial size and a rapid rate of natural increase.

Of course during the 1930's there was much in-migration to rural Appalachian areas — in many cases by the same people who had left these areas during the previous era of industrial prosperity. But what changes took place in the early 1940's, when the incentives and opportunities for full employment were possibly greater than at any time in the history of the region? Some data are available, with special reference to the farm population.<sup>36</sup>

During the two years following the census date in 1940, it is estimated, the civilian population of the Appalachian Region increased by 0.61 per cent.<sup>37</sup> This increase was composed of a considerable increase in nonfarm population and a decrease in farm population. Total migration from the rural-farm population during the two years was about 779,000, or 14 per cent, as compared with 13 per cent for the whole United States. When natural increase in remaining population is deducted, it is found that the

<sup>35</sup> O. E. Baker and T. B. Manny, *Population Trends and the National Welfare* (28 pp., processed; Washington, 1935), p. 3.

<sup>36</sup> Data on population not otherwise credited are taken from unpublished studies of the U. S. Department of Agriculture, Bureau of Agricultural Economics, Division of Farm Population and Rural Welfare.

<sup>37</sup> *Atlas of Agricultural Information, Appalachian Region.*

net decrease in rural-farm population was 518,000, or 9.1 per cent, as against 8.8 per cent for the United States. These comparisons between the region and the nation do not in themselves indicate that the excessive regional underemployment pool was being substantially drained.

The lag in the movement of underemployed people was evidently not remedied in subsequent years. It is estimated that by the end of 1943, 3½ years after the census date, 550,000 farm workers had left the farm and another 300,000 had shifted to industrial employment, using the farm only as a place of residence. This figure of 850,000 people includes only workers and potential workers. Despite this heavy out-migration, the labor necessary for 1943 agricultural production in the region could, it is estimated, have been performed by 450,000 fewer workers than were actually available, making no allowance for reorganizing its many inefficient farms.

Meanwhile new reserves of workers continue to pile up in rural areas. For the decade 1940-1950 it is estimated<sup>38</sup> that 205 men will enter the working-age group in the Appalachian Region for every 100 lost from this group through death or aging. The state-average replacement rate varies from 186 in West Virginia to 243 in North Carolina.

Probably the underemployment situation in other rural occupational fields is not so serious as in agriculture, although to analyze rural underemployment separately by occupations may be misleading. Except for those comparatively segregated rural activities like textile manufacture, carried out in little rural towns, rural occupations are in a large measure supplementary from the social viewpoint. Much farming is done on a part-time basis. Woods work, mining, work in small mills, service employment, and farm work are alternative occupations for many individuals. The really significant consideration is the balance between the rural working force as a whole and the employment opportunities, as a whole, open to these workers.

The field of forestry, for example, is just as deeply concerned as are the fields immediately affected, by underemployment of farm workers, mine workers, and other rural laborers. In the ag-

<sup>38</sup> *Atlas of Agricultural Information, Appalachian Region.*

gregate, and from the social viewpoint, these men are jacks-of-all-trades. Their underemployment is as much a burden upon, and a challenge to, forestry as to the occupation immediately concerned. The effect upon timber production, prices, transportation, and marketing of the existence of a class of chronically idle men able and willing to work in forestry occupations is one of the chief forestry problems of the region. It lays the forests, forest owners and workers, and other rural people and resources open to exploitation and sets up barriers against correcting this situation. This proposition will be enlarged upon and frequently emphasized in chapters to follow.

### A MALADJUSTED AGRICULTURE

Underemployment of labor implies a maladjustment of the co-operating factors of production. General rural underemployment is associated with maladjustments in the business of forestry, of mining, and of agriculture.

In 1942 studies were made in three areas in the highlands, to determine the feasibility of combining the farm units into units of efficient size for war production.<sup>39</sup> It was found that in order to employ effectively one full-time worker, four to six of these units would need to be thrown together. These areas, of course, represent close to the least efficient use of farm labor and resources in the region.

A helpful over-all view of the extent of agricultural maladjustment in the region is provided through use of a farm classification developed out of the special cross tabulations of 1940 agriculture-census data for the Appalachian states.<sup>40</sup> Farms were classified

<sup>39</sup> Reed H. Bradford, and E. C. Weitzell, *Rural Underemployment and Land Use, in a Marginal Agricultural Area of West Virginia* (W. Va. Agr. Exp. Sta. Mimeographed Cir. 48; 23 pp.; Morgantown, 1943).

David E. Derr, and R. E. L. Greene, *Manpower Utilization in Relation to Agricultural Resources, Davidson County, N. C.* (13 pp., processed; Washington, 1943).

Olaf F. Larson, and James C. Downing, *Manpower for War Work — Eastern Kentucky* (ii + 82 pp., processed; Washington, 1943).

<sup>40</sup> U. S. Dept. Agr., Appalachian Regional USDA Committee, Technical Services Subcommittee, *Toward Planning for Rural Resources in the Appalachian Region* (iv + 90 pp., processed; Washington, 1943), pp. 28-49.

U. S. Dept. Commerce, Bureau of the Census, and others, *Analysis of Specified Farm Characteristics for Farms Classified by Total Value of Products, Appalachian Region* (Tech. release 4; 13 pp., processed; Washington, 1943).

into five income types: (1) commercial farms, those with value of products sold, traded, or used in 1939 of \$1500 or more; (2) marginal farms, with value of products of \$600 to \$1499, whose operators worked less than 150 days off the farm in 1939; (3) subsistence farms, with value of products of \$100 to \$599, whose operators worked less than 100 days off the farm; (4) part-time farms, with value of products of \$600 to \$1499 and operators working 150 days or more off the farm, or with value of \$100 to \$599 and operators working 100 days or more off the farm; (5) rural residences, with value of farm products of \$1 to \$99.

Commercial and marginal farms, comprising 37 per cent of the total number, accounted for about 84 per cent of the value of farm products sold or traded (Table 2). Nearly two-thirds of the farms in the region were in the subsistence, part-time, and residence categories. These farms contained an average of less than 13 acres of harvested cropland. The average value of all farm products

TABLE 2

NUMBER AND SELECTED CHARACTERISTICS OF FARMS IN THE APPALACHIAN REGION, BY INCOME TYPE, 1939

Income Type	Number	Per cent	Average acreage	Average cropland acres harvested	Per cent of farms without horse, mule, or tractor
Commercial	111,643	10.6	188	61	7
Marginal	276,534	26.3	95	29	15
Subsistence	408,305	38.8	55	13	42
Part-time	173,819	16.5	60	15	38
Residence	64,242	6.1	32	5	76
Unclassified	18,411	1.7	...	...	...
All types	1,052,954	100.0	79	22	32

VALUE OF FARM PRODUCTS IN DOLLARS

Income Type	Average consumed, sold, or traded per farm	Average consumed per farm	Average sold or traded per farm	Total sold or traded per income type	Per cent of total sold or traded by all income types
Commercial	3,023	336	2,687	299,995,741	52.3
Marginal	924	270	654	180,856,343	31.6
Subsistence	323	185	138	56,426,090	9.8
Part-time	402	197	205	35,632,895	6.2
Residence	60	51	9	578,178	0.1
Unclassified	...	...	...	...	...
All types	772	218	544	573,489,247	100.0

sold, traded, or used was \$318, and of this amount, well over half represented products used at home by the farm family. Only \$143 worth of products were marketed by the average farm. On more than 4 farms out of every 10 there was no horse, mule, or tractor: farm operations were performed by hand labor.

In 1940 there were about 28 million acres of cropland on the farms of the Appalachian Region. It has been stated that more than  $4\frac{1}{4}$  million acres of this land is unsuited for use in crop production and should be retired — not even to pasture, but to forest use. More than  $6\frac{1}{3}$  million acres now in farms should, it is asserted, be retired completely from the agricultural column.<sup>41</sup> On those lands permanently suited to farming, the small size of farm units is apparently the basic problem. According to one statement,<sup>42</sup> the number of farms that the region can efficiently maintain is about 745,000, or nearly 30 per cent fewer than the present number. After such a reorganization, 43 per cent of the farms would fall in the commercial class, with an average of sixty-five acres of cropland per farm; and another 33 per cent of them would be merely rural residences, with an average of two acres of cropland, for home-garden purposes only. The great bulk of present-type farms — overstuffed, undersized, and underequipped, occupying large areas of the land resources of society and returning to society very little but poverty — should be removed altogether from the agricultural roster. If these estimates are accepted as reasonably close to the long-run ideal, then they indicate the nature of the problems today confronting the farm economy of the Appalachian Region.

Such farm problems as these imply coördinate problems of forestry. The problems of farm people — their low income, their inefficiency, and their limited opportunity — impinge directly upon forestry, because, for one reason, 45 per cent of all the forest is owned by farm people and its management is in their hands. The problems of farm land are also in part the problems of forest land, because farming and forestry are the two chief alternative uses of land in the region, and where the one is in maladjustment, the other, by the same token, is also.

<sup>41</sup> *Toward Planning for Rural Resources in the Appalachian Region*, p. 11.

<sup>42</sup> *Toward Planning for Rural Resources*, pp. 36-39.

## A MALADJUSTED FOREST ECONOMY

Forestry, also, has its special maladjustments pertinent to the problems of people and the land. Mislocation and misuse of forests, inefficiencies in the application of labor to forest and timber production, and the many interrelationships between forest management and the structure, social health, and income of the community and the capacity and psychology of the individual are among these problems. But these matters are a principal subject of succeeding chapters; and since there they are considered in detail, they will not be treated here.

## MALADJUSTMENTS OF THE COAL-MINING AREAS

The personal plight of the bituminous coal miner is as grave as that of any class of people in the highlands. His problems arise in the unstable and hazardous nature of the industry that employs him, in his barren and unhealthful surroundings, in his personal bondage within the feudal community where he lives, and in his inadequate income and conditions of work. The miner enjoys some periods of prosperity, when his burden is considerably lightened. Perhaps for that reason, and because he attributes his customary prostration to specific, alterable human agencies and not to inescapable natural forces, he recognizes and resents his own problems: which, by and large, is not the case with other highlands people. The problems of the coal miner and his community may not appear to be forestry problems in any legitimate sense. Yet a study of the forest situation cannot rightly overlook the mining community, for that community is a closely related part of the same social organism of which the forest economy proper is another. No part of this organism can altogether escape an infection suffered by other parts. Furthermore, forestry and mining are linked as alternative occupations and sources of income; they are linked through the use of wood in the mining process;<sup>43</sup> they are even linked through the economic and psychological conflict between depletion and conservation of natural resources. The problems of the miner and his land are related to all these considerations.

<sup>43</sup> J. E. Barton, *The Regenerative Forests of Eastern Kentucky and Their Relation to the Coal Mining Industry* (Ky. State Forester Cir. 8; 4 pp.; Frankfort, 1919).

The past few years have been a time of great change for the miner. He has won, whether temporarily or permanently, better conditions of work and pay and a greater measure of social security. He is unlikely to reach again the depths struck before the days of safety and insurance laws and general unionization. He may not reach again the depths of such a depression as that of the 1930's. It will, nevertheless, be valuable to review a picture of the coal miner as he was during that depression. Such a picture was sketched by Crawford in 1934.<sup>44</sup> Times change; but many of the basic problems of the miner and his community persist over long years.

Mining is hazardous: not merely accident, but also sickness, is common among miners. "Mine owners have promoted Safety First and First Aid to reduce an appalling list of accidents and fatalities. Except at large plants this activity has languished . . ." during depressed times. The smallest mines, the "wagon" or "truck" mines, are most hazardous, for relatively few safety precautions are taken. "Dampness and poor ventilation result in pulmonary maladies. Tuberculosis, or 'miner's asthma,' is caused partly by daily inhalation of coal dust."

Against the hazards of accident and sickness most mines but the smallest employ a doctor, paid by deductions out of the miners' wages. The largest mines have, in addition, well equipped infirmaries and staffs of trained nurses.

The company doctor is often an issue of some bitterness. No list of complaints of the workers, when they organize, omits the "company doctor injustice." The doctor, though supported by the miners, is employed by the company. Unlike the physician of independent practice, the company doctor seldom feels any responsibility for his patients. Miners complain that often he takes his time when responding to a call; that sometimes he either ignores the call or forgets to come; that when he does come he shows not even a professional, much less a humanitarian, interest in the patient. Moreover, in case of accident or death resulting in line of duty, the doctor is likely to relieve the company of responsibility by misrepresenting the actual cause.

A miner's pay varies in the extreme. When times are good, he has enough to buy silk shirts and a fine automobile; he is not

<sup>44</sup>In Couch, *Culture in the South*, pp. 361-373. Quotations in the remainder of this section are from the same source.

inclined to save much of his pay. When times are poor he works to avoid starvation. But his work is not steady in such times.

Many companies give all their men a few days' work rather than a few men full-time work. This policy . . . enables the owners to keep the miner's wages from going away from the commissary [operated by the company] since no miner working two or three days a week draws any cash above his commissary needs to spend elsewhere. A full-time employee might draw some cash and spend it at outside stores. Before the miner can draw on his wages he first must have made enough to cover "deductions" for rent, coal, light, smithing, doctor, hospital, insurance, school, burial, and at some mines, church. These cuts . . . at many mines remain the same regardless of the number of days a month the miner works. . . In time of depression the miner does well to earn \$30 a month. . .

Except in good times the miner is coerced into accepting for his labor, not government money, but a highly inflated form of private currency known as company scrip. While waiting for pay day . . . he must have food and clothing for himself and family. With no money in the house, his wife must draw scrip, which is good in trade at the commissary. By pay day he generally has drawn all his earnings. . . Company prices range from 25 to 100 percent higher than chain-store prices. Many companies make more profit from their commissaries than from the sale of coal. Some operate mines in order to have renters and store customers. . . The miner . . . would risk his job if he traded at outside stores.

Most mines except the smallest have their own towns, or "camps," with the houses rented to miners.

The houses are, for the most part, crudely constructed shacks, closely set in rows along hillsides or creek bottoms. The worst are without plaster, running water, toilets, or sanitation of any kind. . . Water is carried from springs in roadsides or creek banks. The privy is built over a creek, or on the slope near the back door. The cow, when the miner is so fortunate as to own one, is stabled under the floor if the house is one of those perched on stilts upon the hillside. . . When times are prosperous and labor is scarce, the worker may live on his own property, no matter how far distant. But when labor is plentiful the miner is given the choice of renting a company house or surrendering his job. . .

Food is . . . a problem, over the period of a lifetime. Compelled to pay extortionate commissary prices . . . [the miner] cannot put much on his table with only two or three days' work a week. . . Potatoes



may be found prepared in two ways, fried and mashed, for the same meal, with little else. . . Not always is there milk, even canned milk, for the children. . . In the impoverished camps of Kentucky, milk is regarded as medicine. . . Pellagra is common. Susceptibility to tuberculosis and other diseases is greatly increased by malnutrition. . . During a strike the miner and his family must subsist on rations from the union and stuff begged from soft-hearted hucksters who are permitted on the public highways but not in the feudal area of the company. . .

What "cultural" opportunities relieve the miner of the drabness of his lot, the boredom of his spare time? . . . First, every mining town of any size has its own school, customarily supported in part by the company out of its own treasury or by cuts from the miners' wages. . . When times are good and work is plentiful, all children of school age may be found in the classroom. When work is slack, children of the most destitute families are likely to stay out because they have insufficient clothing. . . Every mining community has its church or churches. . . The mining town is not without its secret order, or "lodge" . . . Whatever cultural influence the movies may have on American life, that influence is doubtless at its worst in the mining town. Here the cheapest pictures are shown every night in the week. . . What is true of the movies is true of such literature as reaches the miner. . .

### The miner's political and civil rights are restricted.

Organized protests usually set forth a long list of grievances and demands. Among the demands are abolition of the yellow-dog contract [an agreement by miners, when accepting employment, not to join a labor union nor to agitate against the company], a check-weighman of their own choosing, a doctor subject to their will, the right to trade where they wish, reinstatement of men cashiered for joining the union, the right to assemble peacefully and to choose leaders in any industrial controversy. Among other grievances are search and seizure without warrant [most camps have their deputy sheriffs, employed by the company], arrests on trumped-up charges, unlawful evictions from company houses, the blacklist, and a general conspiracy of operators and a misinformed and unorganized public to defeat their cause.

The mining company is not altogether to blame for the miner's plight. In part, his plight is the outcome of the whole organization of the mining industry. Mines of medium and small size, especially, are exposed to the full force of a violent trade cycle, with depressions marked by low prices and the bitterest competition.

Fluctuations in the demand for coal strike back with great severity at the mining companies, and, beyond them, at the coal miner.

### RURAL-INDUSTRIAL RELATIONS

While industrial development is an outstanding feature of many of its areas, the Appalachian Region as a whole is not highly industrialized. Only 31 per cent of the total population in 1940 was classified as urban, as compared with 60 per cent for the rest of the United States. Nearly 41 per cent of the population lived on rural farms, as against 21 per cent for the rest of the nation. But the size of the rural nonfarm population (28 per cent for the region, 19 per cent for the remainder of the United States) is an index of the substantial importance of small-scale and decentralized industry and business in the Appalachian states. The value added to gross income by manufacture in 1939 was \$118 per capita of the total population, as contrasted with \$106 for the rest of the United States.

The chief *centers* of manufacturing industry in 1939 were Chattanooga, Knoxville, Memphis, and Nashville, in Tennessee, where some of the main products were textiles, hosiery and other wearing apparel, iron and steel products and machinery, wood products, footwear, and leather goods. In the Cincinnati and Louisville areas, in Kentucky, iron and steel products, machine tools, wearing apparel, furniture, and food products were the chief items of industry. The Wheeling industrial area of West Virginia is an important steel and glass center. The Hampton Roads and Richmond areas, in Virginia, have large shipbuilding works and, in addition, leather and food-products industries. Charlotte, North Carolina, is a hosiery, textile, and food-products center.

Besides these centers, there are several areas in the region marked by *more or less decentralized* industrial development. There are the textile, tobacco, and furniture industries scattered through the southern part of the piedmont. Hydroelectric power and fertilizer production have been developed in the Tennessee Valley. Coal, oil, and gas in Kentucky, southwestern Virginia, and West Virginia are important basic industries. The Kanawha valley of West Virginia is one of the most important chemical-industry centers of the world.

Perhaps most closely associated with the rural people of the

region are the multitude of small, *highly decentralized* industrial plants scattered throughout it. Wood-using mills (particularly sawmills, of which there are nearly 14,000 in the five states); food processing plants; establishments for weaving, furniture making, and other crafts; and decentralized plants of such industries as rayon products are important examples.

It was seen in the section on the piedmont people (pp. 66-73) that the rapid industrialization of that province has led to maladjustments between the people and their economic and social environment. The same is true in large measure of the other industrial areas of the region. These maladjustments are, so to speak, problems of the short run. The long-run industrial problem of the region as a whole, however, is the scantiness of industrial development. That this is a problem is reflected in all that has been said about the high ratio of population to land resources, the underemployment of the people, and the maladjustments of agriculture and forestry. If these genetic resources cannot fully employ the people not engaged in industrial, trade, and service occupations, then obviously the goal of full employment can be met only by expanding these occupations. It would be theoretically possible, of course, for this goal to be met solely through out-migration from the region at a rate exceeding the natural increase in population. Some out-migration may surely be expected to continue as a future trend, and its rate may even approach that of the natural increase. But so long as the region retains its resources and natural advantages, it may be expected to hold a part of its increase in population and to use that increase along with the equivalent of its potentially underemployed manpower in developing its industry and related trades and services. Industry can expand both by carrying present and new products to higher degrees of manufacture and by utilizing more fully the output of genetic and extractive resources. An increased efficiency of both farming and forestry, with resulting greater output, can provide more *full-time* employment in those fields and also call for concomitant industrial expansion, based upon the processing of farm and forest products. In the light of these opportunities, today's paucity of industrial units constitutes a problem.

At the present stage of industrial development there are further problems—those of long standing and those in the making—

concerned with what may be called the extent of centralization. Regarding geographic centralization, where does the optimum lie with respect to the balance between intensive urbanization and extensive ruralization of industry? How well does the present pattern of industrial development conform to this optimum? Regarding centralization of ownership or management, where does the optimum lie with respect to the balance between concentration and diffusion, and between the different forms of organization of ownership and management — for example, the private corporation as against the coöperative? How does the present situation compare with this optimum? To answer these questions categorically cannot be attempted here. But some discussion of related issues may help to clarify the broad problems involved.

Three sorts of industrial development, classified according to degree of centralization, have already been recognized (pp. 86-87). First is the most centralized development. Large-scale centralization may be the result solely of industrialists' desire to augment their wealth and influence, although centralization of ownership does not preclude geographical decentralization. On the other hand, centralization may develop simply because it is economical. It may permit economies in the technology of production and savings of cost attendant upon location in a center where basic materials, supplies, or skilled labor are available and where the general facilities for industry are well developed. The latter is undoubtedly the major explanation of such large-scale centralization as exists in the region. The industrial development of the Kanawha valley is explained largely by the presence of power and resources. Large-scale production in the steel and metal-products centers is to a great extent the result of economies of mass production. Here a problem is to adapt community facilities for living to the need for concentration of population. This is largely an urban problem.

Intermediate in the scale of centralization is the closely spaced rural industry typified by textile milling in the southern piedmont. It is perhaps here that some of the greatest problems exist from the standpoint of rural-industrial relations. Such industrial areas lack both the advantages of an urban society and the advantages of a completely rural life. Provision of adequate cultural facilities, particularly those of education and recreation, is a major

need. Another is provision for adequate sanitation and public health. If these needs are to be met, community development may be expected to lie in the urban direction and away from the rural. As such changes mature, the advantages previously enjoyed by industries in these areas, including ready and flexible supplies of low-cost labor, cannot continue indefinitely. The industry of these areas will need to strike a new competitive balance, consistent with conditions of labor and returns to labor adjusted in the light of enlarged alternative opportunities. The lack of such a balance today constitutes a major problem.

The third class of industry is that which is fully decentralized. Such industry, typified by the small-scale rural plant, is widely regarded as desirable because of the opportunity it affords for country life; for wider distribution of the rewards to ownership, management, and labor; and for higher returns from commodities released to the market from rural areas. True, these are the opportunities, but they are opportunities not generally brought to fruit. Too often country life merely affords a backlog of subsistence so as to make bearable the lowest of cash returns to labor, meanwhile isolating labor from what chances for betterment the outside world might offer. Too often the rewards to ownership, management, and labor are not more widely distributed but more narrowly concentrated in the hands of the few whose superior financial position permits them to exploit the many, to whom rural life has afforded much contentment but little cash. Too often the market itself exploits these rural producers, even where, as producers, they are successfully and beneficially established.

The lack of education and training to fit them for industrial work is a severe handicap to rural people. Inefficiency in the use of both labor and capital equipment prevents achievement of full, productive employment. Such inefficiency is probably typical of rural industry in many places.

The problem of rural underemployment is closely linked with that of highly decentralized industry. It is now possible for small rural industry to operate upon subsidy received in the form of underemployed labor — workers willing to put in much time for a little cash simply because they have nothing better to do. Unless workers are to sacrifice a large share of their remuneration for the privilege of a rural life, small industry must win a right to

existence through competition on the basis of economic and social advantage. Not all types of industry can operate successfully on a greatly decentralized basis. In fact, the kinds of manufacture suited to being conducted on this basis in the Appalachian Region appear to be distinctly limited. The manufacture of forest products appears to be one of the few outstanding examples of an industry where great decentralization has been generally successful, in the sense that small rural plants have survived and, indeed, continually risen in importance up to the present. The existence of such plants, in itself, is desirable; and through the agency of education, and with gradual improvement in technology and the conditions of ownership and management, it may be shaped into a powerful instrument for allowing forests to contribute their optimum to employment and income. But the possibility cannot be overlooked that the present success of these small wood-using plants is dependent upon conditions which are among the most serious problems of forestry in the region: the depletion of timber stands, the prevalence of wasteful timber utilization, the gullibility of small forest owners, the underemployment of forest labor, and the subservience of local market functionaries to those of the concentration and central markets. These problems will be discussed in subsequent chapters. If these problems are to be solved, what then will be the position of decentralized forest industry? For such industry this question foreshadows a further problem of the future.

#### EDUCATION

In all that has been said about the problems of people and the land in the Appalachian Region, the question of education stands continually in the near background—the need for it a major requirement for erasing social and economic backwardness, the lack of it a major problem.

In 1940, 22 per cent of all persons twenty-five years old or older in the region had completed less than five years of school. In the remainder of the United States, 13 per cent of this age group had completed less than five years. The region's rural population exhibited a more serious deficiency. Here the percentage of persons twenty-five years old or older without at least five years of schooling was 26; for the rest of rural United States the percentage was 15. The most serious deficiency, however, was among the rural-

farm population. In 1940, of all rural-farm persons twenty-five years old or older in the region, 28 per cent had completed less than five years of school; in the rural-farm remainder of the nation, 19 per cent. This percentage for the rural-farm group varied by states from 20 in West Virginia to 32 in Virginia and North Carolina, where the low educational status of Negroes is reflected in the state average. The critical areas in the region, in lack of education of rural-farm people, were the coastal plain and the highlands of Kentucky, where numerous counties had percentages exceeding 40, and the piedmont of Virginia and northern North Carolina.<sup>45</sup> The educational status of rural-farm people is of great interest to forestry, because, by and large, this is the class of people best representing those whose personal behavior has the closest bearing upon the forestry situation.

Public expenditures for education in the region are noticeably low. In 1930, total expenditure per pupil enrolled in elementary and secondary schools ranged from \$35 in Kentucky to \$56 in West Virginia. The United States average was \$77. In the five most mountainous counties of West Virginia the average expenditure per pupil was \$54; in North Carolina, Tennessee, and Virginia, from \$22 to \$26; in Kentucky, \$19.<sup>46</sup> Relatively low expenditures in the highlands goes back in part to the matter of taxable wealth. Wealth per child in the five most mountainous counties of Kentucky, for example, was \$1463, as compared with \$4937 in the entire state. Wealth per child was highest in West Virginia, where the state average was \$5822. The average for the nation was \$6235.<sup>47</sup>

School attendance in the region, and especially in the highlands, compares unfavorably with acceptable standards. In the whole United States in 1930, public elementary schools were in session an average of 177 days, and the average pupil attended 148 days. School sessions in the Appalachian Region varied from an average of 173 days in Virginia to 157 days in North Carolina; attendance ranged from 143 days in Virginia to 119 days in Kentucky. Highlands counties exhibited persistently the lowest school attendance, both in number of days and in per cent of the full

<sup>45</sup> *Atlas of Agricultural Information, Appalachian Region.*

<sup>46</sup> U. S. Dept. Interior, Office of Education, *Education in the Southern Mountains* (U. S. Office of Ed. Bull. 1937, 26; 51 pp.; Washington, 1938), p. 28.

<sup>47</sup> *Education in the Southern Mountains*, p. 33.

session. The extreme case was in the five most mountainous counties of Kentucky, where the average pupil attended school 97 days, 68 per cent of the days school was in session.<sup>48</sup> Furthermore, "in Kentucky mountain counties about one in five failed to enroll in school."<sup>49</sup> Enrollment in high school, in per cent of the entire public-school enrollment, ranged from 13.3 in the five most mountainous counties of West Virginia to 4.6 in those of Kentucky, while the average for the entire region was about 15, and for the entire nation about 17.<sup>50</sup> Inaccessibility of schools is a problem in the highlands; and so far as high schools are concerned, inaccessibility is a problem in most rural areas of the region. In the highlands there is one public school of any type per 6.5 square miles of land, but only one high school per 100 square miles or more. Areas per public school in the states of the region as a whole vary from 3.9 to 14.1 square miles; but areas per high school range from 53.8 to 67.6 square miles. It is held by some authorities that the area served by high schools should not be much greater than that served by elementary schools.<sup>51</sup>

Something remains to be said of the quality of schooling provided in the Appalachian Region. This is difficult to evaluate. Data on the education of teachers, however, may be of some significance in this connection. Of the entire public-school teaching staff in the states of the region, from 8.4 per cent (Virginia) to 37.4 per cent (Kentucky) had only a high-school education or less. The percentage for the United States is 4.2. In the five most mountainous counties of Kentucky, 76.1 per cent of all public-school teachers had no more than high-school education.<sup>52</sup>

The program of vocational education aided by the federal government has assumed great significance in recent years. More than half of the high schools of the Appalachian Region have departments of vocational education, where training in farming and home economics is emphasized.<sup>53</sup> Opportunities appear to exist for incorporating into such training at least a few of the broad principles of forest conservation and management and timber

<sup>48</sup> *Education in the Southern Mountains*, p. 21.

<sup>49</sup> *Toward Planning for Rural Resources in the Appalachian Region*, p. 79.

<sup>50</sup> *Education in the Southern Mountains*, p. 17.

<sup>51</sup> *Toward Planning for Rural Resources*, p. 80.

<sup>52</sup> *Education in the Southern Mountains*, p. 25.

<sup>53</sup> *Toward Planning for Rural Resources*, p. 85.



marketing and even, in areas where circumstances are especially favorable to small-scale forest production, for setting up special courses in such production. Little or nothing, however, has been done in this direction.

### PUBLIC HEALTH

Side by side with the education of the people goes their health as an item of equipment for participating in the affairs of society and as a determinant of the effectiveness with which they may convert the resources of production at their disposal into income. An ignorant people cannot be expected to manage their forest resources most productively, nor can a people weakened and demoralized by disease and malnutrition.

Tuberculosis, venereal disease, typhoid fever, pellagra, and diphtheria are among the more notable diseases of rural people. The prevalence of these diseases may not readily be expressed in quantitative terms. Mortality data from the 1940 Census, however, throw some light upon the situation. Deaths from typhoid fever ranged from 1.0 per 100,000 of the rural population in North Carolina to 3.2 in Kentucky, the rate in three out of the five states of the region being higher than the United States average. The prevalence of tuberculosis in the coal-mining areas has already been mentioned (p. 83). Tennessee and Kentucky had very high tuberculosis death rates: 72.6 and 67.4, respectively, per 100,000 of the rural population; and all the Appalachian States except North Carolina had rates exceeding the national average of 42.4. Deaths from pellagra were notably numerous in North Carolina: 4.9 per 100,000 rural inhabitants, as against 2.3 for the nation. Diphtheria mortality was considerable in Kentucky, Tennessee, and West Virginia. Infant and maternal mortality were higher than for the United States as a whole in all Appalachian States except Kentucky.

Malnutrition is apparently fairly common among rural people in many areas of the region. The results of surveys indicate that the typical diets of these people are low in ascorbic acid, thiamin, niacin, riboflavin, calcium, iron, and even calories and protein. That this situation has a marked effect upon the level of vitality of the people, there can be little doubt.

A study of rural-family living in Knott County, in the Ken-

tucky highlands, has revealed low family consumption of potatoes and sweet potatoes, tomatoes and citrus fruit, beans and peas, and meat, poultry, fish, and eggs. Diets of some families were deficient in milk, especially at times of the year other than summer.<sup>54</sup>

In North Carolina, a medical and nutritional survey of eight hundred boys and girls enrolled with the National Youth Administration disclosed that 95 per cent of these youths had dental caries, that 61 per cent were underweight, and that many had low ascorbic-acid levels when enrolled.<sup>55</sup> Some light is shed on nutritional conditions in the rural-industrial piedmont by a study made in 1940-1941 in and around Bynum, a small cotton-textile town in Chatham County, North Carolina.<sup>56</sup> It was found that the typical diet contained two-thirds of the amount of calories recommended by the Committee on Foods and Nutrition of the National Research Council as adequate for health. Vitamin C was extremely low, its deficiency being most marked in the spring of the year, when home-grown food was not available. Intake of thiamin and riboflavin was only one-half of the minimum regarded as necessary for maintenance of health. Serious deficiencies were observed, also, in the intake of calcium and iron. Most of these deficiencies were found to be even more serious among the Negroes than among the whites.

In Tennessee, preliminary results of surveys of a rural population suggest the prevalence of several important dietary deficiencies: calories; protein among adults and older children, and more commonly among Negroes than among whites; iron among women and children; vitamin A; and ascorbic acid.<sup>57</sup>

In Virginia, the State Nutrition Committee in 1941-1942 made a survey of about five thousand school children in schools well distributed over the state. Only one-third of these children were

<sup>54</sup> Faith M. Williams and others, *Family Living in Knott County* (U. S. Dept. Agr. Tech. Bull. 576; 69 pp.; Washington, 1937).

<sup>55</sup> I. H. Manning, Jr., and D. F. Milam, "Medical and Nutritional Survey of 800 N. Y. A. Youths" *Sou. Med. Jour.* 36:5: 373-380 (1943).

<sup>56</sup> D. F. Milam, "A Nutritional Survey of a Small North Carolina Community," *Am. Jour. Pub. Health* 32:4: 406-412 (1942).

<sup>57</sup> J. B. Youmans, "An Assessment of the Nutrition of a Rural Population in Tennessee," *Am. Jour. Pub. Health* 31:7: 704-708 (1941).

J. B. Youmans and others, "Surveys of the Nutrition of Population, 2: The Protein Nutrition of a Rural Population in Middle Tennessee," *Am. Jour. Pub. Health* 33:8: 955-964 (1943).

found to have adequate diets. There were sufficient vegetables in 48 per cent of the diets; sufficient milk in 66 per cent; sufficient fruit in 75 per cent. The diets of rural children were poorer than those of urban children.<sup>58</sup>

Facilities for combatting the health problems of the region, especially of the rural areas, leave much to be desired.<sup>59</sup> In 1942 the average ratio of population to effective physicians (those sixty-five years old or older counted as one-third effective) was 2036, and in sixty-six sample rural counties (without a metropolitan center in that or an adjacent county) it was 5826. The American Medical Association has suggested 1500 as a maximum adequate ratio. While 1942 data were affected by the war, it is doubtful if this effect was so great as to invalidate the conclusion that there is normally a scarcity of physicians, especially in rural areas. In 1940 the regional ratio of population to dentists was 3596, as compared with a suggested standard of 2500. Hospitals afforded an average of 2.9 beds per 1000 population, and, in all rural counties, an average of 1.1 beds. A generally accepted standard is 4.5 beds per 1000 people.

Environmental sanitation has always been a difficult problem in rural areas, because of unsatisfactory land-tenure arrangements, poor community organization and planning, and the lack of understanding of its importance to rural health.<sup>60</sup> Unsafe water supplies and lack of screening are common in rural homes. Nearly 8 per cent of all houses in the region lack both an inside toilet and a privy, and of rural-farm dwellings 16 per cent, or one out of every six, is without toilet facilities of any kind.<sup>61</sup> The meager development of environmental sanitation in the region is a major health problem.

Such is the background of the people released by the Appalachian Region for migration to other states. Such is the environment of the greater numbers who remain at home to exert a continuing drag upon the national level of living.

<sup>58</sup> Geneva Parker, *Nutrition of Virginia People as Indicated by Diets of School Children* (Va. Agr. Exp. Sta., Rural Soc. Report 24; 71 pp., processed; Blacksburg, 1942).

<sup>59</sup> *Toward Planning for Rural Resources in the Appalachian Region*, pp. 71-75.

<sup>60</sup> *Toward Planning for Rural Resources*, p. 75.

<sup>61</sup> U. S. Dept. Commerce, Bureau of the Census, *Census of Housing, 1940* (State reports, 2nd series; 29 tables; Washington, 1943), Table 7.

## CHAPTER III

### PROBLEMS OF FOREST-LAND MANAGEMENT

THIS CHAPTER and the next deal with problems associated with the management of forest land, the growing of timber, and the production of forest products other than timber — forage, game, recreational facilities, and water and soil influences. These are subjects included in the first two major divisions of the field of forestry economics (pp. 8-9). Among the forest products, timber calls for special treatment, not merely because of its peculiar importance, but also because more is known about it than about the others. For this reason the problems of forest management relating specifically to timber production, together with the problems of bringing that product to a stage ready for distribution, will be discussed separately in Chapter IV. In the present chapter land management will be discussed, and brief treatment will be given the nontimber products of the forest.

#### MULTIPLE USE OF FOREST LAND

The forest is not merely a timber-producing plant: it is at the same time a habitat for wild life, a regulator of the hydrologic cycle, a stabilizer of the soil, a forage-producing plant, and a recreational ground and aesthetic asset. Forest management, therefore, consists of much more than timber management: it is concerned as well with managing the resources of the forest other than timber. Furthermore, it is concerned with managing these resources together as a group — as joint products of a single economic process. Its objective is the optimum contribution of this group of products to the general welfare, irrespective of the contribution of any single product. This is the doctrine of multiple-use management of the forest.

If each use of the forest were independent of all other uses — that is to say, if the amount of any product produced had no influence upon the shape or position of the cost curve for any other product — then multiple use of the forest would not be an economic issue: each use could be put under management separately

and carried to its own optimum without reference to other uses. The fact of the case is, however, that each use is closely related to others and has a strong influence upon their cost curves. Thus the doctrine of multiple use has great practical significance, and multiple-use management involves considerable study of the relationships among the products of the forest.

It is possible to distinguish three broad categories of relationship among forest uses: Uses may be said to be *compatible* if increased output for one lowers cost for the others, *conflicting* if increased output raises cost, and *independent* if a change in output has no effect upon cost. Obviously, whether two uses are compatible or conflicting may depend upon the rate of output of each of the two products: at a low rate of output, two uses may be compatible, while at a higher rate they may be conflicting; and here the implication is that at some intermediate rate they are independent. So long as uses are either compatible or conflicting, the doctrine of multiple use is significant. It is true that where uses are compatible, the issue of multiple use appears less pressing than where uses are conflicting, because in the former case the points of optimum adjustment are less clearly defined, and the loss in revenue occasioned by departure from optimum production is relatively slight. But it should be stressed that the theory of multiple-use management is the same whether uses are compatible or conflicting. However, since the various uses of the forest are more generally compatible at extensive levels of production and more generally conflicting at intensive levels, it cannot be denied as a practical proposition that the issues of multiple-use management are more clearly defined and more urgently in need of being met under intensive forestry than under extensive forestry.

The distinction between compatible and independent uses on the one hand and conflicting uses on the other is significant to problem analysis. Uses of the first sort may be treated together in much of their problem analysis, since their problems tend to be parallel. For example, the basic problems concerned with the use of land for forest purposes are common to all forest uses. Again, to take an example of specific forest uses, fire and excessive cutting, which diminish the productivity of the forest as a timber producer, also tend to reduce its productivity for recreation, soil management, and some phases of water management. Conflicting

uses, on the other hand, may require separate problem analysis. For example, those conditions which promote the fullest income from forage and from wild life are in many cases a deterrent to timber productivity. In any case, however, the ultimate objective of analysis is to weave together the problems of all forest uses, so that they may be judged in terms of their joint effect upon the general income.

In some parts of the Appalachian Region and in some types of forest, timber production is secondary, insofar as social revenue is concerned, to other uses of the forest. It may well be, for example, that watershed values of the forest are paramount in some sections of the highlands. An extreme example is found in some recreational areas, where land management is aimed primarily at the optimum production of aesthetic values and the greatest marginal product of timber as a commodity is zero. By and large, however, timber production is the principal forest use in the region, and the problems of nontimber uses center around their status as supplementary enterprises to the main enterprise of timber growing.

But regardless of which enterprises are the main ones and which are supplementary, the objective upon which problem analysis is oriented is the use of forest land for all the many purposes to which it is suited, in such a way that the combined product from all uses shall maximize the general income.

This viewpoint is implied but not fully developed in what follows. The orientation of the analysis is largely around timber growing, and little is done directly with forest products other than timber. The best that may be said for this approach is that timber provides an example, and that this example is appropriate, since timber production is of paramount importance in the Appalachian Region.

#### USE OF RURAL LAND

The original forest of the Appalachian Region was largely unbroken.<sup>1</sup> In the process of settlement and the clearing of land for agriculture, the area of forest has been reduced to about 63½ million acres (Table 3), 51 per cent of the total land area. The his-

<sup>1</sup> H. L. Shantz and Raphael Zon, *Atlas of American Agriculture: Natural Vegetation* (29 pp.; Washington, 1924), p. 3.

tory of land clearing has followed a somewhat different course in each of the provinces of the region.

In the interior province, where now less than one-third of the land is in woods, clearing progressed steadily and on a wide scale toward the ultimate goal of complete agriculturalization. This goal did not preclude the existence of forests, but it involved the creation of little islands of forest scattered across the open farm land of the province. Most farms have their patch of woods. This is a typical farm-woodland country, such as is found throughout the Middle West east of the prairie. In many areas, where topography is relatively uniform, the location of farm woods has been

TABLE 3  
LAND AREA OF THE APPALACHIAN REGION, BY STATE,  
PROVINCE, AND MAJOR USE, 1940\*  
(in thousands of acres)

State or province	All land	Forest land	Cropland	Other cleared farm land	Other land
Kentucky	25,670	8,728	6,509	9,193	1,240
North Carolina	31,451	18,402	7,192	2,560	3,297
Tennessee	26,855	12,822	7,612	5,662	759
Virginia	25,535	14,832	4,771	4,912	1,020
West Virginia	15,418	8,732	1,828	4,087	771
All states	124,929	63,516	27,912	26,414	7,087
Coastal plain	20,364	12,777	4,393	806	2,388
Piedmont	21,660	11,585	5,410	3,251	1,414
Highlands	30,328	18,367	3,903	6,554	1,504
Great valley	16,905	9,059	3,097	4,225	524
Interior	35,672	11,728	11,109	11,578	1,257
All provinces	124,929	63,516	27,912	26,414	7,087

\* U. S. Dept. Agr., Appalachian Region Tech. Services Committee, *Atlas of Agricultural Information, Appalachian Region* (loose-leaf, pp. not numbered, processed; Washington, 1942).

determined, not by the character of the land or soil, but rather by the distribution of the land surface among individual farms and by each farmer's judgment as to his needs and opportunities for producing cultivated crops, forage, and timber.

The great valley is also a farm-woodland province and in many areas, especially in Tennessee, the history and present status of woodland development are similar to those in the interior. In most areas of this province, however, topography and soil have played an important part in locating the forest stands. In a fertile valley

flanked by ridges, these ridges may form nearly continuous strips of forest land, parceled out among the adjacent valley farms, which themselves have been largely cleared. The valleys of poorer soil, on the other hand, may be more or less wooded.

The third farm-woodland province, the piedmont, is about as heavily wooded as the great valley (more than one-half of the land in forest), but the woods are more evenly scattered throughout the province. By and large, they follow the pattern of topography, which is minutely dissected. But the piedmont differs altogether from the interior province in the history of its land-use pattern. While in the latter province the boundaries of the woodland have been pushed back steadily toward a more or less generally recognized goal, in the piedmont there has been no definite boundary and certainly no definite goal. Nearly all the lands in the province have at one time or another been used for crop production, and many of them have been rotated several times between cultivated crops and forest. In some areas farming is being gradually forced off many lands, and the farm-woods pattern is being replaced by continuous blocks of woodland.

Coming, finally, to the two most heavily wooded provinces of the region, the coastal plain and the highlands, each with more than 60 per cent of the land in forest cover, further types of historical development are in evidence. The coastal plain is partly a farm-woodland territory, with a history similar to that of the piedmont. Extensive sections of it, however, have for a long time remained in forest. Although virtually cleared in the course of logging operations, these sections were not developed for agriculture but were permitted to be restocked by forest trees. Lastly, the pattern of land use in the highlands is about the opposite of that in the interior province. Here are islands of cultivated land and pasture dotted through an expanse of timber. The farms are, in a sense, woods farms; and the forest, while partly owned in connection with farm land, has nothing of the farm-woods character. Topography and soil, modified by the pressing need of the people for agricultural resources, have been the limiting factors in land use.

After the lapse of between one and three centuries of land development, with the trial-and-error and the readjustment that have come into play during that period, it might be supposed that



the present utilization of land in the Appalachian Region represents an approach toward adjustment. Taking the region as a whole in large view, there is little question that the pattern of use most likely to produce optimum returns in the long run has already been broadly established. But nearly everywhere within this broad picture are problems of land-use adjustment for localities and even for provinces. It is easy to understand why this is so. In even the most fluid of worlds changes in land use would be unlikely to keep full pace with the changes in demand and in production technique that dictate changes in the utilization of resources. In the Appalachian Region — marked, rather, by the absence of fluidity — the response has not been rapid, although the determinants of change have been normally active. While the persistence of the noncommercial frontier in some sections has in part insulated them from the dynamics of the general economy, it has carried with it the factor of isolation, which has greatly retarded such response to outside influences as has been called for.

From the earliest days these influences calling for readjustment have been present continuously and at times acutely. Changes in the conditions of overseas trade in tobacco and cotton were the chief influences in colonial times. Subsequently the development of the West was the chief source of disturbance to the land-use pattern. When the lumber industry moved into the region from the north, new factors came into play, not only bearing upon the demand for products of the land, but bearing also upon the condition of the land and its suitability for alternative uses. Shifts in the local and domestic demand and supply of such farm products as tobacco, cotton, hemp, fruits, and dairy products have influenced markedly the land-use pattern, and have created maladjustments in land use that have taken a generation to correct. The southwestern piedmont of Virginia, once a dark-fired tobacco center, has been in maladjustment since 1920 as a result of the virtual extinction of the market for this product. The old south-central tobacco area of Kentucky suffered a similar depression, and relief in the form of dairy and general-farming development has begun to come only in very recent years.

Local agricultural depressions of this type are almost invariably followed by an increase in the acreage of forest land. Sometimes the forest then develops sufficiently so that the land begins

to produce timber and other forest products. Frequently the trend toward forest use of land is reversed before the new forest can develop to this stage, and clearing takes place before the completion of a forest generation. It is seen here, and will be emphasized in subsequent sections, that land-use maladjustments are of peculiar significance in the case of forest land because of the great length of time required for a forest crop to mature, and because of the difficulty of reversing decisions with respect either to the use of forest land or to the management of the timber itself.

While the forest use of land has been affected more by shifts in the field of agriculture than by any other influence, the forest use has been influenced markedly by some changes within the field of forestry itself. One of these, the movement of the lumber industry, has already been mentioned. Another has been the rise of the pulp industry in the region. Another has been the general sentiment recognizing the need for federally owned forests in the East to protect watersheds, conserve timber, and promote other uses of the forest. This sentiment, taking the tangible form of national-forest establishment, has resulted in, or at least hastened, the conversion of other rural lands, especially farm lands, to forest use. But these again are shifts that have taken place slowly and only long after the need for them had arisen. Wars invariably cause radical changes in land use — maladjustments that are slow to be corrected in subsequent peace years. And new causes of maladjustment are continually looming on the horizon. At present, perhaps, a growing demand for milk and for fruits and vegetables and a prospective increase in demand for small-diameter timber are among the most important of these.

The slowness of the response to land-use stimuli is explained on several grounds. The habits of people, the customs of the people, their prejudices, and their lack of ready recognition of the direction of changes that will benefit them are all deterring influences. Prompt response to shifts in the general economy — even where land use is concerned — calls for a type of business foresight not possessed by many. Land and land use are perhaps more closely associated with popular custom and tradition than any other factor of production. The community is a social as well as an economic organism, and the farm is a home as well as a business. The use of land delineates the environment of the people. All these

things are difficult to change. The products produced on the land are slow to mature. Forests are an extreme case. But even farm crops require at least a year to plan and grow. Improvements made on the land produce returns of a long-run order. Once made, they may be used more economically than abandoned.

Partly correlated with the lags just discussed are those shifts in land use that appear to be contrary to the direction of adjustment. Such a shift is the movement of crop and pasture land up the narrow hollows and steep slopes of the highlands and the continued rotation of such land between farm and forest use under conditions that permit neither use greatly to benefit the user. Another such shift is the destructive lumbering of forests valuable for soil or water protection or recreation. Another is the impairment of aesthetic values by improvements designed to further commercial interests. Another, the settlement of areas unsuited to this purpose, placing an unnecessary burden both upon the settlers and upon the community to which they claim affiliation. So long as the rights of fee-simple land ownership are interpreted as they now are, and so long as such practices are regarded as the inevitable price of democracy in matters of land management, these problems will persist. It is well to note, however, that violations of the general welfare of the type described are very frequently committed, not by the people in general, but by an influential few, whose influence springs not from the rights of democracy but from the power of economic autocracy.

Rough estimates were made of the extent of land-use maladjustment in the Appalachian Region in 1940.<sup>2</sup> Probably these estimates lay too much emphasis on the mere physical suitability of land for various uses and not enough on the practical need to combine lands into operable units of enterprise. Quite possibly, also, the estimates give less than full consideration to the need for woods on many farms of the region. These estimates indicate that the aggregate of forest land was, in 1940, about in balance. The need was for about 170,000 acres more forest in the region: an increase of little more than one-fourth of one per cent. It was estimated, on the other hand, that woodland on farms was about 4.3

<sup>2</sup> U. S. Dept. Agr., Appalachian Regional USDA Committee, Technical Services Subcommittee, *Toward Planning for Rural Resources in the Appalachian Region* (iv + 90 pp., processed; Washington, 1943), pp. 8-11.

million acres ( $17\frac{1}{2}$  per cent) in excess of the adjusted level — about the same acreage by which farm land as a whole was judged to be in excess. Of the farm-woods excess, 4.2 million acres was accounted for by woodland on submarginal farms that should be retired altogether from agriculture, and another 1.6 million acres of woodland that should remain in the farm bracket and be cleared. These were offset by the 1.5 million acres of cropland that should be retired to the farm woods. The slight increase in total forest area in the region, despite a decrease in farm woodland, would come largely upon open lands on those submarginal farms to be taken out of agriculture. The magnitude of these forest-land maladjustments when expressed even on a regional basis suggests how very great such maladjustments might be found to be if one were to study the local situation.

#### FOREST-LAND OWNERSHIP

The ownership of forest land in the Appalachian Region is a principal key to the problems of forest management. It is the owner of the land who determines the policies followed in its management; in some cases he determines a deliberate policy; in others by his indifference he opens the way for a negative policy.<sup>3</sup> Thus, the pattern of ownership — the manner in which the holdings of various classes of owners are arranged geographically — provides the theme for local forest management. Finally, the size of individual forest holdings determines to some extent the potentialities of forest management and the problems of management. Problem analysis, then, is concerned with three aspects of ownership: the aggregate extent of holdings of owners classified according to their relation to forest management, the size distributions of individual holdings, and the geographical pattern of their distribution. Unfortunately, all the facts are not known. But fragmentary and related data are available.

Such statistics as are at hand are not based upon a classification of owners that will reflect very accurately their weight in the for-

<sup>3</sup> "One of the primary difficulties in private forestry lies in the character of ownership of the land. Hundreds of thousands of tracts, big, little, and in between, are owned by individuals, corporations and other agencies, each with distinctive objectives and distinctive economic and financial problems." (Henry S. Graves, "Cooperative Effort in Forestry," *Forestry News Digest*, June 1937: 5-6, p. 5.)

est-management scheme.<sup>4</sup> The nearest available approach is information, gathered from more or less reliable sources, on farm and nonfarm ownership, the latter subdivided into public and private holdings, public holdings subdivided again into national forest, other federal, and other public forest, and private nonfarm holdings subdivided again into small holdings (less than five thousand acres) and large holdings (five thousand acres or more). Some information is available, also, on the general location of lands held by these broad classes of owners.<sup>5</sup>

The outstanding feature of forest ownership in the region is

<sup>4</sup> This is written before the results of the 1945 forest reappraisal of the United States Forest Service are available. Reports from the reappraisal, especially the report on status of forest management, should serve to clear up many a point on which doubt is expressed in this and the next chapter.

<sup>5</sup> Forest-ownership data were compiled on a county basis and then grouped by state and province. The total area of forest land was the starting point. From this was subtracted (1) farm woodland, (2) large private nonfarm forest holdings (of 5000 acres or more), (3) national forest, (4) other federal forest, and (5) other public forest. The balance was called small private nonfarm forest holdings (of less than 5000 acres).

*Total forest area* was calculated as follows: Total land area was taken from the 1940 land-area report of the U. S. Bureau of the Census, *Areas of the United States, 1940* (v + 465 pp.; Washington, 1942). From this was subtracted (1) the area of cleared farm land as reported in Series I of the 1940 Census of Agriculture; (2) the area of urban land (that situated in places having 10,000 or more inhabitants) as given in the census tabulation, "Land area on April 1, 1940, for municipalities having 5,000 or more inhabitants in 1940"; (3) the area of other cleared lands, including populated places having less than 10,000 inhabitants, roads, rights-of-way, and the like, this last being estimated in acres by multiplying the population outside places having 10,000 or more inhabitants by the factor 0.48043, developed with the help of Mr. Francis J. Marschner of the United States Department of Agriculture, Bureau of Agricultural Economics. The resulting figure was taken directly as the acreage of forest, for counties in West Virginia, Kentucky, and Tennessee. For those in Virginia and North Carolina, where the presence of beaches and marshes is not properly accounted for in the method of calculation used, the results were revised so as to fall in line with the estimates of the United States Forest Service, based upon forest surveys in those states.

*Farm-woodland area* was taken directly from Series I of the 1940 Census of Agriculture.

*Area of large private nonfarm holdings* was compiled from (1) records of the United States Forest Service of forest holdings of 1000 acres or more, taken as part of a national reconnaissance survey of timber ownership; (2) detailed records of the Tennessee Valley Authority, showing the ownership and location of all but the smallest forest tracts within the Tennessee watershed; (3) estimates and informal records of a number of persons familiar with the forest-ownership situation in various parts of the Appalachian Region.

*National-forest area* was taken from the report of the National Forest Reserva-

the preponderance of farm woodland. There are 28.7 million acres of farm woodland (Table 4). This represents 45 per cent of the entire forest area. If with these farm woods are grouped the small private nonfarm holdings, which resemble farm woods in their size and decentralized ownership, it is found that the resulting group overwhelmingly characterizes the forest-ownership scheme of the Appalachian Region, accounting for 76 per cent of the entire acreage of forest land. Large private holdings comprise 15 per cent of the forest; and public, 9 per cent. Of the latter, about seven-tenths is national-forest, two-tenths other federal, and one-tenth state- and local-government ownership.

The great extent of farm and other small, private forest holdings keynotes not only forest management, but also the whole forestry situation in the Appalachian Region. There are perhaps 900,000 such holdings in the region, with an average size of about fifty to fifty-five acres. They range in size up to five thousand acres, but most of them are less than two hundred acres in area. About 708,000 of these small holdings are in farm ownership: 67 per cent of the farms in the region have woodlands. The greatest diversity of management policies, of management ability, and of forest conditions and problems characterizes these properties. All of them, however, have in common the problems associated with small size and lack of specialization. These problems, indeed, be-

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tion Commission, *Report for the Year Ended June 30, 1940*, 76th Cong., 3rd Sess., Senate Doc. 317 (vi + 44 pp.; Washington, 1941).

*Other public-forest area* (National parks, monuments, and military reservations; state forests and parks; and miscellaneous forested lands owned by federal, state, or local governments) was taken from a variety of sources, such as file records, correspondence, published material, and maps. Chief sources were these:

In Virginia and North Carolina, forest-survey records of the United States Forest Service.

In Kentucky: (1) Commonwealth of Kentucky, Dept. Conservation, Div. Forestry, *Eighth Biennial Report* (26 pp.; Frankfort, 1939). (2) U. S. Works Projects Administration, Federal Writers' Project, *Kentucky, a Guide to the Bluegrass State* (xxix + 489 pp.; New York, 1939).

In Tennessee: (1) Tennessee Valley Authority, Dept. Forestry Relations, *Forestry Facts about the Tennessee Valley* (Forestry Bull. 2: 55 pp., processed; Knoxville, 1938). (2) Tennessee State Planning Commission, *Federal and State Organizations Concerned with Land Use in Tennessee* (Bull. 12; x + 125 pp., processed; Nashville, 1938).

In West Virginia: West Virginia Conservation Commission, *Annual Report for the Year July 1, 1939, to June 30, 1940* (48 pp.; Charleston [?]), and *Annual Report for the Year July 1, 1937, to June 30, 1938* (63 pp.).

come the forestry problems of the region as a whole, and have their influence upon every phase of the forestry situation. This fact will be underscored repeatedly throughout this problem analysis. The negative policies of many small owners open the way for timber buyers and operators to determine the course of forest management. This they do at the time of cutting, and thus share, as it were, in the prerogatives of ownership. This fact further characterizes the situation of the small forest holdings.

TABLE 4  
OWNERSHIP OF FOREST LAND IN THE APPALACHIAN REGION,  
BY STATE AND PROVINCE, 1940  
(in thousands of acres)

STATE OR PROVINCE	ALL OWNERS	FARM	PRIVATE		PUBLIC		STATE AND LOCAL
			Small <sup>a</sup>	Large <sup>b</sup>	National forest	Other	
Kentucky .....	8,728	4,592	2,440	1,129	389	129	49
North Carolina .....	18,402	9,093	5,390	2,291	905	402	321
Tennessee .....	12,832	5,219	3,264	3,406	529	329	75
Virginia .....	14,832	6,761	5,417	1,065	1,297	222	70
West Virginia .....	8,732	2,994	3,168	1,601	893	...	76
All states .....	63,516	28,659	19,679	9,492	4,013	1,082	591
Coastal plain .....	12,777	5,341	4,711	2,188	115	139	183
Piedmont .....	11,585	7,345	3,776	105	108	106	145
Highlands .....	18,367	6,531	4,329	5,234	1,843	278	152
Great valley .....	9,059	3,242	2,592	876	1,910	386	53
Interior .....	11,728	6,200	4,271	989	37	173	58
All provinces .....	63,516	28,659	19,679	9,492	4,013	1,082	591

<sup>a</sup> Individual holdings of less than 5000 acres.

<sup>b</sup> Individual holdings of 5000 acres or more.

The large private forest holdings of the Appalachian Region range in size from 5,000 to more than 400,000 acres. Lumber, mining, and pulp companies are the chief owners. Extremes of management policy typify these holdings. Some are reserved intact as a backlog for future use. Some are heavily exploited. The middle road of conservative use is not commonly followed, though there are a few notable exceptions, particularly in the coastal plain. Most of the large properties were amassed during the large-scale lumbering boom and during the period of mine prospecting and initial development; a few have been built up recently through acquisition of smaller tracts. Many of the large holdings that once existed, especially those of the lumber companies, have

disintegrated, and this process of disintegration appears to be continuing at the present time, with some exceptions, mostly in the eastern part of the region. In recent years, however, consolidation of abandoned industrial holdings into public forests, through either purchase or tax reversion, has been of some significance.

The public forests include eight national forests and purchase units, two national parks, and a scattering of state-owned forest lands. County and community forests are very few. The extent of public forests is insufficient to throw much weight in the scales on the side of good land management.

Public forests are concentrated in the highlands and great valley; while large private holdings are to be found chiefly in the western branch of the highlands and in the eastern coastal plain. Farm woods are scattered throughout most of the region. (See Figure 4.)

#### FOREST TAXATION

The problem of forest taxation, like many other problems of forestry, has its roots and must find its ultimate solution outside the field of forestry proper. It is a problem not merely in the type and amount of tax levied against timber and timber land, but also in general government organization and finance. Reference will be made here only to property taxation, which is the form of taxation having the most general bearing upon forestry and receiving the most widespread interest. (Federal income taxation, sometimes mentioned as a deterrent to forestry in special cases,<sup>6</sup> has in recent years, because of high rates, possibly stimulated certain cost outlays for forestry by high-income forest owners.)

The general property tax tends to obstruct the practice of forest production as a going concern on private lands, discouraging particularly such efforts as private owners may undertake, to raise a merchantable crop of trees while foregoing income for a period of years. The property-tax burden has three aspects:

(1) The high cost of local government, since, if government expenditures are high, the tax burden must necessarily be heavy; (2) the faulty administration of the property tax, whereby forestry may be bearing

<sup>6</sup>Fred Rogers Fairchild and associates, *Forest Taxation in the United States* (U. S. Dept. Agr. Misc. Pub. 218; 681 pp.; Washington, 1935), pp. 406-410.



more than its fair share of the cost of government; and (3) the inherent disadvantage of the property tax in respect to deferred-yield forests.<sup>7</sup>

Let us now consider these three points in more detail.

1. The services of a local-government unit, even if efficiently administered, cannot be performed for less than the cost of salaries and expenses of standard personnel and the cost of standard equipment and facilities. The per-acre cost of local government therefore tends to be high in small counties, such as those of coastal Virginia, whose boundaries were set to accommodate the transportation situation of a century or two ago. Probably most of the counties in the region are today too small for greatest governmental efficiency. The per-capita costs of local government tend to be high in counties of low population. The cost per dollar of taxable wealth tends to be high in poor counties, and the region has its share of such counties. Inefficiency in local government increases costs. The location of homes and farms in inaccessible spots — or, as in the highlands, strung out along the narrow ribbons of bottom land between the hills — increases the costs of local-government facilities and services. The existence of a class of impoverished subsistence families, whose principal wealth consists in the blessings of rural life, increases the burden upon those properties and persons able to pay taxes. Such costs as these are borne by forests along with other property.

2. There is evidence, however, suggesting that a part of the burden of property taxation falls with unjust weight upon forest land as compared with other land, this inequity arising in faulty administration of the property tax. Behind this situation lie the inexperience and unscientific methods of tax assessors, the prevalence of crude rules of thumb for establishing valuations, the infrequency of revaluations, and the inadequacy of review and equalization procedures and of central supervisory and integrating services in general. There is apparently a universal tendency among assessors to over-assess low-value properties in comparison with those of high value.<sup>8</sup> Since much forest land is of the low-value order, this tendency would appear to militate against forestry. The facts of the case could presumably be discovered by a

<sup>7</sup> R. Clifford Hall, *The Forest-Tax Problem and Its Solution Summarized* (U. S. Dept. Agr. Circ. 358; 18 pp.; Washington, 1935), p. 1.

<sup>8</sup> Fairchild and associates, *Forest Taxation in the United States*, pp. 143-144.

study of assessment ratios: the ratios of assessed to actual values of different types of property. R. W. Nelson<sup>9</sup> found that unweighted assessment ratios for selected forest properties in twenty-one counties in North Carolina in 1933-1937 averaged from 90 to 234 per cent, the minimum mentioned being the only county average falling below 100. He states that ". . . it is apparent that forest lands are generally heavily overassessed. No authoritative study has been made recently of the assessment ratio for farmlands in the State, but there is agreement among competent observers that the prevailing ratio is now less than 100 per cent." (The great variation among assessment ratios is also significant to the forest-tax problem.) Wager and Thomson<sup>10</sup> found that in 1925-1930 assessment ratios for rural properties in three North Carolina counties, for which data were available, averaged 92 for forest and transitional lands, 88 for crop and pasture lands, and 70 for other lands.

While tax statutes provide for reassessment of lands at one- to four-year intervals, it is common practice to continue old valuations for long periods, copying them from the previous year's books from year to year.<sup>11</sup> A. Z. Nelson,<sup>12</sup> for example, studying the forest-tax situation in Culpeper County, Virginia, in 1941, found that the two most recent county-wide assessments for the general property tax had been made in 1925 and 1938. "A period of 13 years elapsed, therefore, during which time no changes on the assessment rolls were made except the addition of the value of new buildings by the Commissioner of Revenue." R. W. Nelson states that "the overassessment of the forests, resulting in overtaxation as compared with other types of investment, occurs at the two points in the rotation period that are especially crucial with respect to the extent and character of commercial forestry."<sup>13</sup> These points are, first, the stage of cut-over forest just at

<sup>9</sup>North Carolina Classification Amendment Commission, *Report on Property Classification for Tax Purposes and Homestead Tax Exemption* (334 pp.; Raleigh, N. C., 1938), pp. 288-289.

<sup>10</sup>Paul W. Wager, and Roy B. Thomson, *Taxation of Forest Property in North Carolina* (For. Tax. Inquiry Rept. 17; 222 pp., typewritten; Washington, 1931), p. 60.

<sup>11</sup>Fairchild and associates, *Forest Taxation*, p. 143.

<sup>12</sup>A. Z. Nelson, *Forest Land Taxation in Culpeper County, Virginia* (23 pp., processed; Washington, 1941), p. 4.

<sup>13</sup>*Report on Property Classification for Tax Purposes and Homestead Tax Exemption*, p. 275.

the beginning of the rotation and, second, the stage at which the forest has just become merchantable for low-value products such as pulpwood and should be permitted to develop further so as to produce products of higher value.

3. Finally, the general property tax discriminates against forest production as a deferred-income investment.<sup>14</sup> This fact has long been recognized, and many forms of special forest-tax legislation have been tried by the states at various times. Most of these have been on the order of the yield tax, a form of tax having, in itself, serious weaknesses.<sup>15</sup> The state of Kentucky passed such a yield-tax law in 1926, but the law was held unconstitutional and was repealed in 1930.<sup>16</sup> Kentucky and Virginia in 1936 passed leasing laws granting concessions to owners willing to lease their lands to the state, but these laws have been dead letters from the start.<sup>17</sup> The only special forest-tax law now in effect in the region is that of North Carolina, passed in 1939, instructing tax assessors to make no increase in the tax valuation of real estate as a result of tree planting on vacant land for reforestation purposes, during a period of ten years after planting.<sup>18</sup>

In connection with special forest-tax legislation, the West Virginia Tax Limitation and Property Classification Amendment of 1939 is of interest.<sup>19</sup> This legislation, companion to that which reorganized road and school services under state administration, was designed to cut property taxes by establishing maximum rates of tax levy. Four classes of property were defined and a maximum rate set for each. These classes and the maximum rates per \$100 of assessed valuation are —

I. Personal property .....	\$0.50
II. Farm real estate, including farm wood- land and other property occupied by the owner or a bona fide tenant .....	1.00

<sup>14</sup> Fairchild and associates, *Forest Taxation*, pp. 46-47.

<sup>15</sup> Fairchild, *Forest Taxation*, pp. 402-403.

<sup>16</sup> Louis S. Murphy, *State Forest Tax Law Digest of 1939*, (52 + 4 pp., processed; Washington, 1939), p. 4.

<sup>17</sup> Murphy, *State Forest Tax Law Digest of 1939*, p. 10.

<sup>18</sup> Murphy, *State Forest Tax Law Digest of 1939*, p. 35.

<sup>19</sup> E. C. Weitzell and L. F. Miller, *Forest Land Utilization in Nicholas and Webster Counties, West Virginia* (W. Va. Agr. Exp. Sta. Bull. 309; 66 pp.; Morgantown, 1943), pp. 25-26.

III. Forest lands and other rural commercial properties .....	1.50
IV. Commercial properties located within municipalities .....	2.00

Here is obvious discrimination against private, nonfarm forest lands, as compared with farm woodlands and other farm property. An example of this is seen in the records of Webster County, West Virginia, where, following enactment of the amendment, taxes on "commercial" (nonfarm) forest land were reduced by 46 per cent, while those on farm land were reduced 73 per cent.

In recent years there has been an unmistakable national trend toward a lighter property-tax burden and toward better administration of property taxes. Between 1932 and 1941 the proportion of their revenue derived from property taxation by the states of the union dropped from 13.4 to 4.3 per cent, by the counties from 72.0 to 52.1 per cent, by municipalities from 75.7 to 64.3 per cent, and by school districts from 73.9 to 60.4 per cent. These relative reductions were accompanied by an absolute reduction in property taxes. All the states except six have enacted legislation giving some branch of the government the authority to supervise the making or review of property-tax assessments. A number of states now sponsor in-service training of local assessing officers. Assessing standards have been improved, also, through the activities of the National Association of Assessing Officers.<sup>20</sup> To the extent that the Appalachian states share in this trend, the forest-property tax problem of the region may be expected to diminish in importance.

#### TAX DELINQUENCY

Tax delinquency, where it exists on a large scale, is a serious problem in local government finance and is a symptom of serious problems in land utilization. The Subcommittee on Tax Delinquency of the Land Committee of the National Resources Planning Board<sup>21</sup> states that

<sup>20</sup> Information supplied by Mr. P. E. Malone, formerly of the United States Forest Service.

<sup>21</sup> U. S. Nat'l Res. Planning Bd., Land Committee, Subcommittee on Tax Delinquency, *Tax Delinquency and Rural Land-Use Adjustment* (Nat'l Res. Planning Bd. Tech. Paper 8; iv + 190 pp., processed; Washington, 1942), p. iv.

. . . a very considerable part of tax delinquency stems from land use maladjustment. . . Adequate tax enforcement procedures, vigorously used, can become an effective, yet just, method of bringing maladjusted land into public ownership for rehabilitation, replanning, and rededication to a more appropriate use.

Because forest land is usually an important, if not the major, element in rural tax delinquency, such delinquency suggests the existence of forestry problems.

Complete and uniform statistics on the extent of tax delinquency of rural lands or forest lands in the region are not available. Sufficient scattered data are at hand, however, to indicate that such delinquency has been widespread in recent times and grew in extent during the agricultural depression of the 1920's and the general depression of the 1930's.

Allred, Boyer, and Horne<sup>22</sup> found that of the 1932 levy of rural property taxes in Tennessee, 40.9 per cent was delinquent on May 1, 1933, as compared with a delinquency of 14.3 per cent of the 1929 levy on May 1, 1930. They stated (in 1935) that property-tax delinquency had been increasing continuously since 1922, and irregularly since 1905; that since 1927 a larger proportion of taxes had constantly been delinquent than for any year from 1890 to 1927; and that the property-tax-delinquency problem, which formerly had been most serious in urban areas, had, during the previous decade, become most acute in rural areas. The general depression, and especially the agricultural depression, of course aggravated the tax-delinquency situation. Much of the recent work on tax delinquency was done at the time when conditions were worst. Possibly there has been some temporary improvement in very recent years, but depression data are still of great significance in indicating the seriousness of fundamental maladjustments that persist, if not on the surface, then in latent form.

It was estimated in 1932 that 2,220,000 acres of rural land in Virginia and 2,000,000 acres in North Carolina were delinquent, and that at this time delinquency was greatly on the increase.<sup>23</sup>

<sup>22</sup> C. E. Allred, P. B. Boyer, and R. E. Horne, *Tax Delinquency on Rural and Other Property in Tennessee* (Tenn. Agr. Exp. Sta. Cir. 53; 8 pp.; Knoxville, 1935), pp. 2-3.

<sup>23</sup> U. S. Dept. Agr., Forest Service, *A National Plan for American Forestry* (73rd Cong., 1st Sess., Senate Doc. 12; x + 1677 pp.; Washington, 1933), p. 879.

Probably much of this delinquency was of the long-term or chronic order. Data for 1932 and more recent years, for 90 of the 100 counties in North Carolina, show that current delinquency of all property taxes amounted to 8.8 per cent of the total levy in the fiscal year 1932-1933, but had increased to 53.3 per cent by the fiscal year 1935-1936.<sup>24</sup> In 1930, Blakey<sup>25</sup> reported an estimate that 10 per cent of the forest land in West Virginia was delinquent.

An analysis of the situation in West Virginia, with special reference to Nicholas and Webster Counties, has been made by Weitzell and Miller.<sup>26</sup> Prior to 1932, a high proportion of both farm and commercial forest properties had become delinquent. The depletion of timber, the lack of coal-mining development, the general depression of 1929, and rising costs of local government forced widespread delinquency. Following property classification and tax limitation,

in spite of this encouragement to tax payment, large areas of cut-over lands were not redeemed immediately. Until late in the 1930's and the boom of interest in subsurface (coal) development, there appeared to be definite lack of interest in holding cut-over lands at any cost. During the period 1935 to 1940 large tracts not of great value for coal became delinquent. . . . In the two counties more than 77,000 acres of commercial woodland were tax delinquent in 1941. This represents about one-fifth of the commercial woodland in privately owned tracts of 500 acres or more. . . . Eighty-seven percent of the current delinquency of commercial forest lands has occurred since 1936. In all probability these cut-over lands will become a greater problem as the general tax load becomes heavier, particularly where subsurface development does not warrant a continuation of private ownership. Practically all owners have indicated that they will not continue to pay taxes unless some immediate income is forthcoming.

The tendency for tax delinquency to be most severe in the case of forest properties is not, however, limited to West Virginia.

<sup>24</sup> U. S. Dept. Agr., Forest Service, Report on Macon County, North Carolina; Its Fiscal Status in Relation to the Nantahala National Forest (111 pp., typed; Washington, 1936), p. 48.

<sup>25</sup> Roy G. Blakey, *Report on Taxation in West Virginia* (xxvii + 452 pp.; Charleston, 1930), p. 395.

<sup>26</sup> Weitzell and Miller, *Forest Land Utilization in Nicholas and Webster Counties, West Virginia*, pp. 29-30.

Such information as is available indicates that this condition obtains more or less throughout the region, at least outside of the best farm-woodland areas. Commenting on the delinquency situation in North Carolina and on the prevalence of short-term, rather than long-term, delinquency in the state, the Forest Taxation Inquiry reports<sup>27</sup> that

there is, however, one region where delinquency is unusually high and where there is some disposition to forfeit the land. It is significant that this region is characterized by forest lands, with a minimum of other resources. It comprises 10 counties in the southeastern part of the State (southeast tidewater). This area was originally covered with magnificent longleaf pine. There is still some merchantable timber in the area, and there is natural reproduction. It cannot be considered a denuded area in the worst sense. It is, however, the region where the greatest damage has been done by fire and also where the closest cutting has been done. It is the region with the least industrial development, the poorest agricultural development, the sparsest population, and the highest tax rates.

Elsewhere, within farm-and-forest areas, forest lands appear to be more generally delinquent. A study of Beaufort, Chatham, and Macon Counties, North Carolina,<sup>28</sup> revealed that the forests as a whole show more delinquency than farms. In Johnson County, Tennessee, the delinquent area of "rough land" (nonfarm land) increased 58 per cent between 1928 and 1932, while that of "mountain land" (where farming was feasible) increased 35 per cent in the same period.<sup>29</sup> Such data as these have the greatest significance to a consideration of the problems of private forest management, and particularly of timber management.

It has been the policy of the states at all cost to return delinquent lands to the tax rolls under private ownership. Every expedient has been tried to this end: abatement of taxes and penalties, revaluation of lands for redemption purposes, and tax sales of land at low prices. Tracts that could not be returned to a current tax status in private ownership have become largely "no man's land." Aside from the reluctance of the states to take title

<sup>27</sup> Fairchild, *Forest Taxation in the United States*, p. 178.

<sup>28</sup> Fairchild, *Forest Taxation*, p. 179.

<sup>29</sup> U. S. Dept. Agr., Forest Service, Report on the Relationship of the Unaka National Forest to the Fiscal Status of Johnson County, Tennessee (52 pp., typed; Washington, 1936), p. 35.

to such land, such action by the states has been beset by legal handicaps and uncertainties. So far, West Virginia is the only state in the Appalachian Region which has attempted to make adequate provision for acquiring and managing chronically delinquent lands; and this attempt has met with great difficulties.

In West Virginia, prior to 1940, there was no provision for either the state or the local governments to own or manage tax-forfeited lands.<sup>30</sup> Tax reversion to the state was never complete. The state tried every means to return delinquent lands to private ownership. When delinquency became widespread in the early thirties, the counties adopted the extra-legal practice (approved by the state auditor) of revaluing lands "for redemption purposes only." For example, in Nicholas and Webster Counties, more than 111,000 acres of commercial forest lands were revalued for redemption purposes between 1933 and 1939. Assessments were reduced between 57 and 83 per cent. In Webster County 35,000 acres of delinquent lands originally valued at \$12 per acre were revalued at \$2. Interest and penalties were canceled. In expectation of special relief, many landowners who might otherwise have paid their taxes did not do so. In 1940 this chaotic situation was brought to order. Legislation was passed to legalize reclassification and revaluation for redemption purposes. Taxes due for years prior to 1929 were canceled. Interest and other penalties for 1932 and prior years were forgiven.

At the same time, it was provided that lands not redeemed by January 1, 1942, would be offered for sale and, if not purchased by private persons, would be sold to the state and would later pass into the possession of the Public Land Corporation of West Virginia, which, failing action by the original owner within a specified period, would take permanent title to them. The corporation had been set up in 1933, but no provision had been made at that time for it to obtain clear titles, because the period of redemption by original owners had not been limited. The 1940 legislation, however, was apparently decisive. The corporation was given authority to

designate lands to which it has title for development and administration for the public use including forestation, stock grazing, agricultural re-

<sup>30</sup> Weitzell and Miller, *Forest Land Utilization*, pp. 30-34.



habilitation and homesteading. . . It shall convey, assign, or allot lands to the title or custody of proper departments or other agencies of State government for administration and control. . . For the purpose of consolidating lands under either State or Federal administration, the corporation may sell, purchase, or exchange lands or stumpage.<sup>31</sup>

The policy of the corporation was not prescribed with regard to the types of land to be retained by the state or the future disposition to be made of land. Specifically, the public was not protected against unwise or unscrupulous transfer of lands to private interests.

In 1943, an essential part of the legal mechanism for transferring title to the Public Land Corporation was declared unconstitutional, and hence the status of tax-delinquent lands in West Virginia was again in doubt.<sup>32</sup>

#### FIRE AND OTHER DESTRUCTIVE AGENCIES

This section properly deals, in addition to forest fire, with insects, disease, weather phenomena, and other agencies, exclusive of cutting, which damage the productivity of forest resources. Only forest fire, however, will be discussed, as an important representative of this group of destructive agencies.

Woods burning is sometimes used as a silvicultural practice for such purposes as getting rid of undesirable species of trees or brush, controlling pests, or even reducing the fire hazard. This use of fire as a tool in forest management does not form a part of the subject now to be discussed. The subject here is wildfire, started accidentally, or set intentionally for purposes other than forest management. It is possible to demonstrate that wildfires result in a general loss of real income, that they can economically be prevented or controlled down to a low level of loss, and that their current prevalence is therefore a problem. There is reason to believe, indeed, that wildfire is a major problem of forest management, and that considerable progress is needed toward the solution of this problem before much can be done about many other problems of forestry in the region.

The effect of fire upon the forest many vary all the way from negligible damage to complete destruction of all living vegetation.

<sup>31</sup> Weitzell and Miller, *Forest Land Utilization*, pp. 33-34.

<sup>32</sup> Weitzell and Miller, *Forest Land Utilization*, p. 33.

The more critical the weather conditions and the more inflammable the forest fuel, the hotter and more destructive is the fire likely to be. In the Appalachian Region fires sometimes destroy young stands of susceptible species such as shortleaf and Virginia pines and thin-barked hardwoods. Fires often kill individual trees of small diameter in saw-timber stands, thus cutting down the future productivity of these stands. But fires which destroy any quantity of medium- or large-size timber — say, trees ten to twelve inches or larger in diameter — are comparatively rare. The typical forest fire in the region is a light fire, which does its damage by killing reproduction and weakening the larger trees, opening them to attack by insects and fungi.

A major feature of the hardwood forests of the region is the prevalence of butt rot in the trees. This rot originated in the light fires of past years, which killed a patch of bark at the base of the trees and exposed the interior to attack by fungi. In a region-wide study of selected Appalachian hardwoods, Hepting and Hedgcock<sup>33</sup> found that more than 49 per cent of the merchantable trees examined had wounds, and that about 96 per cent of these were fire wounds; trees without basal wounds showed an average of 1.5 per cent cull, while wounded trees averaged 15.5 per cent. Since Hepting and Hedgcock studied only merchantable trees, their data do not include the great numbers of saw-log size trees rendered wholly unusable by fire, or of smaller trees, so prevalent in the region, which have been damaged or killed by fire.

Insect damage following fire is most common in pine. The Ips bark beetles, the pine sawyers, and the southern pine beetle are all known to attack trees weakened through fire, and quite commonly cause the death of trees. Weakened hardwoods are occasionally attacked by ambrosia beetles, whose inroads, while not resulting in mortality, typically render the wood unmerchantable.

The effect of wildfire upon the forest is not confined, however, to the damage to timber. Other values of the forest, also, are damaged. Destruction of forest litter and humus by fire depletes soil fertility, reduces water values, and accelerates erosion. Forest fire impairs recreational values. It may destroy game and

<sup>33</sup> George H. Hepting and George G. Hedgcock, *Decay in Merchantable Oak, Yellow Poplar, and Basswood in the Appalachian Region* (U. S. Dept. Agr. Tech. Bull. 570; 30 pp.; Washington, 1937), p. 27.

affect adversely the habitat for game (although in some cases it improves the habitat, just as it may in some cases improve silvicultural conditions). It may throw out of balance the water relations of the forest and greatly increase surface run-off.

Of the 70 million acres of forest and adjacent, critical nonforest land in the region judged to require fire protection, about two-thirds were under some organized protection system in the five-year period 1936-1940 (Table 5). In Kentucky, the State having poorest protection, less than 20 per cent of the forest area was protected; while in West Virginia more than 85 per cent was protected (the percentage for West Virginia has subsequently reached 100). About one-tenth of the protected areas were national forest purchase units and other lands protected by the federal government. Most of the remainder was in counties organized under state protection systems, supported by the state and federal governments coöperatively under the provisions of the Clarke-McNary Law. Some industrial forest owners contribute to the protection of their lands from fire, and a few have active protection organizations of their own. At least three pulp companies in

TABLE 5  
EXTENT OF FIRE PROTECTION ON AREAS NEEDING IT IN THE  
APPALACHIAN REGION, BY STATE, 1936-1940<sup>a</sup>

STATE	ACRES NEEDING PROTECTION	ACRES PROTECTED			AREA UNPROTECTED	
		Total	Federal	State and private	Acres	Per cent
Kentucky .....	9,254,037	1,701,510	446,919	1,254,591	7,552,527	81.6
North Carolina ..	21,472,357	15,014,642	1,215,167	13,799,475	6,457,715	30.1
Tennessee .....	13,821,734	8,335,449	811,655	7,523,794	5,456,285	39.7
Virginia .....	15,630,467	12,224,352	1,484,436	10,739,866	3,406,115	21.8
West Virginia .....	10,133,946	8,816,802	888,258	7,928,544	1,317,144	14.2
All states .....	70,312,541	46,092,755	4,846,455	41,246,300	24,219,786	34.4

<sup>a</sup> U. S. Dept. Agr., Forest Service, Div. of State Cooperation, *Forest Fire Statistics, Calendar Year 1940* (43 pp., processed; Washington, 1941).

southeastern North Carolina practice intensive fire protection.<sup>34</sup> On the other hand, industrial holdings of the western highlands, such as those of the mining companies, are largely without private protection. The problem of forest fire, however, is not necessarily solved by the mere placing of an area within a protection system. To say that an area is protected is one thing; to say that it is ade-

<sup>34</sup> George M. Jemison, *The Forest Fire Problem in the Territory of the Appalachian Forest Experiment Station and a Fire Research Program* (iv + 73 pp., typed; Asheville, N. C., 1940), p. 19.

quately protected is quite another. Furthermore, no amount of effort directed at suppressing fire solves the fundamental problems of forest-fire prevention. These points will be made clearer subsequently.

During the five-year period 1936-1940, an average of at least 1,782,000 acres of forest land burned annually in the region; this was about 2½ per cent of the area classified as requiring protection (Table 6). Two and one-half per cent is not a large fraction. And yet, repeated year after year in a crop of such long standing as a forest, the cumulative damage is tremendous. Of course many stands burn over repeatedly, some of them nearly every year, so that it is not justifiable to conclude from the annual average of 2½ per cent that the region burns over once in forty years. Nevertheless, a very large portion of it burns in the course of a forest generation.

Forest-fire data for unprotected areas are necessarily incomplete. Available records show that an average of at least 4.4 per cent of these areas burned annually during 1936-1940, as compared with about 1.6 per cent for protected areas (Table 6). Fires are kept most rigidly in check on federal areas, where relatively advanced fire-protection techniques and equipment are used intensively. Less than 0.2 per cent of these areas were burned annually in 1936-1940.<sup>35</sup> At the opposite extreme were the unpro-

TABLE 6  
FOREST AREA BURNED ANNUALLY IN THE APPALACHIAN REGION,  
BY STATE, 1936-1940<sup>a</sup>

STATE	TOTAL AREA BURNED <sup>b</sup>		PROTECTED AREA BURNED		UNPROTECTED AREA BURNED <sup>b</sup>	
	Acres	Per cent	Acres	Per cent	Acres	Per cent
Kentucky . . . . .	367,656	3.97	30,996	1.82	336,660	4.46
North Carolina . . . . .	426,170	1.98	230,298	1.53	195,872	3.03
Tennessee . . . . .	800,391	5.79	315,455	3.78	484,936	8.84
Virginia . . . . .	97,509	0.62	50,518	0.41	46,991	1.38
West Virginia . . . . .	90,664	0.89	90,664	1.03	...	...
All states . . . . .	1,782,390	2.53	717,931	1.56	1,064,459	4.39

<sup>a</sup> U. S. Dept. Agr., Forest Service, Div. of State Cooperation, *Forest Fire Statistics, Calendar Year 1940*.

<sup>b</sup> Incomplete data.

<sup>35</sup> U. S. Dept. Agr., Forest Service, Div. of State Cooperation, *Forest Fire Statistics, Calendar Year 1940* (43 pp., processed; Washington, 1941).

tected areas in Tennessee, where 8.8 per cent of the forest was burned in the average year.

Granting the existence of a regional fire problem, the question of the magnitude of this problem still remains in doubt. It seems logical to suppose that the marginal loss of real income associated with an annual burn as great as 8.8 per cent considerably exceeds the marginal cost of protection. There may be some doubt whether this is true also in the case of the 0.2 per cent burn. Indeed, just how far to go in reducing forest fires under various conditions is a question unanswered on economic grounds. Again, it may well be that suppression (including "presuppression") efforts have already been carried sufficiently far in many areas of the region, and that further funds may be spent economically only for prevention purposes. But this question, too, remains unanswered. Here definitive problem analysis awaits further research.<sup>36</sup>

Of about 12,700 fires occurring annually on protected forest areas in the Appalachian Region during the period 1936-1940, less than 1 per cent are known to be other than man-caused (Table 7). Smokers are reported to have started the greatest number of fires — more than a fourth of the total (this item in the statis-

TABLE 7  
NUMBER OF FIRES PER YEAR, BY CAUSE, ON PROTECTED FOREST AREAS  
IN THE APPALACHIAN REGION, BY STATE, 1936-1940<sup>a</sup>

State	All causes	Lightning	Smokers and campers	Debris burning	Incen- diary	Other causes
Kentucky .....	803	5	203	185	272	138
North Carolina .....	4,103	42	1,617	816	994	634
Tennessee .....	3,627	11	818	846	1,013	939
Virginia .....	2,163	23	809	522	204	605
West Virginia .....	2,041	6	990	435	320	290
All states .....	12,737	87	4,437	2,804	2,803	2,606
Percentage .....	100.0	0.7	34.8 <sup>b</sup>	22.0	22.0	20.5 <sup>c</sup>

<sup>a</sup> U. S. Dept. Agr., Forest Service, Div. of State Cooperation, *Forest Fire Statistics, Calendar Year 1940*.

<sup>b</sup> Smokers, 25.7 per cent; campers, 9.1.

<sup>c</sup> Railroads, 3.8 per cent; lumbering, 2.4; miscellaneous, 6.8; unknown, 7.5.

<sup>36</sup> Such research in "forest-fire economics" is under way in several parts of the region at the time of writing.

tics may well be subject to exaggeration). The activities of smokers and of campers are associated to a great extent with the "fall fire season," which is at its height when vegetation is dry in October and November. The burning of crop residues, pastures, and debris starts 22 per cent of the forest fires. These are activities which come mainly during the "spring fire season," which reaches a critical peak in April and May, before the vegetation of the new year has opened out. Incendiaries, who account for 22 per cent of the fires, operate during both these seasons, as well as at other times of the year when forest fuels are sufficiently dry. An incendiary is anyone who sets a fire with the intention of burning over land or damaging property not owned or controlled by him.<sup>37</sup> He may set fire to the woods to protect his own property, to give vent to a grudge, to express some ulterior motive such as the desire for employment in fighting fire, or simply out of sheer "devilment" or "ornariness" — that is, in response to the ordinary need for self-expression or relief from boredom. Beyond these motives are those of the pyromaniac, but it should be made clear that pyromania probably accounts for little of the sum total of incendiarism.

The prevalence of man-caused forest fires in the Appalachian Region suggests that the need for fire prevention may comprise a very large share of the general fire problem. Again, the prevalence of incendiarism among man-caused fires provides one of the most tangible and forceful examples of the close relation between the economic problems of forestry and the social and psychological problems of the community. Weaknesses in community education, health, and cultural opportunities are unquestionably major factors in the problem of incendiarism.

<sup>37</sup> U. S. Dept. Agr., Forest Service, *Glossary of Terms Used in Forest Fire Control* (24 pp.; Washington, 1939), p. 3.

## CHAPTER IV

### PROBLEMS OF TIMBER MANAGEMENT

#### ECONOMIC CHARACTERISTICS OF TIMBER

##### TIMBER: MINE OR CROP

THAT TIMBER IS A CROP and not a mine has been emphasized.<sup>1</sup> Yet it would be inaccurate to say that timber is a crop in the ordinary sense, just like corn or apples. And it cannot be denied that timber production has in it elements of mining as well as of cropping.<sup>2</sup>

Take as the distinction between a mine and a crop that the former is definitely exhaustible while the latter is not, being based on the power of animate matter to reproduce and grow. Now since trees reproduce and grow, the removal of timber from an area does not preclude the possibility of returning to that area for successive harvests; and in this respect timber is a crop. On the other hand, where original or "old-growth" timber is concerned, the removal of this timber from an area does essentially preclude returning to that area for successive harvests of old-growth timber; and consequently the old-growth forest is in this respect a mine and not a crop.

Again, take as the definition of a crop that it is a commodity reproduced and grown as a business enterprise, and that therefore the quantity of it being reproduced and grown at any time is the result of an appraisal by enterprisers of the relative costs and returns of reproducing and growing it. Obviously timber is

<sup>1</sup> W. B. Greeley and others, "Timber: Mine or Crop?" *U. S. Dept. Agr. Year-book for 1922* (180 pp.; Washington, 1923), pp. 83-180.

<sup>2</sup> Fernow states that "the forest is not merely a mine, but a reproducible resource — a living, growing crop, the product of the soil and climate, which can be reproduced *ad libitum* in even superior quantity and quality to what nature alone and unaided has done." Bernhard E. Fernow, *Economics of Forestry* (xii + 520 pp.; New York, 1902), p. 45.

And Greeley: "Timber is distinctive in that, from the practical point of view of a supply of raw material, it may as yet be obtained either from a mine or a crop." W. B. Greeley, "Economic Aspects of Forestry," *Jour. Land and Pub. Utility Ec.* I:2: 129-137 (1925), p. 129.

not, at the present time and in the region under consideration, a crop in this sense. Taking the country as a whole, old-growth timber and volunteer second growth are still too accessible and plentiful (as respects the needs of the immediate future) for many to find encouragement in the business of raising timber for purposes to which such growth is suited.<sup>3</sup> Or, taking the Appalachian Region, there is still so much land not called into use for farming or industry or habitation or other nonforest purposes and which, therefore, largely as a natural happenstance, is occupied by trees, that standing timber, such as it is, is of low value. Of course this standing timber is of low value partly because it is of inferior quality or accessibility. It may be presumed that cultivated timber would be of higher value than wild timber. Yet such a presumption is evidently not sufficiently strong, or the prospective value advantage of cultivated over wild timber not sufficiently great, in the minds of private landowners to induce many of them to engage in timber culture as a business. The typical forest landowner finds himself fortuitously possessed of a stand of timber, in the arrival and development of which he has been at most a passive agent. (This fact, and especially its relation to supply responses, is developed a little further in Chapter VI.) Insofar as any business of production is concerned, or the weighing of costs and returns, this is to be found in the harvesting of timber, but not to any extent in the growing of it in the Appalachian Region. In this respect timber is like a mine, not like a crop.

Historically, the transition from mining to cropping is a gradual

<sup>3</sup> "So long as there exists sufficient wild timber to meet the requirements of the world's population the price of timber will be dominated by those supplies, and cultivated timber will only have the advantage that it is generally grown in fairly accessible places." W. E. Hiley, *The Economics of Forestry* (xiii + 256 pp.; Oxford, 1930), p. 4.

"It is not until the virgin stands of timber face exhaustion, not until the remaining stands are absorbed in private ownership or government reserves, not until the remaining forests are far removed from consuming centers that economic forces permit the practice of forestry on a profitable basis." Ralph W. Marquis, *Economics of Private Forestry* (viii + 219 pp.; New York and London, 1939), p. 166.

"The great bodies of accessible virgin timber on the earth's surface tend to control the general price levels of forest products, and hence to fix the limits within which timber culture may obtain a competitive foothold." Greeley, "Economic Aspects of Forestry," p. 129.



one. As supplies of wild timber, both local and distant, recede<sup>4</sup> or deteriorate in quality and as prices rise, successive measures of forest protection and culture become economically desirable, first in the public view, later in the individual private view.<sup>5</sup> In the Appalachian Region today, such forestry practices as extensive fire protection are generally accepted as worth while, and other measures, like simple cutting practices, bear fairly complete acceptance for public lands and a very few private lands.

#### LONG PERIOD OF PRODUCTION

Compared to other genetic products, trees take a long time to grow and become merchantable. Consider, for example, the loblolly-pine forest of the coastal plain of North Carolina — one of the region's fastest-growing types of forest. This forest, on good (ninety-foot) sites and with "normal" stocking, reaches an average tree diameter of seven inches (with individual trees ranging in size up to twelve inches) at an age of twenty-five years.<sup>6</sup> Under less dense stocking, the period is a little shorter. In any case the resulting forest is almost fully usable as pulpwood and contains a substantial saw-log volume. Such good sites, however, comprise only from 3 to 6 per cent of the loblolly-pine forest in the North Carolina coastal plain. On sites of medium quality (seventy- and eighty-foot sites), which account for about three-fourths of this forest,<sup>7</sup> it takes about thirty years (under normal stocking) to develop a stand of seven-inch average diameter.<sup>8</sup> It takes about fifty years on such sites to grow a stand of ten-inch average diameter,<sup>9</sup>

<sup>4</sup> Greeley, "Economic Aspects of Forestry," pp. 130-131.

<sup>5</sup> Graves recognizes four stages in the development of "applied forestry in a new country": (1) Protection of forests from fire, insects, and disease; (2) Measures to insure restocking of forests; (3) Provision for retaining growing stock after cutting; (4) Organization and management of forest tracts for sustained yield. Henry S. Graves, "Cooperative Effort in Forestry," *Forestry News Digest*, June 1937: 5-6, p. 5.

<sup>6</sup> R. D. Forbes and Donald Bruce, *Rate of Growth of Second-Growth Southern Pines in Full Stands* (U. S. Dept. Agr. Cir. 124; 77 pp.; Washington, 1930), p. 52.

<sup>7</sup> J. W. Cruikshank, *Forest Resources of the Southern Coastal Plain of North Carolina* (Appalachian For. Exp. Sta., Forest Survey Release 4; iii + 46 pp., processed; Asheville, N. C., 1940), p. 12; J. W. Cruikshank, *Forest Resources of the Northern Coastal Plain of North Carolina* (Appalachian For. Exp. Sta., Forest Survey Release 5; iii + 48 pp., processed; Asheville, N. C., 1940), p. 12.

<sup>8</sup> Forbes and Bruce, *Rate of Growth of Second-Growth Southern Pines in Full Stands*, p. 52

<sup>9</sup> Forbes and Bruce, p. 52

with the main body of the stand fully merchantable for saw timber, and trees ranging in size up to sixteen inches. At least sixty or eighty years are apparently required to develop saw-timber stands on even the intermediate and better mountain-hardwood sites.<sup>10</sup> Stands of upland oak on average sites attain an average tree diameter of ten inches in about a hundred years, and on poor sites this forest has an average diameter of only about seven and a half inches at age one hundred.<sup>11</sup> All the ages quoted would be less if a more usual, less heavily stocked "normal" had been taken as the standard. But the fact of a long period of production still remains.

Of course, in thinking of these periods of time, one should not picture the planting of seed or seedlings on bare ground, and the subsequent waiting for twenty-five or seventy or one hundred or more years. That is certainly not the typical case. Common enough to warrant consideration, however, is the case where cropland or pasture is abandoned by the farmer and allowed to revert naturally to tree growth. If pine or yellow poplar quickly takes possession of the ground — which, fortunately, one of them very often does — the period of waiting begins and is clearly recognizable. If trees have difficulty in becoming established, the period of waiting will be longer than otherwise. Similar, clearly recognizable waiting periods may follow when fire kills a forest stand or when timber is heavily logged for such products as mine timbers or charcoal wood.

The really typical case in the Appalachian Region, however, is that of the all-aged or many-aged forest, already established and growing. Some of the trees are ready to cut. Others are nearly so. Beneath these is an understory of younger growth in various stages of development. In most of the mixed-hardwood forest, and in pine areas of sufficient size to contain all age classes of trees, there appears to be no waiting period whatsoever, since there may always be some timber ready for harvest. The waiting period, however, is just as much a reality in this case as in the others. If

<sup>10</sup> E. H. Frothingham, *Timber Growing and Logging Practice in the Southern Appalachian Region* (U. S. Dept. Agr. Tech. Bull. 250; 93 pp.; Washington, 1931), p. 36.

<sup>11</sup> G. Luther Schnur, *Yield, Stand, and Volume Tables for Even-Aged Upland Oak Forests* (U. S. Dept. Agr. Tech. Bull. 560; 88 pp.; Washington, 1937), pp. 7-8.

the forest growing stock is — with respect to stocking, quality, kinds of trees, or other factors — economically maladjusted, then the minimum length of time in which the attainment of a specific goal of adjustment can be generally assured is the waiting period, or rotation, as before. And, in actual fact, maladjustment of the growing stock is probably close to universal within the region.

But even where there is no maladjustment of growing stock, the rotation period of waiting is still pertinent. In the first place, any fortuitous event affecting the forest growing stock, which cannot be reckoned with in the plan of management (or is not reckoned with, under a planless system) may introduce a distortion within the pattern of age classes of trees, which can be ironed out only during the course of a rotation. Here, as in the other cases where bare ground is not the starting point, the thing waited for may be less than the entire harvest of the year or period; but the time of waiting may not be less than the rotation. In the second place, any fortuitous event outside the forest business, which cannot be reckoned with in the plan of forest management, may call for a new goal of management which can be reached only during the course of a rotation.

It is, then, apparent that unless the general economy is, to all intents and purposes, static, there is a significant period of waiting, limited by the rotation, which characterizes the production of timber, regardless of the structure of the forest growing stock or the scheme of forest management.

*Likelihood of maladjustment.* The fact that the forest rotation is in almost all cases at least one human generation in length, and in many cases several generations in length, is most significant. It means that there is great likelihood that changes in the general economy will disrupt plans of land management or forest management and thereby create maladjustments which cannot be erased for long periods. As a practical matter it means that perpetual and rather general maladjustment is inevitable in a dynamic economy. Since this is true even of flexible types of business with short periods of production, it is not surprising that it should be true of timber-growing. In the case of timber-growing, the degree of maladjustment is not directly proportional to the length of rotation, but certainly increases with rotation length.

Maladjustment takes a number of forms and arises in a number

of different ways. Land planted or seeded in trees may subsequently become inherently more valuable for some nonforest use.<sup>12</sup> If the change in value is sufficiently marked, the forest rotation sufficiently long, and the age of the forest at the time of the change sufficiently young, clearing of the forest, even if no timber products whatsoever are derived, may be the best course. If, on the other hand, the timber is best left standing, it may later be harvested, and the enterprise liquidated, at the end of a rotation shorter than otherwise. Thus, because the rotation is long, the current condition of timber on a tract may exert a great influence upon the point of adjustment, with respect to growing stock, that is most economical over a period of years. During the course of a long rotation, cyclical changes in demand for forest products tend to leave the growing stock continually in maladjustment, either because they invalidate the long-run goals originally adopted in the plan of management, or because they dictate a changed plan, which in turn becomes invalidated.<sup>13</sup> The use of land to produce corn may be determined on the basis of a plan covering substantially only one year (or a few years, where fertilizer, the crop rotation, the livestock enterprise, and perhaps the balance of the farm business as a whole are considered). But the use of land to produce timber, and the particular form and aims of the timber management, may not be determined rationally except on the basis of a long-run plan, in which the assumptions are very likely to be proved substantially false before harvest time.<sup>14</sup>

*The stake of society.* It is obvious that a number of the forms of maladjustment just described may be maladjustments only in the public view, and not in the individual private view. This difference between public and private maladjustments may be

<sup>12</sup> That is, identical land without tree cover would be put at once to nonforest use.

<sup>13</sup> Secular changes in demand, also, may create forest maladjustment. Hiley says that "secular price changes affect forest finance *very much more* than trade booms and slumps because the production period in forestry is very long." (Italics not in the original.) Hiley, *Economics of Forestry*, p. 54.

<sup>14</sup> "With slowly produced commodities a long period of undersupply is followed by a correspondingly long period of overproduction with hardship to the producer. Furthermore, with slowly produced commodities a state of equilibrium may not be reached after the first period of overproduction, but may be delayed for an indefinite number of production cycles." Barrington Moore, "Two Views of Economic Aspects of Forestry," *Amer. Lumberman* 2066:23 (December 19, 1914), p. 23.

thought of in terms of the different rates of interest applicable in the two cases. Or it may be thought of in terms of the shifts in value of forest land and standing timber that accomplish the short-run purpose of adapting an inflexible productive plant to a dynamic situation.

In either case, the important point is this: Because the period of production in forestry is long, the condition of growing stock at any time may be, at least in part, the result of decisions made in the rather distant past — that is, up to a rotation before; and decisions made at any time with respect to the growing stock cannot bear final fruit until the rather distant future — that is, a rotation later. (There is an implicit assumption here that the forest use of the land remains the best.) But decisions may be made at any time, in the case of merchantable forests, that result in immediate changes in the growing stock and immediate returns from the business. The same decision has its effect both in the present and in the distant future. Now since the course of action which yields maximum returns in the near future may not be that which will yield maximum returns in the far future, there may be a conflict between the interests of individuals and those of society at large so long as the two groups discount the future of different rates. This conflict is additional to that which may arise through differences in the degree of rationality of the two groups.

It follows that in any society in which the interests of the people at large are considered in policy formulation, such policy will call for some measure of control by the public over the business of timber production.<sup>15</sup>

*The rate of interest.* Because the period of production in forestry is long, the rate of interest has a large influence upon decisions in timber management. As in the case of land value itself, value of a forest — that is, of the series of returns anticipated from it — is

<sup>15</sup> "The time element, together with the large capital required in timber-wood production, renders the forestry business undesirable to private enterprise of circumscribed means. . . Long-lived persons, like the state and corporations, and large capitalists, can alone engage in it as a business by itself with hope of financial satisfaction." Fernow, *Economics of Forestry*, p. 131. And again: "Not only capital, but economic capacity and character and moral strength are required to maintain a systematic forest management and withstand the temptation to realize. Again the state, communities, and corporations, who have an interest in continuity, are most safely intrusted with a business that can be so easily unbalanced." Fernow, p. 132.

See also: Marquis, *Economics of Private Forestry*, pp. 181-199.

expressible only with reference to a given interest rate. Consequently the rate of interest is a major determinant of the best course to pursue with respect to products to be produced, species to be favored, length of rotation, cutting-diameter limits, frequency and intensity of cutting, quantity and character of growing stock to be maintained, and other types of management alternatives. The rate of interest is a major factor, also, in deciding the basic question, whether forestry, or some other use, or some combination of uses is most economical in a given case.

Other things being equal, a relatively high rate of interest puts forestry at a relative disadvantage among the various uses of land. Given the forest use, a relatively high rate of interest tends to give advantage to products or species that will yield a return during a short rotation. It favors, by the same token, low cutting-diameter limits, heavy cutting, and a small growing stock. Of all the variable factors affecting the choice of alternatives in forest management, the rate of interest is frequently found to be the most influential. That is to say, a change in this factor amounting to a given proportion of its reasonable range will produce a larger shift in the result than a comparable change in any other factor.<sup>16</sup>

*Slow rate of production.* Associated with long production periods in forestry is low output per unit of time. Although there is opportunity for intermediate cuttings of timber before the final harvest, particularly in stands managed under a multiple-storied system, the average annual yield still is of the order of  $1/r$  times the quantity of growing stock at the end of the rotation, where  $r$  is the rotation length in years. Take a high average stumpage value of \$10 per thousand feet, board measure, for shortleaf pine in North Carolina.<sup>17</sup> Assume, liberally, an annual yield of 300 board feet per acre. The gross value of stumpage produced on an acre of such forest land is, then, \$3 a year. The amount of labor required to log this timber, bring it to the sawmill, and convert it to lumber is possibly about one man-day, of which about half is woods work. In the Appalachian Region generally, typical

<sup>16</sup> "A difference of 1 per cent in the rate of interest charged may in some cases alter the computed cost of production by as much as one hundred per cent." Hiley, *Economics of Forestry*, p. 91.

<sup>17</sup> Henry B. Steer, *Stumpage and Log Prices for the Calendar Year 1942* (U. S. Dept. Agr. Statistical Bull. 79; 128 pp.; Washington, 1944), p. 54.

figures for value and employment would probably be only a third to a tenth of those just given.

Apparently timber production in itself is a fairly labor-extensive form of land use.<sup>18</sup> Apparently, also, if the values of lands best suited to each type of use were compared, use for timber production would be found to rank fairly low in the scale. If this is so, then timber production as a source of income and employment might be expected to succeed as a full-time proposition only in large tracts; and to be carried out on small tracts, such as farm woods, only on a part-time, or supplementary, basis. This is generally true within the region.

#### CONFUSION OF CAPITAL EQUIPMENT AND PRODUCT

A growing forest is like the capital equipment in any other productive plant: it is one of the factors of production which combine to turn out a merchantable product. This is so regardless of whether some of the trees in the stand are currently merchantable for any purpose. Trees perform their function as productive capital by producing and supporting additional layers of usable wood each year. These layers are, in one sense, the product; in another sense, capital, since they may, in turn, produce and support still additional layers. When the product is harvested, however, this harvest does not take the form of peeling the merchantable outer layers from each tree. Rather, the harvest is made by cutting down entire trees.<sup>19</sup> These whole trees, then, become the product, and the whole trees that are left standing remain, for the time, capital equipment, or growing stock. What is product and what is capital then depends solely on the choice of individual trees to be felled at harvest time. Outside of tree size, species, and condition — factors bearing upon the question of merchantability, with respect to which there is, in general, great latitude for decision — there is no essential physical distinction between individual trees that are called product and those that are called capital.

One result of this situation is that a merchantable forest grow-

<sup>18</sup> "The forester's crop grows mostly unattended; only when harvest time comes is he busy; and since . . . he may reproduce his crop without direct labor by the mere manner of harvesting the old crop, even seeding time may not call for much effort; his business is 'labor-extensive.'" Fernow, *Economics of Forestry*, p. 112.

<sup>19</sup> Such uncommon practices as pollarding excepted.

ing stock represents an extraordinarily liquid item of capital equipment: Not only may it be used to turn out a product, but it may also at any time be called upon to make available at once the entire product of the rotation, by being converted, itself, from capital to product.<sup>20</sup> In one sense this is merely a liquidation of capital, but it differs from most capital liquidation in that the capital may be sold in that identical market with which the sellers may already be familiar as the operators of a going business — the market in which they have their established contacts and their experience.

A roving timber operator who conducts his business in a territory of small, separately owned forest tracts such as farm woods may liquidate the forest capital of many owners, in such fashion that they themselves may not produce another merchantable crop during their lifetime. For such an operator, however, the timber is distinctly of the order of product and not capital, since, over the territory within which he operates, he may well have sufficient timber and forest land to continue permanently his present mode of operation.

The liquidity of forest capital often makes it possible to convert quickly from timber production on a going basis to nonforest use of land — more quickly, in most cases, than the reverse conversion can be made.

A second result of the confusion between timber product and capital is to throw much weight upon decisions in forest management at the time of the harvest. Generally speaking, the larger the forest growing stock, the larger is the annual product, or growth. The larger the growth, the heavier is the output of products for harvest. But the heavier the harvest, the smaller the growing stock and the smaller the growth. To get a larger product in the future

<sup>20</sup> "Capital and interest, wood stock and harvest, are mixed together, the differentiation being made, not by the character of the material, but by voluntary economic considerations and self-imposed saving, and . . . while in the lower age classes the capital is tied up without any possibilities of realizing on it, it is possible to liquidate portions of it in the older age classes at any time, making it readily available, to be turned into other channels — this ease of reducing the fixed capital without appreciable loss is one of the peculiarities of the forestry business, which . . . also brings with it the danger of uneconomic anticipation of the harvest, of disturbing the systematic progress of a management for continuity, of returning to mere exploitation when there is an urgent need of money." Fernow, *Economics of Forestry*, pp. 131-132.



calls for taking a smaller product at present. To get a larger product in the present, the near future must be sacrificed. (In this respect the forest resembles a mine.) What balance to strike between a large and productive growing stock and a large current harvest is always a major question.

#### OTHER ECONOMIC CHARACTERISTICS OF TIMBER

A few relatively minor points with respect to the economics of timber as a product should be mentioned. One of these is the peculiar relation between timber and the land on which it grows. Under a permanent forest system, these two factors operate together in such a fashion that their separate contributions — their identity — often need not or cannot be studied. At the same time, these two factors may, in a sense, become joint products of timber operation, where the forest enterprise is liquidated. The bare land, ready for nonforest use, may be either the principal product or the by-product.

Another characteristic has to do with the jointness of various timber products.<sup>21</sup> When a tree is felled, the various portions of it, usable or not, are all produced jointly. For every tree which yields saw logs, there are smaller logs and limbs as joint products. If left in the woods unutilized, they soon deteriorate and are lost. They may be had for the additional expense of bucking and transportation. The practical result of this fact is to make economical the utilization of some substandard material of a sort that would not be produced for its own sake. Other joint timber products are bark and sawmill slabs, edgings, and sawdust.

#### PROBLEMS IN THE SILVICULTURAL CONDITION OF FORESTS

Something has already been said, in a descriptive way, about the principal types of forest and their distribution over the Appalachian Region (Chapter I). Additional details are now called for respecting the condition of the forest, the quantity and stocking of timber, and the general character of forest sites. These matters are important because the present condition of timber stands

<sup>21</sup> "Inasmuch as all timber is obtained under conditions of joint cost . . . the prices of all types of logs are interrelated. Even logs used mainly for paper are affected by conditions of demand and supply in the lumbering industry." John A. Guthrie: *The Newsprint Paper Industry; An Economic Analysis* (Harvard Ec. Studies 68; xxiii + 274 pp.; Cambridge, Mass., 1941), p. 141.

is a major factor influencing the potentialities and determining the programs of the future and therefore setting the problems of the present.

#### FOREST CONDITION CLASSES

Of the 63½ million acres of forested land in the region (Table 8), a little more than 28 million acres (44 per cent) supports forest stands "merchantable for saw timber" — that is, having at least 600 to 1000 board feet per acre in saw-log size trees.<sup>22</sup> The

<sup>22</sup> Data on the acreage of forest condition classes and the quantity of standing timber (Tables 8 through 11) in part are drawn from published material and in part are estimates. They relate to the year 1940. For the sake of comparability with other figures as to date, the 1945 estimates of the United States Forest Service reappraisal have not been used. Data obtained in the forest survey of the United States Forest Service were available for Virginia and North Carolina. J. W. Cruikshank, *North Carolina Forest Resources and Industries* (U. S. Dept. Agr. Misc. Pub. 533; iv + 76 pp.; Washington, 1944). T. C. Evans, G. E. Morrill, and John Carow, *Virginia Preliminary Tables of Forest Area, Timber Volumes and Utilization* (iv + 70 pp., processed; Asheville, N. C., 1941). In these states the data were corrected, when necessary, to 1940. Statistics for each province were derived in some cases directly from the published figures, in some cases by adjusting on a proportional basis for differences in boundary lines. Allowance was made for "non-commercial forest area," which was omitted from the Forest Service inventory but is included here. The figures for West Virginia and Kentucky are unofficial estimates made by the writer, and based upon office records of the Forest Service and the judgment of colleagues. The figures for Tennessee are based upon surveys and estimates by the Tennessee Valley Authority.

With respect to the data on forest-condition classes, cautious interpretation is called for on grounds additional to those mentioned in the text. In Virginia and North Carolina the forest-survey information was gathered on ¼-acre plots, widely spaced over the states. Data for the other states were obtained or estimated on a similar basis. Consequently the statement that 44 per cent of the forest area is merchantable for saw timber, having an average of at least 600 to 1000 board feet of standing timber per acre, should be understood to read, "44 per cent of all ¼-acre forest sample plots were found to contain at least 150 to 250 board feet of standing timber." Surely these are two quite different statements. As a matter of fact, the first statement has no precise meaning without reference to the unit of area on which the measurements were taken; for, particularly in a patchy forest like that of the Appalachian Region, the percentage of any special kind of plot or area depends upon the size of the plot or area. The smaller the plot, the greater will be the range and deviation of the variable under consideration; the larger the plot, the narrower the range and deviation.

For example, the mean volume of saw timber per acre of all forest land in the region is estimated to be 1,527 board feet. This estimate is obtained on the basis of ¼-acre plots. On the same basis the lower limit of the range is zero, and the upper limit is, for practical purposes, probably about 25,000, only a small fraction of 1 per cent of the plots falling above this amount. Now suppose that plots are increased in size to two acres. The deviation of plot volumes about their mean will

balance, representing the greater share of the forest, has so few usable trees of saw-log size upon it that the stand is unmerchantable for saw timber. More than 30 million acres of this balance, however, is "merchantable for cordwood," having at least a 5 per cent stocking of trees two inches or larger in diameter.<sup>23</sup> This represents 48 per cent of the entire forest. The remaining 8 per cent of the forest land is either denuded or is stocked with tree reproduction.

This three-way division of forest land — 44 per cent saw timber, 48 per cent cordwood, and 8 per cent unmerchantable and non-

now be much narrower, with few, if any, plots falling above 25,000. With ten-acre plots, none will fall above 25,000; in fact, the practical upper limit may now be scarcely more than half of that amount; while the lower limit will probably be somewhat more than zero. So the range and deviation will decrease as plot size is increased, until, with a plot size of 63,516,000 acres (the whole forest area), the range and deviation about the mean of 1.527 (assuming that this is the true mean) will be zero. Obviously, then, the statement that a given percentage of the forest contains more than a stated volume of timber per acre is meaningless without reference to the size of the unit area on which the measurements were taken. And it may be added that the interpretation of the statement — that is, the visualizing of just what the statement means as a practical fact, and how much different the percentage would be if the sample plots had been of a different size — is difficult in the extreme, if not impossible.

Now the statement that 44 per cent of the forest is merchantable for saw timber is just such a statement as has been analyzed here: it is a statement to the effect that a given percentage of the forest contains more than a stated volume of timber per acre. It is true only with reference to  $\frac{1}{4}$ -acre plots. But one-fourth of an acre is a very small patch of forest. It has no practical significance insofar as harvesting operations are concerned, and it is presumably with respect to the harvest that one is interested in the matter. Small sawmills, for example, usually need at least ten to fifty acres for a setting; and significant acreages for most other types of saw-timber operation range from there on up into the thousands. With reference to blocks of such size, the percentage of the forest merchantable for saw timber is not known. Most assuredly, however, it is something other than 44 per cent.

Since the standard deviation of the volume-per-acre distribution of large plots tends to be less than that of small plots, the percentage of large plots having more than a fixed limit of volume per acre will tend to be greater than the corresponding percentage of small plots if the fixed limit is less than the grand mean volume per acre, and the percentage of large plots having more than a fixed limit of volume per acre will tend to be less than the corresponding percentage of small plots if the fixed limit is greater than the grand mean volume per acre. Only if the fixed limit is equal to the grand mean will plot size tend to have no effect upon percentage.

This limitation of extensive forest surveys based upon small sample plots holds for many classes of forest statistics. The fact is by no means sufficiently taken into account in interpreting such statistics.

<sup>23</sup> In reports of the Forest Survey, these stands have usually been called "under-saw-log-size second growth," a more accurate term than "cordwood." The latter term is used here for brevity's sake.

restocking — is perhaps not the best for descriptive purposes, for it suggests a picture a little more favorable and encouraging than the truth. Small sawmills ordinarily require a stand of 1000 to 1500 board feet per acre in order to operate successfully, and only the smallest mills ordinarily operate in stands of as little as 1000 board feet per acre (Chapter VIII). So far as commercial operations of any size are concerned, a forest, particularly in the case of hardwoods, is scarcely to be bothered with unless it contains at least 2000 board feet per acre. Furthermore, if any merchantable growing stock is to be left standing after the operation, the forest must initially contain more than the amounts just stated. Without this reservation, the statement that 44 per cent of the forest is in saw-timber stands would be very misleading.

TABLE 8  
FOREST-LAND AREA OF THE APPALACHIAN REGION, BY STATE,  
PROVINCE, AND CONDITION CLASS, 1940  
(in thousands of acres)

STATE OR PROVINCE	ALL STANDS	STANDS	NON-SAW-TIMBER STANDS	
		MERCHANTABLE FOR SAW TIMBER	Merchantable for cordwood	Unmerchantable and non-restocking
Kentucky .....	8,728	3,174	4,908	646
North Carolina .....	18,402	9,779	7,185	1,438
Tennessee .....	12,822	4,601	6,928	1,293
Virginia .....	14,832	7,342	6,769	721
West Virginia .....	8,732	3,287	4,480	965
All states .....	63,516	28,183	30,270	5,063
Coastal plain .....	12,777	7,392	4,148	1,237
Piedmont .....	11,585	5,784	5,162	639
Highlands .....	18,367	7,545	9,177	1,645
Great valley .....	9,059	3,160	5,418	481
Interior .....	11,728	4,302	6,365	1,061
All provinces .....	63,516	28,183	30,270	5,063

In like manner, the picture of unmerchantable and non-restocking areas requires clarification. It may, perhaps, be said that the figure of 8 per cent just given for such areas is too low. Such a statement might be justified on the ground that the area classified as cordwood contains a substantial acreage of forest stocked largely with two- and four-inch trees, actually not usable for any cordwood products now commonly marketable in the region. Much

of this area of small-size trees might well, indeed, be classed as unmerchantable.

The proportion of saw-timber stands does not vary greatly, on the average, from state to state, though it is noticeably lower in the western states of the region than in the eastern: 36 per cent in Kentucky and Tennessee, 38 per cent in West Virginia, and 49 and 53 per cent in Virginia and North Carolina, respectively. That the proportion of saw-timber forest diminishes toward the west is shown, too, in the figures for the provinces:

	<i>Per cent</i>
Coastal plain .....	58
Piedmont .....	50
Highlands .....	41
Great valley .....	35
Interior .....	37

#### QUANTITY OF TIMBER

There is nearly 100 billion board feet of standing saw-log timber in the region (Tables 9 and 10). About 97 billion feet of this is live growing stock, the small remainder being dead chestnut still standing and usable for saw logs. More than nine-tenths of the saw-log growing stock is in stands of the saw-timber condition class. This growing stock, in the region as a whole, is nearly equally divided between softwood and hardwood timber. But among the states and provinces is great variation. The proportion of hardwood in the total saw-log growing stock in each state is as follows:

	<i>Per cent hardwood</i>
Kentucky .....	84
North Carolina .....	33
Tennessee .....	67
Virginia .....	50
West Virginia .....	88

And in each province:

	<i>Per cent hardwood</i>
Coastal plain .....	30
Piedmont .....	42
Highlands .....	75
Great valley .....	76
Interior .....	74

It is surely not a coincidence that the hardwood areas of the region are those where the proportion of saw-timber stands is lowest and where, as will be seen in Table 11, the stocking of saw timber per acre is lowest. This association may be ascribed to a number of factors, but the one of interest here is that hardwood stands are slow to regenerate and grow, as compared with soft-

TABLE 9  
QUANTITY OF STANDING TIMBER IN THE APPALACHIAN STATES,  
BY TYPE OF MATERIAL AND KIND OF WOOD, 1940  
USABLE FOR SAW LOGS (*in millions of board feet*)

	All States	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
<b>Growing stock</b>						
Softwood .....	47,649	1,233	28,839	4,102	12,470	1,005
Hardwood .....	49,369	6,664	14,504	8,430	12,385	7,386
All kinds of wood .....	97,018	7,897	43,343	12,532	24,855	8,391
<b>Cull trees, tops, dead chestnut</b>						
Softwood .....	...	...	...	...	...	...
Hardwood .....	2,338	172	900	18	806	442
All kinds of wood .....	2,338	172	900	18	806	442
<b>All types of material</b>						
Softwood .....	47,649	1,233	28,839	4,102	12,470	1,005
Hardwood .....	51,707	6,836	15,404	8,448	13,191	7,828
All kinds of wood .....	99,356	8,069	44,243	12,550	25,661	8,833
<b>ALL USABLE WOOD (<i>in thousands of cords</i>)</b>						
<b>Growing stock</b>						
Softwood .....	197,115	6,614	112,038	12,324	61,068	5,071
Hardwood .....	337,116	42,040	88,117	78,237	87,893	40,829
All kinds of wood .....	534,231	48,654	200,155	90,561	148,961	45,900
<b>Cull trees, tops, dead chestnut</b>						
Softwood .....	11,460	491	5,455	1,439	3,542	533
Hardwood .....	249,532	30,440	66,424	60,520	54,463	37,685
All kinds of wood .....	260,992	30,931	71,879	61,959	58,005	38,218
<b>All types of material</b>						
Softwood .....	208,575	7,105	117,493	13,762	64,610	5,604
Hardwood .....	586,648	72,480	154,541	138,757	142,356	78,514
All kinds of wood .....	795,223	79,585	272,034	152,520	206,966	84,118

wood, and consequently are more retarded in their development after cutting. The fact that hardwood stands are more generally deteriorated suggests that the harvest of timber in the Appalachian Region has been conducted in accordance with what was currently standing in the forest as growing stock, and not in accordance with what the forest was capable of producing as a genetic resource. The evidence is very clear in the figures, as it is, indeed, upon the ground and in the logging operations.

The total quantity of all usable timber in the region — cord-

wood-size trees five inches and larger in diameter, as well as saw-log size trees — is estimated to be about 795 million cords (Tables 9 and 10). Of this amount, only about two-thirds is growing stock, the remainder being in cull trees, hardwood tops and limbs, and dead chestnut. When the timber resource is viewed from the standpoint of total volume in cords, the extent to which the Ap-

TABLE 10  
QUANTITY OF STANDING TIMBER IN THE PROVINCES OF THE APPALACHIAN  
REGION, BY TYPE OF MATERIAL AND KIND OF WOOD, 1940  
USABLE FOR SAW LOGS (in millions of board feet)

	All provinces	Coastal plain	Pied-mont	High-lands	Great valley	Interior
Growing stock						
Softwood .....	47,649	25,831	11,857	4,968	2,164	2,829
Hardwood .....	49,369	10,841	8,729	14,855	6,999	7,945
All kinds of wood .....	97,018	36,672	20,586	19,823	9,163	10,774
Cull trees, tops, dead chestnut						
Softwood .....	...	...	...	...	...	...
Hardwood .....	2,338	...	16	1,577	709	36
All kinds of wood .....	2,338	...	16	1,577	709	36
All types of material						
Softwood .....	47,649	25,831	11,857	4,968	2,164	2,829
Hardwood .....	51,707	10,841	8,745	16,432	7,708	7,981
All kinds of wood .....	99,356	36,672	20,602	21,400	9,872	10,810
ALL USABLE WOOD (in thousands of cords)						
Growing stock						
Softwood .....	197,115	94,957	62,303	22,860	12,388	4,607
Hardwood .....	337,116	64,793	66,041	90,594	49,471	66,217
All kinds of wood .....	534,231	159,750	128,344	113,454	61,859	70,824
Cull trees, tops, dead chestnut						
Softwood .....	11,460	3,883	3,240	2,292	1,769	276
Hardwood .....	249,532	38,456	32,378	86,925	45,421	46,352
All kinds of wood .....	260,992	42,339	35,618	89,217	47,190	46,628
All types of material						
Softwood .....	208,575	98,840	65,543	25,152	14,157	4,883
Hardwood .....	586,648	103,249	98,419	177,519	94,892	112,569
All kinds of wood .....	795,223	202,089	163,962	202,671	109,049	117,452

palachian States are a hardwood region becomes apparent. Nearly three-fourths of the total volume is hardwood, and 63 per cent of the growing stock in cords is hardwood. In total volume, hardwood timber predominates in each of the five states, even in North Carolina accounting for 57 per cent of all the timber. The same is true of each of the five provinces; and in the coastal plain, where the pine of the region is concentrated, 51 per cent of the total quantity of wood in cords is hardwood.

## STOCKING AND COMPOSITION OF STANDS

The average acre of forest land in the region supports 1527 board feet of saw-timber growing stock, or 8.4 cords of all growing stock (Table 11). Province by province, growing stock becomes progressively sparser toward the west. Among the states, Kentucky and West Virginia appear to have the poorest average stocking of timber, the former as a result of its depleted interior woodlands and its rather heavily logged highlands section, the

TABLE 11  
QUANTITY OF FOREST GROWING STOCK PER ACRE IN THE  
APPALACHIAN REGION, BY TYPE OF MATERIAL, STATE, PROVINCE,  
AND CONDITION CLASS, 1940  
USABLE FOR SAW LOGS (in board feet)

STATE OR PROVINCE	All stands	Stands merchantable for saw timber	Stands not merchantable for saw timber
Kentucky .....	905	2011	273
North Carolina .....	2355	4132	341
Tennessee .....	977	2283	247
Virginia .....	1676	3235	147
West Virginia .....	961	2172	230
All states .....	1527	3129	250
Coastal plain .....	2870	4742	300
Piedmont .....	1777	3301	258
Highlands .....	1079	2253	261
Great valley .....	1011	2575	174
Interior .....	919	2068	253
All provinces .....	1527	3129	250
ALL USABLE WOOD (in cords)			
Kentucky .....	5.6	9.7	3.2
North Carolina .....	10.9	17.0	4.0
Tennessee .....	7.0	11.6	4.5
Virginia .....	10.0	16.1	4.1
West Virginia .....	5.3	10.1	2.4
All states .....	8.4	14.2	3.8
Coastal plain .....	12.5	19.2	3.4
Piedmont .....	11.1	17.0	5.2
Highlands .....	6.2	10.6	3.1
Great valley .....	6.8	11.8	4.1
Interior .....	6.0	10.4	3.5
All provinces .....	8.4	14.2	3.8



latter, also a hardwood state, largely because of heavy logging in the recent past.

Few sections of the region, however, have much timber that may be called well stocked from the silvicultural viewpoint. In parts of the coastal plain, loblolly and shortleaf pines have produced excellent stands of second growth. In parts of the highlands, notably in two or three counties in Kentucky, considerable blocks of essentially virgin hardwoods have only recently been opened up for full-scale logging. Elsewhere depletion is the rule. Thin stands of small or defective or otherwise inferior trees — the remnant of operations that have removed the larger and more desirable trees of the more desirable species — characterize a very large proportion of the Appalachian forest.<sup>24</sup> It is of interest (though of course not necessarily of any economic significance) to note that on the average the forests of the region contain about a fourth or a fifth of their original stocking of timber.

As regards size of trees, data for the Appalachian Region as a whole are not available. But a few fairly representative figures may be given for Virginia and North Carolina. In the northern coastal plain of the latter state, one of the most heavily stocked forest areas in the region, where the rapid growth of pine is a potent factor counteracting the forces of depletion, the distribution of the total growing stock in cords, by tree-diameter class, was as follows in 1937:

Tree diameter, inches	Per cent
5.0- 8.9 .....	21
9.0-12.9 .....	32
13.0-18.9 .....	33
19.0 or more .....	14
All diameters .....	100

In the highlands and great valley of Virginia, chiefly a hardwood area, the percentage of total growing stock, by tree-diameter class, was as follows in 1940:

Tree diameter, inches	Per cent
5.0- 8.9 .....	27
9.0-12.9 .....	30
13.0-18.9 .....	25
19.0 or more .....	18
All diameters .....	100

<sup>24</sup> Peter A. Stone, and others, *Economic Problems of the Lumber and Timber*

And in the piedmont of Virginia, where the forest is mixed hardwood and pine and has been as extensively picked over as any forest area in the region:

Tree diameter, inches	Per cent
5.0-8.9 .....	37
9.0-12.9 .....	36
13.0-18.9 .....	18
19.0 or more .....	9
All diameters .....	100

Here, it will be noted, nearly three-fourths of the total growing stock is in trees smaller than thirteen inches in diameter.

As regards tree species, much the same situation obtains — that is, those kinds of trees that are commercially desirable have been cut, while those that are relatively undesirable have been left to grow and to reproduce. The better trees have been taken as product; the poorer left as capital. In this way the character and composition of stands have been changed through logging, in such fashion as makes it increasingly difficult to return for logging operations of the same type, no matter how well the forest has put on growth in the meantime.

And finally, there has been a tendency seriously to deteriorate the quality of the growing stock through repeated selection of the best individual trees for harvest. Decayed, crooked, or limby trees, not easily marketable, have been left standing, and their relative numbers and volume have increased. Such substandard, or non-growing-stock material tends to become an especially grave feature of hardwood stands, particularly where the trees are subjected to an occasional scorching fire. Of the 261 million cords of non-growing-stock timber in the region (a third of all usable timber), hardwood makes up 96 per cent.<sup>25</sup>

#### CONDITION OF FOREST SITES

Throughout the mountainous portions of the Appalachian Region, forest sites tend to arrange themselves in a rather distinct

*Products Industry* (U. S. Nat'l Recovery Adm., Div. of Review, Work Materials 79; x + 335 + vi pp., processed; Washington, 1936), p. 12.

<sup>25</sup> This preponderance of hardwood is due to more than just the factors discussed here. Softwood tops have been classified as growing stock, while the much more voluminous hardwood tops have not. Again, dead chestnut has swelled considerably the volume of non-growing-stock hardwood.

and orderly fashion in accordance with slope, aspect, and relative elevation of the land. In areas of moderate altitude, six broad land types may be recognized as significantly different forest sites, each characteristically supporting its own particular association of tree species: (1) Ridge tops, dry and of very thin soil: yellow pines and drought-resistant oaks such as scarlet and post oaks; (2) upper exposed slopes (south and westerly), hot, dry, and of moderately thin soil: yellow pines and dry-site oaks (the above plus chestnut and southern red oaks); (3) lower exposed slopes, often, also, upper sheltered slopes (north and easterly): typically mixed oak; (4) sheltered slopes, cool and of moderately deep soil: moist-site oaks, such as northern red, black, and white oaks, and other hardwoods in great variety, notably maple, beech, hickory, and birch, with the dead remnants of a heavy stand of chestnut; (5) coves, cool and of deep, well-drained soil: yellow-poplar, northern red and white oaks, basswood, hickory, and other hardwoods, dead chestnut, and often white pine and hemlock; and (6) bottom lands and stream margins, typically of poorly drained soil: sycamore, river birch, and willow. The productivity of these sites increases in regular order through number 5. The ridge tops offer about the poorest hardwood sites in the region; growth is exceedingly slow, and the trees are stunted in both height and diameter. The coves, on the other hand, are the best hardwood sites, so far as rate of growth, tree form, and value of timber products are concerned. Bottom lands and stream margins, with their altogether different tree species, fall into a distinct classification.

At higher altitudes in the highlands and great valley, the effect of exposure tends to give way to the effect of elevation, providing sites for a northern-hardwood forest, resembling greatly the forest of the sheltered slopes at lower altitudes. In the southern blue ridge and along the high ridges of eastern West Virginia, the highest hardwood sites support only a poor and stunted growth of timber. Still above these sites, around the peaks and along the tops of the highest ridges, the climate is that of even more northern latitudes and is conducive to the development of a spruce and fir forest.

At low altitudes, in the basins and foothills, the relation of forest site to slope, aspect, and relative elevation still holds good,

though is modified to some extent by the moderating topography and the increasingly independent influence of soils. Oaks and yellow pine both tend to be more abundant. This situation obtains over much of the piedmont and in the hills of the interior.

The line between piedmont and coastal plain marks roughly the beginning of different forest-site conditions. In the coastal plain, four broad types of forest land may perhaps be distinguished: (1) The sand hills, limited to southern North Carolina, where most of the region's longleaf pine is to be found; (2) the main expanse of high ground throughout the province, where soils are predominantly sandy; here loblolly pine is the outstanding tree species, mixed to some extent with oaks and other hardwoods; (3) well-drained river bottom lands, conducive to extremely rapid growth of gums, bottom-land oaks, ash, hickory, and other hardwoods, as well as cypress and southern white cedar; (4) poorly drained bottom lands and swamps, supporting much the same group of species, but allowing only relatively slow growth of timber; the pond-pine pocosins are to be included in this class of site.

In the interior province, outside the hill sections, one may distinguish three land types, of which the first is by far the most extensive: (1) Oak-hickory uplands, supporting in some places considerable stands of pine and in limestone areas numerous patches of red cedar; (2) stream margins, similar to those of the mountainous areas; and (3) river bottom lands, similar to the better drained bottom lands of the coastal plain.

These forest sites of the Appalachian Region have been greatly altered, in vegetative cover and in productivity, since the time of settlement.

Agricultural development has been the chief influence upon forest sites, affecting them in the process of clearing, followed perhaps by soil loss, depletion of soil fertility, and subsequent abandonment. In the mountainous areas the bottom lands have nearly all been occupied by farms, so that this type of land is now relatively unimportant as a forest site. Indeed, bottom lands over much of the region, except in the eastern coastal plain, have been extensively cleared for farming, and appear to be fairly permanently out of the forest bracket. The same is apparently true of the better agricultural lands of the interior province, the

limestone valleys in the great valley, and the lands of fertile and stable soil type in the piedmont and coastal plain.

Much agricultural clearing, on the other hand, has been followed by abandonment, either permanent or temporary, or the land is today in such condition as presages future abandonment. Few sites in the region have not been tried out for farming, for the process of agricultural growth has been largely one of trial and error. Much mountain agriculture has been tried, found wanting, and yet continued; and today still hangs in the precarious balance of bare-subsistence living. Hillsides cleared for corn have steadily eroded, until they very soon became too poor for cultivation and the farmer turned to fresh patches of ground. On such sites forests have become reestablished rather successfully, exposed slopes often restocking in pine, sheltered slopes in yellow poplar, both highly usable species of trees. Just what effect the period of agricultural exploitation has upon the productivity of the forest site is not known. The other great area of successive clearing and abandonment of forest land has been the piedmont. Here a pine forest has followed the agricultural venture on ground apparently once occupied principally by hardwoods. In recent times, both here and in the coastal plain, hardwood trees have been on the increase.<sup>26</sup> Less usable than the pine, they constitute a difficult problem.

Logging and fire, too, have had their effect upon forest sites. The most dramatic example of this effect has been on the spruce-fir sites, where in many cases wholesale removal of the forest cover and subsequent burning of the slash and burning and washing of the thin soil have produced conditions completely inhospitable to any form of forest growth.<sup>27</sup> This, however, is essentially the only instance of destruction of forest sites in the region. Logging and fire have unquestionably resulted in much soil deterioration on the steep slopes of the highlands and great valley, having their effect both in the destruction of leaf litter and humus and in opening the way for erosion. This is especially true in the

<sup>26</sup> Leonard I. Barrett and A. A. Downs, "Hardwood Invasion in Pine Forests of the Piedmont Plateau," *Jour. Agr. Res.* 67:3: 111-128 (1943).

<sup>27</sup> Hu Maxwell, "Some West Virginia Forest Conditions," *W. Va. State Bd. of Agr. Report for the Quarter Ending June 30, 1908*: 28-40 (Charleston, 1908), pp. 34, 37.

mining areas and in the poorer farm woods, where a constant picking-over process has kept forest stands thin and held their protective value low. In these farm woods, grazing has been another factor leading to poor soil conditions, sparse growth, and soil erosion.

#### ECONOMIC SIGNIFICANCE OF SILVICULTURAL CONDITIONS

It is one thing to point out and describe deterioration of forest sites and forest stands, to draw seemingly unfavorable comparisons between present conditions and those that once existed, and to leave the impression that the whole situation constitutes a grave problem. It is quite another thing, however, to demonstrate acceptably that a problem exists and to point out the specific features of the situation that constitute a problem.

Very little is known about the factors that combine to make for economic adjustment or maladjustment of the forest enterprise. The best treatment and condition of forest sites; the best degree of stocking of timber stands; the best admixture of tree species, diameters, and qualities — the answers to such questions are all very much in doubt.

It should be made clear in just what respect such questions as these are pertinent here. The question of the economically best silvicultural condition of timber stands *at present* is, it should be stressed, not pertinent at all, for the best condition at present is the condition that exists at present. It is only with respect to the future that the question of the best silvicultural condition is pertinent. In fact, the present situation is of interest only in that it has a major bearing upon the question of what is optimum for the future.

From this it follows that problem analysis in the field of timber management must concern itself with the plans of operation now formulated by timber owners with respect to future action; and with the economic motives, the institutional circumstances, and the attitudes that control the formulation of these plans. This is the approach taken in the following two final sections of this chapter.

## TIMBER-MANAGEMENT PRACTICES

Because little is known about the factors that determine adjustment or maladjustment of the timber enterprise, the economic evaluation of management practices is fraught with difficulties and uncertainties. These difficulties and uncertainties are heightened because of the fact that the evaluation needed in comparing anticipated trends in timber management with long-run optimum trends — and, indeed, in determining what is optimum in the long run — depends greatly upon the social attitudes that develop with respect to the ownership and management of natural resources. Upon the degree of control which society decides to exercise over resource use will depend the validity of any problem appraisal made at the present time. It may, of course, be assumed that society *should* exercise a large degree of such control; and an analysis of problems may then be attempted accordingly. This is perhaps the direction in which the present discussion will lean. But if society does not choose to exercise the degree of control that has been assumed, then the analysis based upon the assumption is invalidated — unless the expressed attitude of society itself be regarded as a problem, a position which will not be investigated here.

Considering these uncertainties and difficulties, what may be said constructively about timber-management practices? It will not be possible, it is true, to deal with the question of departure from a specific, known optimum pattern of conduct. It may be possible, however, to point out instances of irrational conduct, of conduct suited to former conditions, now changed, or of conduct suggesting the existence of an abnormally high rate of discount of the future. Such conduct does not demonstrate conclusively, but does suggest, the existence of problems.

## FOREST REGENERATION

It has been seen that the acreage of denuded and non-restocking forest land in the Appalachian Region is relatively small. Natural-forest regeneration of some sort usually follows cutting. The most generally devastated post-logging conditions are to be found in the pine areas, especially in the coastal plain, where a harvest of poles, saw logs, and pulpwood leaves little to occupy the ground

except saplings, which fall easy prey to fire. But such areas are for the most part quickly seeded in by natural means, and a new stand of trees becomes established. Despite the fact that plans are seldom made for the regeneration of desirable species, the species which appear are usually desirable, being some one of the better yellow pines. The same is true, in the piedmont, of heavily logged and burned areas and those which are rejected from agricultural use; except that Virginia pine, a relatively undesirable member of the yellow-pine group, is much more apt to take over the ground than is the case farther east. Indeed, by and large, the Appalachian Region is fortunately endowed to regenerate productive forests on areas that have been subjected to extremely heavy cutting or clearing and perhaps fire, as a part of planless management. In most hardwood areas such treatment is quite likely to result in establishment of a yellow-poplar forest, one of the most desirable types of hardwood forest.

It is in the use of systems of partial cutting—in most cases their planless use—that the greatest difficulties appear to arise with respect to regeneration. In the piedmont, partial cutting and better fire control have apparently led to regeneration of hardwoods in the forest. And in the coastal plain, too, the invasion of hardwood species in pine areas gives cause for concern. In the more westerly provinces of the region, the problem takes the form of increasing dominance of the relatively low-value hardwood species, these species being left to seed the ground when the hardwood species of higher value are harvested.

In the theory of forest practice, there is much to be said for the use of systems of partial cutting wherever the tree species are able to reproduce, and are sufficiently tolerant of shade and competition to develop, under an overstory. The advantages of frequent, partial cutting, as compared with an unmodified system of clear-cutting, may be very great in terms of quantity and quality of yield and in other respects. But in practice, methods of partial cutting, both planned and unplanned, evidently are faced with serious difficulties insofar as tree regeneration is concerned. Rather drastic modification of present practices seems to be essential. In the eastern part of the region, it may be that the trend away from clear-cutting and burning in pine is a real problem.



In the central and western parts, systems that reproduce largely what is unwanted are unquestionably a problem.

It may well be imagined that in a region of prolific forests like the Appalachian Region, slight emphasis is placed upon the planting of trees as a method of forest regeneration. Such, however, is not altogether the case. Estimates by the public authorities concerned have it that there are at least 10,200,000 acres of forest land in the region that should be planted.<sup>28</sup> This represents more than 16 per cent — nearly one acre out of every six — of the forest land in the region. The 10,200,000 acres include 5,700,000 acres said to be in need of full planting and 4,500,000 acres said to be in need of partial planting. The popular notion that the practice of forestry consists in planting trees would not be unjustified were such a program launched. Much more needs to be learned about the private and social advisability of planting trees in the Appalachian Region. What are the chances for success or failure of plantations of different types on the various forest sites? Considering these chances, how much does planting really cost, and how much are plantations worth in terms of timber and in terms of protection to the land and its resources? Is there a need for this timber and this protection? What values would be produced on the land if it were not planted? It is not unreasonable to imagine that the magnitude of the planting program envisaged for the region may itself constitute a problem.

#### TIMBER CUTTING

The present rather poor stocking of forest stands in the Appalachian Region indicates that heavy cutting has been the rule in the past. Normally, everything merchantable has been taken in a cutting operation. In many hardwood areas, this has meant cutting only the few best trees on each occasion of entry; but the principle is the same. With the coming of the public forests and the development of more conservative standards by some few private forest owners, the cutting of every merchantable tree is no longer a universal rule. It is still, however, a reasonably accurate generalization for the region. The explanation of this state of affairs is reviewed briefly later in this chapter.

<sup>28</sup> Estimates of the United States Department of Agriculture, Forest Service, Division of State and Private Forestry.

Periods of slow demand tend, in general, to reduce the intensity of timber cutting and the area cut over. In periods of brisk demand, the opposite is the tendency. The former periods have the same effect upon supply as a lowered interest rate in altering the apparent ratio of present to future values. The latter periods have the same effect as an increase in the interest rate. But the phenomena involved are not altogether like those associated with changes in the interest rate, because changes in demand for timber products seldom affect all types of product in the same degree. Consequently the varying fortunes of the forest growing stock over the course of the business cycles are not easy to trace.

Demand in slack periods is very apt to be concentrated upon particular species and sizes of trees the value of which has remained relatively stable. Lighter cutting therefore tends to be the rule. But the inclination of operators to skim off only the cream of the timber becomes at the same time more pronounced.

Demand in brisk periods, on the other hand, broadens out to include a much wider range of tree species, sizes, and qualities. At the peak of the boom, some kinds of trees may become merchantable which are merchantable at no other time. This has a potentially beneficial effect upon forest composition, helping to get out of the way much inferior growing stock which otherwise would survive to perpetuate its kind. It is also conducive to a more equal treatment of pine and hardwood in mixed stands; and to heavier cutting, and possibly creation of more desirable seed-bed conditions, in pine stands. On the other hand, brisk demand tends to deplete forest growing stock, and so reduce the ability of the forest to produce new timber.

This review of timber cutting practices in times of brisk demand and of slow demand is of interest chiefly for two reasons. In the first place, timber cutting is characterized by just such cycles as have been suggested here. These cycles are modified by other forces, to be described subsequently. But the practices used in timber cutting follow an essentially cyclical pattern: it would be confusing to attempt to analyze them as a stable phenomenon. Furthermore, the effect they produce upon the forest as a whole results to a considerable extent from their cyclical character. In bad times, the creaming process is emphasized; in good times, the

general process of depletion.<sup>29</sup> The latter counteracts the conservative cutting of poor times; the former tends to counteract the benefit of wider markets in good times. The net result is that the forest is influenced chiefly by the less desirable elements in each phase of the cycle. This situation is apparently exaggerated in low-income areas of small-scale forest ownership, such as many farm-woodland areas. Here general depression and low prices create need for immediate income, and may induce owners to cut their woods heavily for what little cash return they may yield — this poor use of labor being better than none at all.<sup>30</sup> There is no good reason to believe that these fundamentals of the situation will be altered by any plans for forest management now established for future use.

In the second place, the experience of the cycle suggests that while a high interest rate is conducive to depletion of the forest growing stock, a low interest rate does not guarantee any solution of the problem. That is to say, the problem of timber-cutting practices belongs only partly to the consideration of supply; it belongs perhaps chiefly to the consideration of demand or "utilization."

This point bears emphasis. An analysis of the problems of timber management cannot be made without reference to the marketing and consumption of timber products. For in these latter fields lies the other chief set of forces that determine value, and upon value ultimately depend all decisions with respect to the timber

<sup>29</sup> This point is noted by Marquis, who does not, however, recognize the deteriorating effect of a slow market upon the mixed forest: "Good markets and close utilization may strip the forest of young growth and seed trees and make no provision for regeneration. Conversely, poor markets and low prices make the marginal tree a better specimen, and the residual stand after logging may soon become a well-stocked growing forest." Marquis, *Economics of Private Forestry*, p. 32.

<sup>30</sup> Marquis makes a somewhat different point in regard to low prices: "A poor market forces the owner to sell at low prices and encourages the conversion of forest land into agricultural land." *Economics of Private Forestry*, p. 112. This point appears to lose force if farm-product and timber markets are simultaneously depressed. It may also be questioned on other grounds: In commercial farming areas, the situation and extent of woodland are apt to be determined by the requirements of the whole farm organization and by other factors quite independent of timber price. In noncommercial areas, on the other hand, crop prices (and therefore the comparison between them and timber prices) are of little significance; indeed, physical suitability of land to produce food, at whatever cost, may be the all-important consideration.

enterprise.<sup>31</sup> The close relation between timber management and marketing is considered more fully in Chapter V. The problems of marketing and consumption are treated in Chapters V through X. The present chapter will, then, continue to deal principally with the supply side of management problems.

One situation pertinent to the problems of timber cutting, and of fairly frequent occurrence in the Appalachian Region, is the insecure financial position of forest owners. Because this situation has in it elements associated with the rate of interest, it will be mentioned here rather than in the following section. Throughout the pine pulpwood areas of the region, and indeed in nearly all areas where there is characteristically a market for low-grade products, such as cross ties and cheap saw logs, many forest owners keep their timber stands perpetually trimmed down to the lowest usable diameter and quality of tree. It is as though the owner or operator lay in wait for each tree to raise its head above the general level of unmerchantability, and promptly harvested that tree. The cutting cycle, then, is short; the volume of merchantable growing stock at the beginning of the cycle is next to nothing; the average volume over the cycle, and the productivity of growing stock, are not notably great. While the point may not be demonstrated conclusively, there is just as good reason to believe with respect to this sort of forest on the one hand, as with respect to a forest of biologically full stocking on the other, that the factors of production are not in optimum combination. It is the writer's belief, based upon observation but not verified statistically, that insofar as the farm woods are concerned, the truncated forest is associated with low farm income — an unfortunate situation, inasmuch as these are the very farms which stand to gain most from productive woods so long as they are retained as operating land units. The difficulty here may simply be a want of cash with which to operate personal and business enterprises — or may be thought of as a want of credit at rates compatible with the productivity of the investment. A high rate of time preference is involved. So it is, too, with other types of private owners who — though not necessarily operating on such a short cutting cycle, because they find it uneconomical to deal with a very small harvest

<sup>31</sup> Charles L. Pack, "Silviculture and Utilization," *Jour. Forestry* 28:3: 338-342 (1930).

per unit of land area — nevertheless cut the forest growing stock very heavily and reduce its merchantable volume to next to nothing.

The high rates of discount to which future values are here subjected are not a matter of the interest rate pure and simple. Periods of time are long and risks are great. Insofar as the growing of timber alone is concerned, these risks are not compensated by prospective returns. This is due to the fact that timber is in great measure an adventitious resource and at any point of time tends to resemble a mine, a matter belabored earlier in this chapter.

There can be little doubt that the forces tending to perpetuate a forest growing stock of low physical productivity constitute a problem. They are a problem from the public viewpoint, and hence, inferentially, to individuals, especially in the capacity of consumers. The problem consists in the failure not merely to provide amply for current needs, but especially to plan for the unknown but potentially very great needs of the future — needs that cannot be met on short notice, but must be allowed for long in advance.

#### INSTITUTIONAL ASPECTS OF TIMBER MANAGEMENT

This section should perhaps be called “Institutional aspects of forest management,” since the opportunity will be taken here to discuss attitudes and influences affecting forestry in general. But timber production will be the primary theme, in harmony with the foregoing sections of this chapter.

#### FARM WOODLANDS AND FARM INFLUENCES

With farm woodlands comprising 45 per cent of the forest land in the Appalachian Region, and with other small private holdings, in many respects like the farm woods, comprising 31 per cent, it is obvious that the timber-management problems of these lands are of prime significance.

So much, however, has been said and written <sup>32</sup> (though not so

<sup>32</sup> For selected references in the field of farm forestry see:

U. S. Dept. Agr., Forest Service, Library, *Farm Forestry, a List of References* (26 pp., processed; Washington, 1938).

U. S. Dept. Agr., Library, *Farm Forestry, 1937-1943, a List of References Exclusive of Periodical Articles* (8 pp., typed; Washington, 1944).

Among published materials dealing with farm-forest management within the

very much done) about the problems of farm-woodland management, that they can here be summarized. This section should be compared with the corresponding one on the small owner as a seller, Chapter VI.<sup>33</sup>

Appalachian Region are the following:

W. W. Ashe, *The Farm Forests of Virginia and Recommendations for Their Improvement* (Va. State Bd. of Agr. Report for 1909; 12 pp.; Richmond, 1910).

T. C. Atkeson, "The Farmer's Wood-Lot," *W. Va. State Bd. of Agr. Report for the Quarter Ending June 30, 1908* (Charleston, 1908), pp. 97-103.

J. E. Barton, *The Farm and the Woodlot* (Ky. State Bd. of Forestry; 21 pp.; Frankfort, 1913).

— *Forestry and the Farm Woodlot* (Ky. State Forester Cir. 5; 4 pp.; Frankfort, 1913).

H. M. Curran, "The Woods Are Full of Pay Days If Cared For," *Progressive Farmer*, Car.-Va. ed. 43:46:8 (Nov. 17, 1928).

Samuel T. Dana, "The Farmer's Wood Lot," *Forest and Farm* (Knoxville, Tenn.) 1:2: 71-73 (May, 1915).

Earl H. Frothingham, "Wood Lots in the Piedmont Region a Profit Source," *U. S. Dept. Agr. Yearbook for 1926* (Washington, 1927), pp. 780-782.

R. W. Graeber, *Management, Harvest, and Sale of Pine Timber for Pulpwood* (N. C. Agr. Ext. Serv. Cir. 218; 13 pp.; Raleigh, 1937).

— *Four Steps in the Management of Farm Woods* (N. C. Agr. Ext. Serv. Cir. 260; 8 pp., not numbered; Raleigh, 1942).

G. H. Hepting, *Reducing Losses from Tree Diseases in Eastern Forests and Farm Woodlands* (U. S. Dept. Agr. Farmers' Bull. 1887; 22 pp.; Washington, 1942).

E. R. Jackson, "Forestry and the Farmer," *Univ. of Va. Alumni Bull.*, series 3:4:4: 417-425 (Charlottesville, 1911).

J. Elton Lodewick and J. W. O'Byrne, *Farm Forestry for Virginians* (Va. Polytech. Inst. Bull. 24:12; 74 pp.; Blacksburg, 1931).

J. W. O'Byrne and J. B. Grantham, *Farm Forestry for Virginians* (Va. Polytech. Inst. Bull. 31:5; 63 pp.; Blacksburg, 1938).

Wilbur O'Byrne, "Farm Forestry Profits in Virginia," *Jour. Forestry* 28:7: 964-970 (1930).

— *Farm Forestry: a Concrete Example* (Va. Agr. Ext. Div. Bull. 124; 16 pp.; Blacksburg, 1931).

Carl I. Peterson, *Forestry for Farmers* (Tenn. Dept. Agr., Forest Service Cir. 13; 300 pp.; Nashville, 1932).

Samuel J. Record, *Suggestions to Woodlot Owners in the Ohio Valley Region* (U. S. Dept. Agr., Forest Service Cir. 138; 15 pp.; Washington, 1908).

G. B. Shivery, *The Farm Woodland in Tennessee* (Tenn. Agr. Ext. Serv. Pub. 144; 20 pp.; Knoxville, 1926).

— *A Practical Example in Farm Woods Management* (Tenn. Agr. Ext. Serv. Pub. 186; 12 pp.; Knoxville, 1934).

Thomas W. Skuce, "Farm Woodlots in West Virginia," *W. Va. Dept. Agr. Bull.* 73: 39-40 (Charleston, 1928).

U. S. Dept. Agr., Soil Conservation Service, Southeast Region, *The Forestry Phase of Farm Planning* (62 pp., processed; Spartanburg, S. C., 1940).

<sup>33</sup>Mr. Joshua Cope, extension forester for New York State, in 1942 offered the writer the following explanation of the farmer's tendency to have little interest in

*Disadvantage of the farm-forest relationship.* Much is made of the proposition that farming and forestry go well together under a single management: The farmer lives near his woods and can give them close attention; the forest provides supplementary employment and income during the slack season for farming; the farmer's experience in caring for growing products, and his work stock and equipment, fit in well with the needs of forest management; woods serve to protect and put to good use the poorer land of the farm, or the excess land; the resulting timber is a cheap source of much-needed wood for farm and home.<sup>34</sup> Most of these points do indeed have validity in the Appalachian Region, though it can scarcely be said that farm work stock and equipment — or, in most cases, experience — can be well applied to the needs of timber production.

There are disadvantages, too, in the farm-forest relationship.

woodland management: (1) In the spirit of the frontier, farmers still regard the woods as potential ground for clearing and farm expansion. (2) The jobs involved in forest management can be done at almost any time of the year and can usually be postponed for several years without its making any appreciable difference. Forest management therefore lacks the *time urge* to which the farmer is accustomed in his other farm work. (3) Farmers generally have little knowledge of the *markets* for forest products. (4) Farmers lack proper *equipment* for logging and preparing forest products. (5) Partly as a result of the points made above, farmers usually sell timber in the form of stumpage. *Lump-sum* sales are common, and these tend to yield a low return and to result in damage to the woods. (6) The *units of measure* used for timber products are strange to most farmers. (7) Farmers are used to the idea of *clear-cutting*, both of their regular farm crops and of timber. This practice precludes full timber yields and sustained-yield management on small tracts.

The Interbureau Committee on Farm Technology of the U. S. Department of Agriculture [*Technology on the Farm* (xiii + 224 pp.; Washington, 1940), p. 198] attributes the "neglect of the farm woodlands" to lack of information (on the part of owners), an annual-crop complex, the "big-forest" idea ("by which it is assumed that forestry is related only to virgin timber, or is something found only 'down South' or 'out West' or almost any place except 'at home'"), the tenancy situation, indiscriminate woodland grazing, and the lack of adequate local markets, the existence of exploitive marketing practices, the deterioration of the woods, and other factors conducive to low returns.

<sup>34</sup> Association of Southern Agricultural Workers, *Forestry in Relation to Agriculture, Papers Delivered before the Forestry Section of the Association, Atlanta, Georgia, February 2, 3, 4, 1938* (40 pp., processed; Washington, 1938), pp. 34-40.

— *Forestry in Relation to Agriculture, Papers Delivered before the Forestry Section, Birmingham, Alabama, February 7, 8, and 9, 1940* (49 pp., processed; Atlanta, Georgia, 1940), pp. 13-17.

Marquis, *Economics of Private Forestry*, pp. 144-147.

John F. Preston, "Farm Woodland — Farm Economy," *Soil Conservation* VI:6: 149-151 (1940).

Timber growing is, if any sort of enterprise, a minor one on most farms. On the better farms, the operator is chiefly occupied with matters pertinent to the farm "proper." On the many poorer farms, the farm woodland is apt to be in such condition, and the attitude of the operator such, that this woodland contributes but little to income (see Appendix). As a minor enterprise, timber growing is not given much effort or ingenuity. Then there is the point, previously discussed, that the farm woods are very likely to be called upon to tide the farm business or the farm family over periods of financial difficulty, and that this is likely to be done in such a way as to create an unproductive growing stock. Finally, another major disadvantage in some hardwood areas is the damaging effect of grazing cattle in the woods: grazing tends to destroy tree reproduction and to pack the soil, and there is good reason to believe that it is incompatible with timber production, as well as with forest-watershed management.<sup>35</sup> This problem is especially notable in the western piedmont and the great valley.

*Disadvantage of small size.* In those parts of the region where farm woodlands occur as isolated patches surrounded by open ground, this openness may lead to unfavorable climatic and biological conditions harmful to the best development of the forest. Throughout the region, the small size of the farm woods makes for small scale of operations. This, in turn, precludes the use of the most efficient methods of management and calls for an intensity of operation that may not be justified except in cases where there is a peculiarly fortunate supplementary relationship between the forest enterprise and some other or others. Labor inefficiency is probably typical of farm-woods operations. Where the harvest is performed by an independent operator, the cost of

<sup>35</sup> Ralph K. Day and Daniel Den Uyl, *The Natural Regeneration of Farm Woods Following the Exclusion of Livestock* (Ind. Agr. Exp. Sta. Bull. 368; 48 pp.; Lafayette, 1932).

Daniel Den Uyl and R. K. Day, *Woodland Livestock Carrying Capacities and Grazing Injury Studies* (Ind. Agr. Exp. Sta. Bull. 391 rev.; 16 pp.; Lafayette, 1939).

Daniel Den Uyl, O. D. Diller, and R. K. Day, *The Development of Natural Reproduction in Previously Grazed Farmwoods* (Ind. Agr. Exp. Sta. Bull. 431; 28 pp.; Lafayette, 1938).

Burr N. Prentice, "Comparative Growth in Grazed and Ungrazed Woodlots at Purdue," *Ind. Acad. Sci. Proc.* 34: 321-328 (Indianapolis, 1924).



inefficiency in harvesting, and in some of the subsequent steps in production as well, is apt to be borne in large measure by the owner of the timber. This tends to be true, for example, where the small sawmill is called in to conduct the timber harvest, as is very frequently, and often necessarily, the case.

*The owner's disadvantage.* As a farmer, with his chief interest and experience in farming enterprises, the woodland owner may be expected to have handicaps in timber management. He is apt to lack essential specialized knowledge of timber and timber products that would permit him to make the most of his woods. Furthermore, he is apt to be governed in his activities by deeply seated prejudices concerning the role of woodland in the farm economy: the frontier philosophy of expanding agriculture through clearing woodland is by no means extinct, and the practice of rotating forest and field is still common enough to bear significantly upon the farmer's attitude in some areas.

In the case of farms operated by tenants, owners are presented with additional handicaps to good forest management. Tenants as a rule have less concern for the farm woodland than do owners, and as a rule are less well prepared to manage the woodland effectively. Rental contracts seldom contain specific provisions for woodland management. The tenant's interest is of an extremely short-run character. This situation would appear to constitute a problem for forestry. It is well to bear in mind, however, that the place of farm tenancy in the general economy is by no means clearly understood; and that farm tenancy, per se, may carry with it advantages which, on balance, outweigh the disadvantages that appear to accrue to limited fields of the economy like forestry. Conrad Hammar, for example, makes the following point:

Despite the fact that early American society probably set few ideals above that of having all farmers own their own farm, modern society with its heavy industrial and urban populations undoubtedly is less concerned over the matter of farm tenure and probably also has a different set of values. The tenure ideal is apparently, therefore, becoming more and more a subordinate one ranking well below those of income, security, equality, and efficiency.<sup>38</sup>

<sup>38</sup> Conrad H. Hammar, "The Land Tenure Ideal," *Jour. Land and Pub. Util. Econ.* XIX:1: 69-84 (1943), p. 84.

There is another tenant besides the farm tenant as ordinarily understood, who plays a far more decisive role in forest management on many farms and on many other small properties as well. This holder of tenure rights is the timber operator: the logger, millman, pulpwood contractor, or other wood user or agent of a user. As will be seen in later chapters, this is the man who so typically in the Appalachian Region acts as the link between the owner and the timber market. To him the owner may default some or all of his rights to decide what timber shall be cut and how it shall be logged. This forfeiture is thrown in by the owner, with his timber, for the payment he receives.

If the farm tenant has but a slight and short-run concern for the resources entrusted to him, the "timber tenant" has even far less. His whole period of tenure extends only from the conclusion of a bargain to the end of his logging, and in this brief space his energies are bent wholly upon current high output and low cost.

*Agricultural communities and institutions.* Not only the situation of the farm woods, but in some measure the whole forest situation, is influenced by the thinking of the people in agricultural communities and of their leaders. The reason why it is the thinking of farm people that is so important is that farming is the principal use of land surface in the region, with which the forest use competes; and in the field of farming is to be found the oldest and most fully developed philosophy with respect to land use and land management. A rational approach to problems of forest management may be extraordinarily difficult so long as the status of forests is regarded as temporary or uncertain. Improvement of the forest-management phase of the whole rural-land situation may be difficult so long as crop and pasture lands are regarded as having the only real potentialities. Such attitudes as these are fairly common in the region. They have their origin in the history of land settlement and development, in the background of the people who did the settling and developing, in the history of the appropriation of public funds for educational purposes related to agriculture, and in the historical fact that farm land is, with few exceptions, the only kind of rural land in the region which has yet been used successfully to produce a continuing livelihood for the operator.

Reinforcing these factors, in turn, are the persistent shreds of

an agricultural myth: Agriculture is the proper destiny of all rural land: agriculture is a way of life superior to all others.<sup>37</sup> With this last is associated the agrarian philosophy of the "good life," under which it is possible to view with optimism and even enthusiasm the continuation of maladjusted subsistence—"farm" communities scraping a bare livelihood from the soil and perpetuating, along with their own poverty, that of all the resources about them.

#### INDUSTRIAL FORESTS AND FOREST POLICY

Among the industrial owners of large forest tracts in the region — lumber and mining companies, land and railroad companies, pulp mills and other wood-processing concerns — the usual forest practice is to cut timber only once, and heavily, from a given piece of land, and subsequently to drop that forest from the books. This is the usual practice, not the universal practice. It is more prevalent in hardwood than in pine areas. In liquidating their forest capital, such owners make the decision to retire not merely from the business of timber growing, but in many cases from the business of timber operating as well. They choose, at least, to forfeit forest productivity to the interests of the immediate operation; though they may find it possible to continue operating by moving to other areas where productivity has not yet been forfeited.

The general reason for the prevalence of such a system of forest management is, of course, that owners see in it a greater financial advantage than in alternative systems: Clear-cutting (or cutting of everything fully merchantable) may well, even on theoretical grounds, possess an economic advantage over partial cutting, although the issues involved are not entirely clear, nor are they generally investigated in great detail by the forest owner.<sup>38</sup> Attitudes and customs held over from the era of excess and virgin timber still carry great weight. Risks, of physical losses and of losses in future markets, are high; interest, taxes, and other car-

<sup>37</sup> John D. Black, *Agricultural Reform in the United States* (x + 511 pp.; New York, 1929), pp. 56-58.

<sup>38</sup> See, for example, "Sustained Yield versus Clearcutting—a Hypothetical Case," *Jour For.* 36: 1138-1141 (1938). Also comments in the same *Journal* by J. M. Walley and W. S. Bromley (36: 1142-1144), D. M. Matthews (37: 222-224), A. Z. Nelson (37: 224-226), and J. E. Rothery (37: 227-231).

rying costs on timber land may be high — all having their influence upon the decision to liquidate. In some cases, necessarily heavy capital investments, large-capacity machinery, large overhead costs of industrial development, and excess industrial capacity lead to a high rate of output, which in turn leads to heavy cutting. The fluctuations of the business cycle bear upon the situation, as has been seen. Still further, the cutting of everything merchantable, as a mode of timber operation, is apt to have marked advantages in cost, for it is simplest, easiest to plan and supervise, fits in well with the prevalent practice of logging on contract where high volume per unit of area is sought, suits the habit of loggers and logging labor, and suffers little or no inefficiency in the handling of small trees where there is a market for mine timbers, ties, or pulpwood, as there is over much of the Appalachian Region.<sup>39</sup>

In the mountainous areas of the region, apparently there are at present few industrial forest owners who are operating their timber under a plan of sustained yield. At various times in the past such plans have been set up and tried out, but operations under them have not been continued.

Much the same may be said of the other chief area of industrial forest ownerships in the region (Figure 4), the coastal plain — with the notable exception of a few of the larger wood-using concerns, especially pulp companies. Partly because the capital requirements of the pulp and paper industry are such that it must seek long-run security of raw-material supply, partly because the rapidly growing timber of the coastal plain is favorable to private efforts in forestry, the pulp industry has taken some steps to put its own forests upon a sustained-yield basis. Its own forests, however, supply only a fraction of its timber requirements; and it is logical to suppose that the industry would make an effort to secure

<sup>39</sup> Fred Rogers Fairchild and associates, *Forest Taxation in the United States* (U. S. Dept. Agr. Misc. Pub. 218; 681 pp.; Washington, 1935), pp. 262-266.

W. B. Greeley, "Forestry Requires Economics As Well As Silvics," *Univ. Washington, Forest Club Quarterly* XI:1: 11-18 (1937-38), p. 14.

Marquis, *Economics of Private Forestry*, pp. 38-41, 92-125.

Stone and others, *Economic Problems of the Lumber and Timber Products Industry*, pp. 2-3, 43-50, 64-73.

U. S. Nat'l Recovery Adm., Div. of Review, *The Lumber and Timber Products Industry* (N.R.A. Evidence Study 22; iii + 32 pp., processed; Washington, 1935), p. 28.

permanence of pulpwood production among the farmers and other small forest owners from whom it buys its raw material. This it has begun to do, working by educational methods and through stipulations in its contracts. No unbiased evidence is at hand regarding the extent or the success of this program.

Viewing the Appalachian Region as a whole and considering the relatively small aggregate acreage of big industrial tracts, it is apparent that the main timber-management problem is not on these tracts. The heart of the problem is in the multitude of small holdings that comprise the bulk of the forest-land resource. Considering the heavy obstacles to voluntary good resource management on these small holdings, grave questions arise concerning their role in the forest economy of the future. What conditions may develop, what measures may be essential, to bring these timber lands into reasonable adjustment with regional goals of forest production? Under the best of conditions, what proportion of the small holdings can realistically be expected to contribute their share to the national income and the national wood basket? As further aspects of the forestry-economic problem unfold in following chapters, these questions will be seen to arise again and with augmented emphasis.

## CHAPTER V

### MARKETING PROBLEMS: INTRODUCTION

#### IMPORTANCE OF MARKETING PROBLEMS

IN MORE THAN ONE SENSE, marketing is the focal point of the entire process of forestry. In marketing, the products of the forest are released for consumption. The aims of forest policy and the work of forest management are culminated and made to bear fruit. It is the character of the market, as a reflection of consumers' demands, that shapes forest-management policies; and it is the efficiency of the market as a reflector of those demands that determines how well the goal of optimum benefit may be seen by the forest manager as an individual negotiator in the market. Furthermore, the efficiency of the marketing process as a link between producer and consumer is a major determinant of the economic incentives to both forestry and forest-product consumption.<sup>1</sup>

In most fields there is a close connection between marketing and production.<sup>2</sup> In forestry, and especially in the timber-management phase of it, this connection is peculiarly close. Putting aside for the moment the functions of forest protection, forest management as it is met with in practice in the Appalachian Region consists very largely in harvesting trees for the market. Intensive practices like planting, pruning, and girdling being of doubtful economic practicability over much of the region, the art of silviculture finds opportunity for expression chiefly at the time when trees are to be felled for sale. Renewal of the forest, provision for

<sup>1</sup> "Sustained timber culture cannot be brought about on one-fourth of the soil of the United States, unless forestry in land use is backed up by forestry in marketing and economics. We cannot grow what we cannot sell." W. B. Greeley, "Forestry Requires Economics As Well As Silvics," *Univ. Washington, Forest Club Quarterly* XI:1: 11-18 (1937-38), p. 13.

<sup>2</sup> N. H. Engle, "Costs and Profits in Marketing," *Annals Amer. Acad. Polit. Soc. Sci.* 209: 122-132 (1940), p. 122.

John F. Pyle, *Marketing Principles*, rev. ed. (viii + 783 pp., New York and London, 1936), pp. 21-22.

optimum growth of favored timber products, and execution of policies with respect to soil and water relations and the intangible values of the woods must all be considered and accomplished at the time of cutting. They are provided for simply — and, for the time, irrevocably — in the choice of individual trees to be removed from the stand.

But the cutting process, aside from being the principal expression of silviculture, is at the same time a first step in the marketing process. Many of the considerations both of silviculture and of demand are thus focused at this one point. And while the silvicultural and other management considerations relate largely to the future, those of marketing relate largely to the present and for this reason carry great weight. The weight of marketing considerations is increased as the cutting cycle is lengthened. In the field of forest protection, not only the manner of cutting but also road construction and maintenance of some types of equipment provide a close link with marketing.

In 1940, some \$437 million worth of timber products was produced in the five Appalachian states (see Appendix). This was tangible evidence of the productivity of timber resources in the region. A part of this value represented the return that owners and managers were able to get in the market for their stumpage, saw logs, ties, pulpwood, and other products. It also represented a large share of the economic ground for the practice of forest management of the region. Some of this value was income received by forest owners and workers who were dependent on the forest for a substantial part of their livelihood. The question of the nature of market forces that made this return what it was and the question of marketing problems representing maladjustments in the determination of this return are therefore matters of prime importance in the economics of forestry.

### SCOPE OF MARKETING

In a restricted sense, marketing may be defined to include only those productive processes creating utilities of possession — that is, selling and buying. This is “all that is essentially marketing, considered as an economic process.”<sup>3</sup> More commonly and realis-

<sup>3</sup> John D. Black, ed., *Research in Marketing of Farm Products—Scope and Method* (Soc. Sci. Res. Council Bull. 7; 221 pp.; New York, 1932), p. 4.

tically, however, marketing is defined to include also the creation of some of the utilities of place, time, and form — transportation, storage, sorting, and the like.<sup>4</sup> The latter, broader definition will be adopted here. Furthermore, as a matter of convenience, some discussion of manufacturing will be included in the discussion of marketing, although there will be no intention of implying that such processes are a part of marketing by any proper definition. The present discussion, then, will include, to the extent deemed necessary and possible, all those steps in production beginning with the first sale of stumpage for cutting or of logs, bolts, or other commodities — and in any event beginning with the first act of changing the form utility subsequent to log bucking or of changing the place utility subsequent to such skidding as is incidental to logging.

Thus, for present purposes, the productive processes related to forestry are divided into two groups, the first group including all primary production through the stage of logging, together with subsequent steps strictly a part of logging; the second group including all further productive processes, with emphasis upon the acts and negotiations attendant on change of title and upon transportation.<sup>5</sup> Like any arbitrary division of a field, this division has its attendant difficulties. It throws into the field of distribution and secondary processing some steps logically a part of primary production, as, for example, transportation of logs from woods to mill and production of lumber at the mill in cases where woods, transportation facilities, and mill are all under single ownership and management. The division used, however, is on the whole the most suitable for the Appalachian Region. While there are examples of integrated woods and mill production, the typical case is for forest products to enter the market in the raw form, and generally in the form of stumpage. It seems proper, then, for the economics of a genetic industry to recognize the first major

<sup>4</sup> H. E. Agnew, R. B. Jenkins, and J. C. Drury, *Outlines of Marketing*, 2nd ed. (xvi + 410 pp.; New York and London, 1942), p. 1.

Fred E. Clark and L. H. D. Weld, *Marketing Agricultural Products in the United States* (xiv + 672 pp.; New York, 1932), p. 30.

Paul D. Converse, *The Elements of Marketing*, rev. ed. (xviii + 985 + 90 + xiv pp.; New York, 1935), p. 77.

<sup>5</sup> In terms of the outline on pp. 8-10, the division is made between sections II and III, with a part of III, B, 1, included with sections I and II.



division of the field at a point immediately following the genetic process.

The stumpage sales classified here as belonging to distribution are sales of stumpage for more or less immediate cutting. Other types of timber sales are regarded as proper to primary production, for the purchaser, intentionally or not, becomes initially a primary producer. Stumpage sold for cutting, on the other hand, thereupon leaves the realm of genetic production. The genetic process may be regarded as complete when the timber has been felled and the logs, if any, made and delivered to the landing. It may scarcely be regarded as complete prior to this point, because of the intimate relationship between silviculture on the one hand and logging on the other.

Something has been said before (p. 2) on the question of whether milling of forest products falls within the field of the economics of forestry. The question may also be raised how far into the higher stages of processing, fabrication, and distribution the economics of forestry legitimately extends. The answers to both these questions will be left in the general form that the economics of forestry is concerned with all those phases of processing, distribution, and consumption that bear directly upon forest production. The degree of this directness of bearing cannot be defined without creating an artificial and burdensome line of demarcation within what is actually an indefinite border zone.

Consumers' demand for forest products and for goods in the production of which forests and forest products play a part, the nature of price-determining forces in all stages of the marketing process, the efficiency of organization of market institutions, and the organization and management of other productive units in the field between primary producer and ultimate consumer — all, as determinants of the returns to forest enterprise, have a perceptible bearing upon forest production. So, also, have many of the conditions of production, consumption, and exchange outside the field of forestry and forest products proper. Some have a bearing whose directness is more clearly recognizable and more reasonably manageable by the genetic economist than others. Geography plays an important part in this distinction. Phenomena relating to products and processes which are local in character are not only more readily assimilated by the research worker who seeks first-hand

experience, but, by virtue of their more limited field of competition and interaction with other productive processes, have a more directly traceable bearing upon the woods price. Again, the organization of business enterprise by forest owners plays an important part in the distinction between matters proper and not proper to forestry economics. Wood-using industries which at all commonly produce their own timber must, because of the existence of supplementary relationships, be given closer consideration than wood-using industries buying their raw material in partly processed form or even in the form of logs. Still again, the existence of directly competing forms of a product has some bearing upon the distinction. The existence in the market of a great quantity of railroad cross ties hand hewed as an integral part of the forest enterprise makes it necessary to give close attention, also, to the processes by which sawed ties are produced and marketed. This sort of basis for distinction, of course, is not the most helpful, since in the first analysis many widely different types of forest products compete directly with one another during the early stages of production, and in the last analysis all forest products and other products and productive processes are essentially competitive in some of their phases. Another basis for distinguishing between matters proper and not proper to forestry economics lies in consideration of labor relationships. Wood-using industries and fields of distribution employing forest or farm-forest labor on a part-time basis are more legitimately the concern of the forest economist than those having no such connection. Finally, the directness of the market itself is a point at issue. The first outlet for raw forest products is necessarily a more immediate concern than subsequent outlets.

It is this type of consideration that will guide the choice of subject matter in discussing the problems of marketing forest products. Another consideration that unfortunately must be prominent is the type of data available and the extent of the writer's familiarity with the subject. Generally speaking, local products like fuel wood and rough lumber will be traced through to the consumer. Other sawmill products will be followed at least as far as the markets with which local producers and dealers are in direct contact. Still other products will be traced only as far as the first major step in processing.

## CHARACTERISTICS OF TIMBER MARKETING

Timber products, and the processes by which they are distributed and manufactured, possess a number of outstanding characteristics distinguishing them from many other types of marketed products. A review of these characteristics will be helpful to the analysis of marketing problems.

*Variety of products.* Dismissing from consideration numerous non-timber products like recreational facilities, game, and soil protection, the products of the forest are still very great in number. "There are said to be over 4,000 commercial and industrial uses for lumber and wood products, and the number is constantly increasing."<sup>6</sup> Products are in part a function of the size of trees. The smallest sizes may yield Christmas trees, decorative boughs and wreaths, and bean poles. Trees of sapling size may be suitable for stakes, fuel wood, or charcoal wood. Trees of cordwood size may produce pulpwood, chemical wood, or posts. Still larger trees are capable of yielding cross ties, saw logs, or poles. Veneer logs and massive timbers are usually taken from the largest trees. However, the larger trees may in many cases be used to produce products, perhaps of a higher grade, that are taken also from smaller trees. A large tree, with its big butt logs, its smaller top logs, the cull sections in its stem, its bark, and its limbs of various sizes, may represent a complex study in utilization.

In part, products are also a function of tree species. Some species of trees are, because of technological specifications and market conditions, notably suited to a single product or limited group of products. Dogwood and persimmon are examples. Most timber products are made from a limited number of species. In the case of lumber, which is actually not a single product with a single market but rather a generic term for a great variety of commodities, species is a prime determinant of the use for which the lumber is suited and the channels through which it may be distributed. This is true in varying degrees of other products, like pulpwood, cooperage bolts, and distillation wood. Few products may be made indiscriminately from wood of any species. Even the market for fuel wood and for charcoal wood evidences a

<sup>6</sup> Ralph W. Marquis, *Economics of Private Forestry* (viii + 219 pp.; New York and London, 1939), p. 19.

marked discrimination among species or groups of species. In the Appalachian states, with their great variety of tree species, the relation of species to product is of peculiar moment. At least seventy-five commercially usable species of trees are to be found in the region.<sup>7</sup>

Products, furthermore, are a function of the character of individual trees of any species and size: their soundness, their form and limbiness, and the conditions of their growth. Excessive rot renders a log or tree unmerchantable. Excessive knottiness may prevent the use of a log for many purposes. The age and rate of growth of a tree are also determining factors in some cases. Oak for ship timbers must have annual rings that are neither too narrow nor too wide. Hickory for handle stock must commonly be of second-growth origin, for in old-growth hickory the sapwood, which the market usually demands for handle-making, is narrow. In the case of saw logs, the size, number, and arrangement of knots and other defects determine the use to which the lumber can be put.

*Need for timber grading.* It follows from all this that the classification or grading of timber material on the basis of its use and value could well be a key feature of timber marketing, and of timber management for the market. Yet the science of bolt, log, and tree grading is but feebly developed. No standardized timber grades, even for pine or for hardwood saw logs, are in general use within the region. Most timber buyers have a rough concept of grade, based mostly on general observation and experience, but few follow any systematic, specific grading rules. As for timber sellers, their concepts of grade are vaguer yet. Hence we have a market in which the raw product has thus far defied accurate description. Little wonder that the timber producer is at times confused or that the timber market here and there borders on chaos!

*Variety of markets.* Just as there is a variety of products of timber, so there is a variety of markets, and for each product or class of product there are usually a number of distinct markets. This is not to imply that any one producer has access to all these markets, or even knowledge of them. The multiplicity of markets is a phenomenon that becomes apparent to one viewing the situa-

<sup>7</sup> George B. Sudworth, *Check List of the Forest Trees of the United States, Their Names and Ranges* (U. S. Dept. Agr. Misc. Cir. 92; 295 pp.; Washington, 1927).

tion from the state-wide or region-wide level. The markets for sawmill products, for example, include those for rough lumber, for ties, for slabs and edgings, and for finished lumber of various specifications. Rough lumber may be sold locally direct to consumers or it may go to concentration yards or planing mills or other market intermediaries or, in some cases, direct to wood-processing plants, in which cases the various species or groups of species are apt to have different outlets. Ties may go to dealers or to treating plants and concentration yards, or direct to the railroad. Finished and graded lumber of the different species has an even greater and more specialized variety of outlets.

What has been said here refers merely to the direct markets within reach of the forest owner or local mill operator. For each type of product or direct outlet there are often numerous concerns operating in the market, and often these concerns, even though handling an identical product in a single locality, do not operate in the same market in any real sense.

*Many small primary producers.* As in many parts of the eastern United States, timber production in the Appalachian Region is carried on by a multitude of small landowners. The sellers in the timber and log markets are therefore numerous and their individual offerings small. The situation is very much like that in the field of agriculture, except that combinations of sellers such as are found in agricultural marketing coöperatives are almost nonexistent in the case of timber marketing. Most of the small timber producers are, in fact, farmers, under the census definition of that term. It is estimated that of some 901,000 forest-land owners in the region, 900,000, with 76 per cent of the forest land, are predominantly small owners, most of them having less than two hundred acres each; of these small owners, 708,000 are farmers (p. 106).<sup>8</sup> This fact creates a characteristic situation with respect to sellers' skills and bargaining position in the market.

Furthermore, it is a reasonable presumption that a large portion of the small, nonfarm forest holdings are in absentee ownership. Without access to management-marketing services for their

<sup>8</sup> Actually, these are not *farmers*, but *farms*, as reported in the census. Other things being equal, the census data, as applied to owners, would tend to be an exaggeration. Furthermore, as applied to sellers in the market, the figures quoted would probably involve an additional exaggeration relative to the numbers of sellers of other classes.

timber, these owners, as sellers, are in a less favorable position in the market than are resident farmers.

*Many small secondary producers.* The timber market is characterized, also, by the great number of small dealers of various types and the great number of small processing plants that operate locally. This is particularly true of the lumber market, where, by and large, dealings in the market and the operations of milling are in the hands of small producers at least up to the stage where the product is ready for the concentration yard or other wholesaler or remanufacturer. Most veneer mills, cooperage plants, and specialty producers on the primary level operate on a small scale, and a share of mine timbers are purchased by little mines. The larger mines, the pulp mills, and the extract and wood-distillation plants are the chief large-scale direct buyers of timber products, but even these buyers operate through a diffuse system of small middlemen.

*Credit function seated in the higher stages.* From the fact that primary producers and many of the agencies in the lower stages of the marketing process are business units of very small size, it tends to follow that they depend upon the institutions situated farther along in the marketing chain to finance their operations. This fact is one of the most important characteristics of timber marketing. The small working capital available to the lower-stage producer and his need for cash payment at the time when, or even before, the exchange of timber products takes place, explains the existence of many timber-marketing institutions and is the key to many timber-marketing problems. The question of cash payment in many cases outranks the question of price in determining the outcome of competition among buyers and hence in determining the nature and function of institutions that persist in the field. That is to say, because of the high rate of discount under which many sellers operate, a low cash bid may be more acceptable to them than a much higher offer of future payment.

*Market controls seated in the higher stages.* The credit function carries with it a considerable degree of control by higher-stage institutions over the operations of the lower stages. Other factors also contribute to the exercise of this control. The key to control lies in the larger size of higher-stage units. These are generally the units which provide the first major concentration of products

in the marketing process, such as the concentration yards in the pine lumber market. Through credit extension such units may gain control over the business policies of their suppliers, a control varying in form from the giving of advice to outright ownership. The exercise of control may also arise in the grading function undertaken by such concentration agencies, and, in areas of low-quantity production, through the fact that a single agency may be the only such buyer in the market. In the case of timber products, which often need to be stored for some time as part of the seasoning process, both the credit function and the assembly function are of first-rate significance. The significance of the latter in this connection consists in the fact that seasoning is attended by tremendous weight reduction, and after this process most products have much greater freedom of movement geographically.

*Low specific value of timber products.* Even seasoned lumber is bulky and heavy in proportion to its value, and unseasoned products, particularly in the form of logs and bolts, have low specific value. This fact, coupled with the ubiquitous character of forest resources, throws peculiar emphasis upon the function of transportation in timber marketing. It also means that competition, particularly at those stages of marketing which precede the first major step in processing, is greatly restricted geographically. This, in turn, underscores what has already been said regarding the key position of institutions carrying out the function of seasoning and assembly.

*Unspecialized organization of small agencies.* Primary producers, as sellers in the timber market, and middlemen who carry out the first steps in marketing, frequently operate in the timber field on a part-time basis. As farmers, most timber sellers have their major source of livelihood and their major interests in other fields of production. Operators of small sawmills are often farmers or others for whom sawmilling is merely a side line. Timber buyers and men in the sub-contractor class may be farmers, or they may be general dealers for whom timber products are just one of a number of different products handled, and very possibly a minor one. From this it follows that the degree of skill applied to timber marketing in the early stages is of a low order. Specialization in timber-marketing functions first appears among the larger con-

centration buyers or processors — further cause of the dominance exercised by these institutions in the market.

*Poorly organized markets.* The market for timber and primary timber products is, by and large, diffuse, divided, and disorganized. Disorganization is the concomitant of small, scattered, and unspecialized production. Most products in tree form and many in log or bolt form have no precise, standard measures of quantity or grade. When it comes to timber on the stump, in most parts of the region this is such a variable commodity, both as regards the kind and quality of the timber itself and as regards the many factors of logging and transportation that affect timber value, that each price negotiation is a separate event, not easily related to other price negotiations and not tending to result in the formation of a general market price. Furthermore, no universal mechanism exists for publishing the results of price negotiations, or even for publishing the presence and location of buyers and sellers in the market. As a result, timber changes hands largely in an aggregate of little, isolated deals, each consummated in the face of imperfect knowledge, particularly on the part of sellers, with "horse trading" and the manipulation of individual psychology much in evidence, and with peculiar opportunities for deceit. Even assuming perfect knowledge of the product at issue in a particular negotiation, which is by no means a justifiable assumption, it still appears that much timber is sold through bargains between individual buyers and sellers, and that therefore the price in each case has nearly the maximum opportunity for variation — that is, between what the seller is willing to take as a minimum and what the buyer is willing to give as a maximum.

Standing timber is, of course, fixed in place; and logs are scarcely more mobile. In those cases, and they are greatly in the majority, where description alone does not suffice to define the commodity for purposes of the market, and since sale by sample is out of the question, buyers must visit the timber or logs and give them close inspection if they are to make an intelligent offer. Thus the factor of geography is again introduced into timber marketing, and the result is apt to be a market negotiation in which a minimum number of buyers and sellers take part: the economic limitation imposed by the cost of travel prevents the assembly of many buyers in a single market, and the difficulty



of transporting, displaying, describing, or even comparing the goods to be sold prevents the assembly of sellers. On the other hand, if a seller transports his logs to the yard or mill of a prospective buyer, the limitations of the market are intensified, and the position of the seller as a bargainer incidentally much worsened.

The market for timber and primary timber products employs, on the whole, the more primitive methods for distributing information. Buyers gain knowledge of the existence of potential sellers through rumor, the advice of friends, chance personal contacts, or simply by foraging at random among owners believed, through a knowledge of their circumstances, likely to entertain a buyer's offer. Here is an additional factor operating to limit the scope of the market, for the local buyer, with a knowledge of his neighborhood, has a great advantage over others.

*The timber market spasmodic.* Some segments of the timber market experience wide fluctuations and are subject to brief bursts of activity over the course of years. While such variation is partly associated with the general business cycle, fluctuations associated with phenomena within the timber market itself are of prime interest here. These fluctuations are least marked in areas where established buyers of standardized products, like the pulp mills, concentrate their procurement and where timber owners have adopted the custom of cutting their woods lightly and at fairly frequent intervals. The fluctuations are most marked in areas where heavy cutting of timber is the accepted practice, where lumber is the major timber product, and in areas lying on the periphery of major timber sheds. Some areas in the region, particularly the isolated, mountainous sections, appear to have undergone marked periods of intense activity at intervals of a decade or two. During such periods an abnormally great amount of timber is produced, and market contacts are greatly elaborated and developed. Timber depletion or the arrival of adverse business conditions terminates the boom, marketing institutions withdraw, and many contacts are severed. Later, after merchantable timber again appears in quantity on the land, production begins to increase, and as market contacts are again established, the volume of marketings rises abruptly and reaches another peak. This type of fluctuation is what may be called a timber cycle.

Other types of fluctuation result from technological factors in

the timber-processing field. Large sawmills generally perform the first exploitation of timber resources, bringing about a peak in production that leads to the cutting out of most timber economically accessible to these mills. Later, smaller mills appear on the scene and commence operations, usually covering the same ground covered by the large operations, but more intensively. A new burst of activity takes place, accompanied by the appearance of a marketing organization different from that associated with the large mills — a many-layered organization dominated by dealers rather than processors — an organization with essentially local orientation. Their activities tend to center now in one locality and now in another, shifting here and there as new opportunities arise or come to operators' notice.

Finally, within each locality where heavy cutting is the rule, each individual owner generates a small timber cycle of his own. During one year in each decade or two he may have products to sell, and during that one year are concentrated all his functions as a producer and seller in the market. He finds and makes his contacts, or he is found by buyers; his timber is marketed through these contacts; and then the entire system, so far as this seller is concerned, is laid aside and forgotten for an indefinite period.

These points all serve to illustrate what is, of course, to be expected, that the connection between the technology of timber production and the problems of timber marketing is very close. These marketing problems, especially problems of establishing and maintaining contacts, are greatly intensified where such fluctuations as have been described are a prominent feature in production.

*Little product differentiation.* Product differentiation is not a prominent feature in the field of timber marketing. Although there is product differentiation in the case of some fabricated forest products, particularly those in which wood is combined with other materials to produce a specialized and distinctive article, most timber products are more or less undifferentiated. This is to be expected of a class of commodities used so largely as producers' goods. Timber and logs, to be sure, vary greatly, no two offerings upon the market being quite the same. On the other hand, the position in the market of the small, infrequent sellers of these commodities is not such as to permit of much product differentiation. The lumber, millwork, veneer, and cooperage made from

these products is produced in rather clearly defined types and grades, which have become standardized and generally accepted. Wood is, after all, just wood; and there is little about it other than its own substance, which is a matter of fairly easy recognition, that can be convincingly differentiated from other wood of the same easily recognized characteristics. Some manufacturers have attempted to dress up their lumber in various ways and to advertise it as distinctive, but such attempts seem not to have met with conspicuous success among the general public. Advertising in the trade journals is apparently concerned mostly with such matters as quantity, variety, and constancy of supply. Retail lumber dealers as a class have apparently never been particularly aggressive or successful in the field of advertising or of offering special services or inducements to buyers.<sup>9</sup>

#### FOREST PRODUCTS CLASSIFIED

It will be helpful in discussing problems in the marketing of the various forest products to group these products and to treat them in groups rather than as individuals. Forest products may be classified in a number of ways. For purposes of describing the manufacture and use of forest products, Brown<sup>10</sup> mentions four possible classification schemes: (1) primary and secondary products, the former being raw products or those direct from the woods, the latter processed; (2) products from living and from felled trees; (3) products chemically and mechanically reduced; and (4) an elaboration of group 3, in which mechanically reduced products, together with raw products other than fuel wood, are divided into construction and container materials. For present purposes a classification will be offered on the basis, not of the

<sup>9</sup> "From now on (lumber) will have to be sold largely in competition with other materials, and if it is to be sold efficiently and successfully, modern merchandising methods will have to be installed, thoroughgoing research made use of to determine its own future. This will involve effective advertising, understandable grading rules, better standardized manufacture, and, more important still, a product which the individual producer is able to stand behind at all times." Arthur N. Pack, *Forestry an Economic Challenge* (161 pp.; New York, 1933), pp. 47-48.

See also: Peter A. Stone and others, *Economic Problems of the Lumber and Timber Products Industry* (U. S. Nat'l Recovery Adm., Div. of Review, Work Materials 79; x + 335 + vi pp., processed; Washington, 1936), pp. 190, 215-219.

<sup>10</sup> Nelson C. Brown, *Timber Products and Industries* (xviii + 316 pp.; New York and London, 1937), p. 5.

origin or form of products, but of the processes by which they are marketed. Major consideration will be given to the character and organization of institutions engaged in marketing the products. The following is suggested:

1. *Pulpwood group*: pulpwood, extract wood and bark, chemical wood, and mine timbers. These products are all characterized by a relatively few, large manufacturing outlets, which are their points of assembly in the distribution system; and by the existence of formal contractual relationships between the links in the chain of middlemen extending between primary producer and manufacturer.

2. *Sawmill products*: The existence of a great number of small, local processors distinguishes these products. Processors hold a unique position in the local economy, and the question of their operating efficiency is an integral part of the local marketing problem. Assembly of products takes place mostly at stages beyond the first processing. Existence of a lengthy series of grades emphasizes the strategic position of the assembly function.

3. *Yard products*: ties, poles, and piles. The concentration yard, often buying direct from the producer or at most through a single, independent middleman, is the point of assembly. From the yard the products go typically to a few, large ultimate consumers. A preservative treatment is usually given these products, often at the concentration yard, and with this exception there is little processing involved in their production.

4. *Veneer group*: veneer logs, insulator-pin bolts, shuttle bolts and allied products, handle-stock material, and bolts for wooden novelties. In the case of these products, such assembly as is involved is performed chiefly by the few, small processing plants. Raw materials are characteristically of fairly high value, are apt to be scattered and scarce, and are often transported considerable distances. Buyers and agents frequently assume middleman functions, and the middleman system is relatively small.

5. *Cooperage group*: cooperage bolts and shingle and excelsior bolts. These products are typically marketed by primary producers direct to the processing plants, from which they enter the general market.

6. *Local products*: fuel wood, tobacco wood, charcoal wood,

posts, shake bolts, paling wood, unsawed tobacco sticks, and poles and stakes for farm crops. Such non-timber products as forage, hay, mast, duff, and bee materials may also be mentioned here. In most cases these commodities are used directly by primary producers, and no change in title is involved. Where they are marketed, the market is local.

7. *Minor products*: hewn timbers, pipe burls, maple-sap products, Christmas trees, wreaths, boughs, mistletoe, and decorative plants. No attempt will be made to classify or discuss these products.

8. *Abnormal products*: recreation, aesthetic values, game hunting, and soil, water, and climatic influences. These products are distinguished by the fact that there is usually no market for them in the accepted sense, or, if there is a market, buyers are direct consumers, who consume the products *in situ*. No attention will be given these products in this discussion.

This is admittedly an imperfect classification. No two products are quite alike with respect to marketing organization. And individual products show much variation. The present classification includes with sawmill products sawed ties, which are properly yard products. A fair share of the mine timbers produced should probably be classed as local products, and the same is true of Christmas trees. Many posts are sold and shipped considerable distances. Even considering such irregularities, however, the classification may probably be regarded as adequate for the purpose for which it will be used.

#### MARKETING PROBLEMS DEFINED

The economic problems of forestry have already been defined in terms of maximum real income, with some qualifications (pp. 15-21). This definition holds good for marketing problems. A little further elaboration is called for, however, to clarify the viewpoint to be taken in discussing marketing problems.

Modern distribution, not merely of forest products but of other goods as well, presents a picture of growing complexity and of growing dominance among the fields of production. The distribution system is characterized by many layers of institutions in great variety which handle and rehandle goods and, with them, a

multiplicity of services. Each of these institutions extracts its share of the consumer's dollar.<sup>11</sup> In the field of timber marketing in the Appalachian Region, primary interest will be focused, not upon the institutions linking manufacturer to consumer, which are the institutions usually referred to in discussions of distribution costs, but rather upon those linking primary producer to manufacturer. Those institutions, too, in the present instance exhibit a marked tendency to multiply. Because the present analysis has mainly to do with the returns to forest production and because a large part of the Appalachian Region faces the problem of competing in general markets with timber produced in regions of less disintegrated production, it may be said that each of those institutions extracts its share of the manufacturer's dollar, or the buyer's dollar in the central market, implying thereby that the primary producer's share of that dollar is cut into rather heavily.

The problem of excessive cost or of inefficiency in the marketing of forest products, as that problem is delimited here, has, therefore, different implications and arises from a different set of circumstances than is the case with the "marketing problem" as that term is often used in the general literature of marketing. Engle,<sup>12</sup> for example, says

We boast of a productive system which has reduced costs of production through the utilization of conveyor-belt techniques to the point where the masses of today are able to enjoy the luxuries of yesterday. With the same breath we fulminate against our inefficient and wasteful system of marketing and our excessive marketing costs, little realizing that it is our marketing system which enables us to enjoy the fruits of our production system, and that, high as marketing costs may be in absolute terms, the cost of the end product delivered to us for our use is often exceedingly low.

Here the point is made that marketing costs have risen as the result of — and, indeed, as the means of — a reduction in manu-

<sup>11</sup> Fred E. Clark, *Principles of Marketing*, rev. ed. (xv + 657 pp.; New York, 1932), pp. 569-570.

Fred E. Clark, and L. H. D. Weld, *Marketing Agricultural Products in the United States*, p. 648.

Paul D. Converse, *Elements of Marketing*, pp. 5-23.

Hugh B. Killough and Barrington Associates, Inc., *The Economics of Marketing* (xxi + 608 pp.; New York and London, 1933), p. 96.

<sup>12</sup> Engle, "Costs and Profits in Marketing," p. 122.

facturing costs through centralization and specialization. The costs of marketing in question are those of the dispersion of processed goods; and to some degree what is said is applicable to the dispersion of processed forest products. In the present discussion, on the other hand, the costs of marketing in question are largely those of assembly of raw materials. If they have risen, or are too high, it is not as an accompaniment of greater production efficiency, either in the woods or in the mills. Rather, if anything, it is as an accompaniment of reduced production efficiency.

It should be made clear that the existence of many agencies in the field of forest-product assembly, and the fact that these agencies divert from the producer so large a share of the buyer's dollar, are not to be regarded *per se* as evidence of inefficiency, or as evidence of the existence of a problem. The system as it stands may be the most efficient one for gathering up the product of many little producers, assembling it, sorting it, grading it, financing its production and handling, bearing the risks of dealing with it, and passing it on to processors and further handlers and users. There are, after all, a great many essential processes through which timber products must pass and a great many difficulties to overcome in their distribution, particularly the initial difficulty of freeing the products from their confinement in a thousand tiny holdings, scattered and often inaccessible. It is logical to expect that these processes should be costly, and it is logical to expect that wherever the buyer has more favorable alternative opportunities the primary producer will need to pay a large share of the extra cost to society entailed in gathering and distributing his product.

On the other hand, the fact that the system as it stands has evolved in a free society in response to recognized need is not sufficient evidence that no problem exists. That is to say, it is not sufficient evidence that maximum real income has been reasonably approximated. As far as producers and market institutions are concerned, some action initiated by them to alter or replace the system to whose evolution they have been largely passive witnesses might conceivably result in enhancing income. If such enhancement is possible, then the system or those phases of it subject to alteration represents a problem. As far as society is

concerned, some measures for changing the organization or functions of productive factors might conceivably result in enlarging income. If such changes are feasible under the set of rules chosen by society for its organization and operation, then the system or those phases of it subject to change represent a problem. Thus, a system of distribution designed for efficiency under the assumption that producers will operate as completely isolated entities may yet be subject to improvement through some horizontal integration of producers' operations or through some vertical integration of production, processing, and distribution. Furthermore, a system designed for efficiency under the assumption that producing units as currently constituted will be coordinated in the most efficient way may still be subject to improvement through social action aimed at fundamental reorganization and reconstitution of producing units themselves.

As regards social action, the analysis of problems calls for attention to more than the narrow field under consideration. Transportation systems furnish an example of this. Many forests of the Appalachian Region are difficult of access because roads are few and poor. But the fewness and poorness of roads is not necessarily a problem. To improve conditions for transporting forest products might cost more than it would be worth. On the other hand, such improvement might not pay its way in the form of returns to forest production, and might yet be worth undertaking in the light of other attendant benefits not associated with forestry.

As in the field of forest production, so in the field of marketing, the data are not at hand by which to conclude in all cases whether a problem exists. Accordingly, in what follows it will be necessary to deal to a large extent with presumptions of the existence of problems. Such presumptions will be that the situation as it exists may be subject to improvement through private or social action of the types described.

#### PROCEDURE TO BE FOLLOWED

In order to analyze the specific problems of marketing forest products, the first six groups of products previously outlined (pp. 176-177) will be considered individually. Major emphasis will be placed on the problems of the first two groups. In this case



the commodity approach to market analysis<sup>13</sup> will be used — that is, an examination of the institutions and the functions of marketing will be made for one group of products at a time.

Aside from the specific problems connected with the marketing of particular products, there are other, general, problems which are so nearly common to the entire field of timber marketing that their treatment under the commodity approach would involve burdensome repetition. Such are the peculiar problems of the small producer and middleman, the general problem of costly distribution, and considerations regarding the relation of marketing problems to other economic problems of forestry. Because of their general, background character, these problems will be analyzed before attention is turned to the individual commodities. The approach will be partly functional and partly institutional.

<sup>13</sup> Converse, *Elements of Marketing*, p. 23. Roland S. Vaile and Peter L. Slagsvold, *Market Organization* (xviii + 498 pp.; New York, 1930), p. 28.

## CHAPTER VI

### GENERAL MARKETING PROBLEMS

#### THE SMALL OWNER AS A SELLER

REFERENCE HAS BEEN MADE in Chapter III to the prominent position of the small owner in the scheme of forest-land tenure. The data on ownership apparently reflect with a fair degree of accuracy the situation with respect to timber production. If anything, an even larger percentage of timber production originates on small ownerships than the areal data suggest.

The larger timber tracts held by mines, pulp companies, and other industrial owners are frequently kept as a reserve and not actively operated. Only the lumber companies are producing on a large scale from their own holdings. Wood users such as mines and pulp mills have a fixed location, often at some distance from their timber tracts. In few cases would their own timber be sufficient to meet their entire needs for any length of time. These users have built up their wood-procurement system to tap the supplies of small owners, and have apparently found that there is no great advantage to be gained from pushing production on their own lands.

The coastal-plain pulp mills, located as they are in the midst of a farm-woodland country, would find difficulty in enlarging their holdings so as to obtain contiguous blocks of timber large enough for economical operation and extensive enough for self-sufficiency. As long as the forest occurs in patches interspersed with farm land, and as long as farmers are willing to produce timber cheaply on a supplementary basis, the situation is one to be fostered by pulp mills and not to be discouraged. To keep farmers in business as regular part-time producers of pulpwood, to interest them in fire protection and forest management, and above all to keep them separated, particularly avoiding any wide-scale association in the marketing field, is a logical policy for pulpwood users. This is not to say that such a policy is fully in accord with farmers' interest or the public interest.

Additional motives have influenced the users of mine timber.

These users' timber holdings are generally located over their mines, or in any event not far distant. But in those localities labor costs, because of the progress of unionization in the mines, are apt to be relatively high. Hence it is often cheaper for these companies to reach out into distant territory beyond the sphere of mining to buy the timber they need. Mining concerns, however, have shown none of the interest in farm-forest management evidenced by the pulp companies, one reason perhaps being that the psychology of mining and of miners is not such as to take readily to conservative resource management.

Finally, the public forests of the region, most of them recently established, are typically composed of depleted timber stands. While there is merchantable timber on these forests of a type that would be readily exploitable under small, private ownership, public management plans call for a period of waiting before full production is undertaken. Hence, production per acre of public forest is apt to fall below the average for the region.

Private owners of small holdings, on the other hand, have the greatest incentive and the greatest opportunity to produce as large a quantity of timber as resources permit. All these factors tend to augment the position of the small owner as a timber producer. The initial stages of timber marketing, then, are a process of concentration. In this process, title is transferred from the many to the few.

In actual fact, the chief characteristics of the immediate market in which small producers sell their output are a reflection both of the nature of the market as such and of the competence of the individual negotiators in that market.

On the seller's part, a number of factors associated with his status as an individual and as a productive factor in the economy affect markedly his position as a seller in the timber market. There is a copious general literature on the subject of the small seller's handicaps, most of it originating in the field of agriculture, where the disadvantages of the small seller are of great moment.

According to Clark and Weld,<sup>1</sup>

The grower labors under distinct disadvantages in his attempt to market. He has frequently neither the time, the merchandising ability, nor

<sup>1</sup> Fred E. Clark and L. H. D. Weld, *Marketing Agricultural Products in the United States* (xiv + 672 pp.; New York, 1932), pp. 16-18.

the information necessary to market his products successfully. He is, moreover, likely to be particularly busy caring for one crop — plowing, planting, or harvesting — just when it may be the most opportune time to market another. And in the winter season, when he has time to market, country roads are often impassable. Since effective production calls for a high degree of specialized knowledge, most farmers are unable to become specialists in marketing as well. They have, consequently, insufficient knowledge of marketing methods and of market conditions, and possess little or no information as to the price of their products in other markets than the local one in which they sell. They know even less of the broad market influences which determine prices. They are often uninformed as to the type of product that factories and final consumers are most willing to purchase.

The operations of the average farmer are on too small a scale to warrant giving much time to marketing or to the performance of certain important marketing activities. This is true in spite of the high degree of specialization that has taken place in agriculture. And it is one of the most important limitations to effective marketing. With his operations conducted on such a small scale the average farmer cannot effectively sort and grade, sell or advertise his crop. His total crop is so small and its quality so variable that he can gain few of the advantages of branding, and for these same reasons he cannot make or maintain effective sales contacts. He cannot, as a rule, economically operate the most effective storage, sorting, and other mechanical equipment for the physical handling of his product. In other words, the individual farm unit is too small to utilize effectively and economically the methods of sale and the physical equipment for effective marketing which have been developed in the industrial field.

The Interbureau Committee on Farm Technology, of the United States Department of Agriculture,<sup>2</sup> analyzes the farmer's timber-marketing handicaps in the following terms:

The lack of adequate local markets and the existence of exploitative marketing practices partly have been responsible for low returns. No sawmills or other wood-using plants may be present locally, or close enough to pay reasonable transportation costs. A single mill, particularly of the portable type, may furnish only an extreme "buyer's market," and cause the farmer to sacrifice the stumpage in a lump-sum sale for only a fraction of its actual value. . . The lack of satisfactory mar-

<sup>2</sup> U. S. Dept. Agr., Interbureau Committee on Farm Technology, *Technology on the Farm* (xiii + 224 pp.; Washington, 1940), p. 198.

kets for farm wood products is sometimes the result of a vicious circle: A shrinking supply of timber leads to dwindling markets, which in turn are discouraging to woodland owners and productive of still further overcutting, abuse, and neglect: The farmer has a poor market because he has a poor wood lot.

The inherent handicaps of the small owner in the timber market may be summarized as follows:<sup>3</sup>

*Minor position of the timber enterprise.* The very fact that he is a small operator with a limited acreage of timber means that the owner must look elsewhere for a substantial part of his livelihood. Farming is usually his chief occupation. If he is an absentee owner, he is usually a small merchant in a neighboring town, or a retired farmer or business man. In any event, timber production and marketing are merely a sideline — a supplementary enterprise.

It follows from this that the owner's major interests and major skills are in lines other than timber marketing. Most of his time is devoted to these other lines. Even were he to manage his woods intensively, assuming for the moment that it would be economical for him to do so, the typical small owner with thirty to sixty acres of timber would scarcely spend more than a few weeks each year with his timber enterprise. Under existing conditions he

<sup>3</sup> Most of the timber-marketing literature, and essentially all of that which deals with small owners, concerns the marketing of farm-woodland products. For the Appalachian Region, see, for example:

R. W. Graeber, "Marketing the Products of the Farm Woodland," *Eleventh Sou. Forestry Cong. Proc.*: 87-93 (New Orleans, 1929).

E. R. Jackson, "Forestry and the Farmer," *Univ. of Va. Alumni Bull.*, series 3:4:4: 417-425 (Charlottesville, 1911), p. 424.

J. Elton Lodewick and J. W. O'Byrne, *Farm Forestry for Virginians* (Va. Polytech. Inst. Bull. 24:12; 74 pp.; Blacksburg, 1931), pp. 59-66.

J. W. O'Byrne and J. B. Grantham, *Farm Forestry for Virginians* (Va. Polytech. Inst. Bull. 31:5; 63 pp.; Blacksburg, 1938).

Wilbur O'Byrne, "Farm Forestry Profits in Virginia," *Jour. Forestry* 28:7: 964-970 (1930).

Thomas W. Sucee, "Farm Woodlots in West Virginia," *W. Va. Dept. Agr. Bull.* 73: 39-40 (Charleston, 1928).

W. D. Sterrett, "Marketing of Woodlot Products in Kentucky," *Ky. State Forester, 2nd biennial report*: 71-140 (Frankfort, 1915).

— "Marketing Woodlot Products in Tennessee," *Resources of Tenn.* (Tenn. Geol. Survey) 7:3: 109-195 (Nashville, 1917).

U. S. Dept. Agr., "Selling Farm Timber," *Weekly News Letter* 3:51: 7-8 (Washington, July 26, 1916).

spends less time than this. If the woods are cut over heavily under a long cutting cycle, many years may elapse between the periods when the owner has forest products to sell and devotes himself to that phase of his business. Under these circumstances he has little incentive or opportunity to become skilled in the complicated job of putting timber on the market.

In considering the minor position of the timber enterprise, one is immediately struck with the close relation between this aspect of marketing and the parallel aspect of management (above, p. 156). If the position of the enterprise is associated with marketing handicaps and thus with low returns, it is equally true that low returns are themselves associated with the minor position of the enterprise, for the owner regards as of minor importance anything that pays him but poorly. As a consequence, low returns in the market lead to a neglect of forest management, which in turn leads to a still more unfavorable position in the market. Two factors are in operation here: the return per unit of measure, and the number of units produced, as a determinant of total income (assuming demand to be elastic). Both these factors illustrate the close link between marketing and management handicaps and suggest that the one cannot be solved without some reference to the other.

The minor position of the timber enterprise represents one step even beyond the analogous difficulty in agriculture with respect to the small seller's position in the market. Farm crops may be sold under a position greatly handicapped because of the small scale of the seller's operations, but at least those operations are the seller's chief operations and are given his best efforts. But in timber marketing there is a double handicap: timber is a minor product of a minor producer. This is the chief circumstance lying behind the other successive handicaps to be enumerated.

*Seller's unfamiliarity with the market.* The seller's unfamiliarity with the market has two aspects: his lack of knowledge of or contact with the various market functionaries handling different products, and his lack of information regarding such market prices as exist. The degree of contact between sellers and potential buyers varies among areas and among products. In pulpwood-producing sections most timber owners know the pulpwood contractor to

whom they may sell their product, though in many cases they do not know who has the primary contract with the mill. The relationships of such contractors to one another and their effect upon the seller's own position are largely unfamiliar matters. Most sellers know the operators of the small sawmills in their vicinity, but few have the basis for judging the best outlets for saw logs. When it comes to more specialized products like veneer logs, the seller's lack of knowledge is even more profound. In areas characterized by general production, where no one product like pulpwood is of outstanding importance, sellers usually are poorly informed as to the choice of outlets available, and have little basis for choosing outlets intelligently.<sup>4</sup>

The owner who makes stumpage sales is probably confronted by a greater handicap than others in making a rational selection of outlet. In selling a heterogeneous and variable product like stumpage, the standards available for judging market values and outlets are beyond the comprehension of most owners. To assemble a sufficiently large number of prospective buyers so that bidding may be used to establish a reasonable price is impossible if there is no means of contact with prospective buyers. In ordinary times most stumpage is sold after the owner has negotiated with one or at most two buyers.

Thus the small seller of timber is handicapped in his knowledge of the best outlets, and even in his knowledge of local outlets, for specific timber products; and in selling timber in general he has neither the acquaintanceship nor the means for drawing competing buyers together. Most sales by small owners are initiated by buyers. The seller is the passive agent. The number of alternative outlets presenting themselves to him at the time when he makes the decision to sell is therefore a minimum.

As regards market prices, there is again some difference among commodities in both definiteness and general knowledge of such prices. Prices of pulpwood are a matter of fairly general knowledge in each locality, and the same is true in a degree of distillation-wood prices. Prices of tie logs and of ties become standardized and known rather readily. Indeed, wherever there

<sup>4</sup> For an enlarged, practical treatment of the subject *lack of familiarity*, see: Wilbur R. Mattoon and W. B. Barrows, *Measuring and Marketing Woodlot Products* (U. S. Dept. Agr. Farmers' Bull. 715; 48 pp.; Washington, 1916).

is a large user operating in a community, and particularly where channels leading from producer to user are direct, market price tends to be a fairly definite concept and to become generally known. On the other hand, products having a variety of small outlets, products the market for which is chiefly local in character, and products passing through an extensive distribution system before reaching central markets are not apt to have well established or well publicized prices. Such products are saw logs, rough lumber, fuel wood, some specialty products, and above all, stumpage.

Buyers of such unstandardized products usually have a much clearer idea of their outlets and their value than do sellers. The buyer treats each negotiation as an isolated case, striving to gain the maximum margin below the price he knows or believes he will receive for the products when he, in turn, sells them. The price finally agreed upon depends largely on the seller's resistance to that sale. Some sellers with little resistance receive a very low price. Such prices are not publicized, either by the buyer or by the seller. When stumpage is sold not by measure but simply by the boundary, for a lump sum, obviously there is no standard of comparison among transactions and the concept of a market price disappears altogether. There being no market price, it is obviously impossible for any general knowledge of price to exist. The most that may be known by sellers is the amount of money that someone received for the timber on a certain tract of land. Just what kind of timber it was, or how much of it there was, are not known. The quantity of products yielded by tracts acquired in this way is a bit of information not ordinarily divulged by timber buyers, to judge by the experience of research workers in attempting to gain such information.

*Seller's unfamiliarity with timber products.* Two sorts of handicap are faced by sellers in respect to their knowledge of timber products. One is the difficulty of distinguishing and identifying products and grades of products. The other is the difficulty of measuring the quantity of products. Both these processes call for skill and experience not possessed by most small sellers.

There are, of course, exceptions. Products like fuel wood and pulpwood are easily defined and easily measured after they have been cut. Products like saw logs and veneer logs are fairly easily



defined, but not so easily graded or measured. Wood for cooperage, handle stock, and other special items is difficult to identify and fairly difficult to measure under the systems that prevail. Standing timber presents the greatest difficulty, and this is important considering the prevalence of stumpage sales in the region. Very few owners have more than the roughest idea how much timber their woods contain or what its best uses are.

*Seller's handicaps in harvesting and preparing products.* The seller's lack of knowledge of the best methods of harvesting and preparing timber products and his lack of equipment for performing these operations are facts of significance primarily to forest management rather than to timber marketing. However, they have an important bearing upon timber marketing, chiefly because they encourage sales of stumpage instead of prepared commodities.

*Brief time devoted to timber marketing.* The scanty attention given to timber marketing by most small owners is chiefly a function of the minor position of the timber enterprise among their activities. In part, also, it is a function of the seller's knowledge of the great limitations to which he, as a small producer, is subject in seeking outlets, and of the expense entailed in locating markets and carrying on negotiations. With little opportunity to gain experience in the marketing field, the seller is greatly handicapped in dealing with relatively experienced and specialized buyers.

*Prevalence of disadvantageous marketing methods.* Some methods of sale commonly practiced, and some methods of timber measurement, grading, and the like, are apparently such as to put the seller at a disadvantage. The prevalence of such methods makes it very difficult for the individual small seller to require other methods, compete as he must with many sellers among whom the prevailing methods are accepted. The individual buyer, also, would be expected not to favor any change, because of the effect upon his margin and his ability to compete as a subsequent seller for further market outlets.

One such method is the use of the Doyle log rule in measuring the lumber content of saw logs. The Doyle rule is the generally accepted standard among private dealers in the Appalachian states. This rule grossly underestimates the quantity of saw ma-

material in small-size saw logs — the sizes making up the great bulk of sales. The chief disadvantage of the Doyle rule, however, is not its understatement of quantity, for that error might be expected to be ironed out in the process of price formation. Rather, its disadvantage lies in the great variability of the error with change in log diameter. Logs thirty inches in diameter produce approximately the amount of lumber that the Doyle rule shows. But twenty-inch logs generally yield about 10 to 15 per cent more than the rule indicates; fourteen-inch logs, 30 to 35 per cent more; and eight-inch logs, more than 150 per cent more.<sup>5</sup> It would be logical to expect that saw-timber buyers, who are usually also mill operators, are more familiar than sellers with the vagaries of this unit of measure and the adjustments necessary to allow for its errors. Another disadvantageous method is that of using the tree as the unit of measure. Cooperage and veneer material and other specialty wood, and some species of timber, like walnut, are often sold by the tree. This is an inexact and extremely variable unit. Again, there is a presumption that the disadvantage redounds to the seller rather than the buyer because of the buyer's greater experience and specialization. Other units of measure in common use are subject to similar difficulties. Even the cord, which is presumably easily defined and measured, is in actual fact an extremely variable unit, a problem to be discussed in connection with the analysis of pulpwood and allied products, and of fuel wood.

Still another disadvantageous marketing method is the boundary or lump-sum sale.<sup>6</sup> In this type of sale the timber standing on a specified parcel of land is sold as a unit, for a lump sum, with or without an estimate of the quantity of products the tract will yield. The seller may never know how much he has in fact received per unit of measure. This method is probably the most common one in the sale of farm timber and that of other small owners. Few sellers have an accurate estimate of the quantity of their standing timber. It will be brought out subsequently that many small buyers, also, labor under the same handicap. No

<sup>5</sup> Donald Bruce and Francis X. Schumacher, *Forest Mensuration*, 2nd ed. (xiv + 425 pp.; New York, 1942), p. 165.

<sup>6</sup> Mattoon and Barrows, *Measuring and Marketing Woodlot Products*, pp. 37-38.

buyer is sure of making a correct estimate of standing-timber volume. Accordingly he must always allow a margin of safety, and the less sure he is of his estimate the greater the margin he must allow. Customary boundary prices tend to reflect this allowance, and the allowance reflected is that of the poor estimators, who appear to be greatly in the majority. Considering the nature of competition in the market for standing timber, this tends to be a powerful depressive influence upon the prices received by timber owners.

If the lump-sum sale could be based upon a reasonably accurate estimate of the quantity and quality of standing timber to be cut, and could be tied in with satisfactory provisions for cutting certain trees and leaving others according to the needs of the forest, it would be an entirely equitable and indeed highly acceptable method of sale for small tracts.

In contrast to boundary or lump-sum sales are sales of stumpage at an agreed-upon price per cord, thousand board feet, or other unit of measure. The amount of timber actually cut is measured and the total price determined from that measurement. This method of sale is seldom used by small woodland owners. If they had adequate means to administer it, the method would be a good one. Without such means, the method is understandably shunned. The average seller does not understand measurement of logs and cannot check the buyer's scale. If he could check the buyer's scale, it would take a great deal of time; indeed, the seller might have to be on the ground continuously to see that all timber removed was measured. There could be endless controversy over the measurement, especially of defective timber. The seller might have to wait a considerable time for full payment.

*Small scale of seller's operations.* The small owner is faced with a number of handicaps associated with his limited output. Maximum efficiency in marketing requires that each tree and each log be channeled toward the outlet for which it is best suited. Some material is best suited for pulpwood, some for ties, some for lumber, and some for poles; and the normal cutting operation yields in a single process just such a variety of material as this. But while the total quantity of timber produced from the small owner's holdings at any one time is limited, the quantity of any one type of product is more limited yet — so much so that it pays the

owner neither to seek out the best market for each type nor to transport such a small volume of material to that market. Besides, specialty buyers are not likely to be interested in such a small quantity of material. The best alternative open to the seller is to convey all his products to some middleman who will undertake the assembly function, combining these products with those of other small owners so that enough product of each type may be accumulated to warrant sorting, grading, and shipment to specialized outlets. In actual practice, what usually happens is that this small owner's entire output is channeled into a single use, such as pulpwood or lumber.

In order that it may be made to yield a reasonable quantity of products, a small holding may be cut over heavily and at long intervals. Many owners have products to sell in significant quantity only once in a decade or longer. Under these conditions the maintenance of market contacts is impossible. The function of contact-maintenance must be undertaken by some other agency — very possibly the one performing the assembly function.

Even when offering all his timber in a single transaction, the small owner has difficulty in attracting the interest of many buyers. The smaller the tract, the more local and limited is the competition for it apt to be. Such a process as assembling a number of bidders for stumpage, for example, is beyond the means of the small owner.

*Seller's unfavorable financial position.* The financial limitations of the small owner are a handicap to him in the field of marketing, just as in production (pp. 152-153). He may be unable to wait so as to time his marketing to coincide with the most favorable opportunities. He often finds it necessary to sell just as soon as there is anything in his woods to be sold. Having once embarked upon a marketing venture, he must seek those outlets which offer an immediate cash return. This fact often bars him from direct negotiations with the larger and more favorable markets. His weak financial position also forces him to resort to those methods of marketing which entail the least use of working capital — the sale of logs rather than processed products, or of stumpage rather than logs. He is thus forced back toward the most primary forms in his market offerings — the forms which tend to be relatively the least remunerative.

In this review of small owners' marketing handicaps, one point stands out above all: that existing methods and conditions of marketing tend to result in depressing the price of the standing timber or other products these owners sell. Now it will be agreed that a part of this depression of price is associated with the misdirection of forest products into use, and is therefore a loss to society and a problem. But for the most part, is not this depression of price a disadvantage to sellers that is just compensated by its advantage to buyers? Indeed, considering that the timber did not cost the seller very much, is there not a net advantage to society in the tendency to pass along low prices to ultimate consumers and thus stimulate consumption? Where, then, is the problem?

Some answers to this question will be developed subsequently. But here a point or two needs to be made. High prices (using the adjective for the moment without defining it) for forest raw material may certainly be undesirable and a problem (pp. 21-22). On the other hand, inordinately low prices, too, may be a problem. Because of the unfavorable financial position of so many small sellers, low price may diminish the total utility of the income produced by timber resources (p. 16). Low price, along with low rates of return to labor, is undoubtedly associated with existing inefficiencies in the utilization of timber and in its processing and marketing. Finally, low price discourages the practice of forest management: it postpones the inevitable transition from timber mining to cropping and greatly heightens the shock of that transition.

A desirable price is one that approximates the cost of replacing resources under a management program designed to meet the optimum requirements of society for timber products. It is against such a standard that prices may be called "high" or "low." If small owners' marketing handicaps result in a price that is low by this standard, then those handicaps are a problem.

#### THE SMALL MIDDLEMAN AS A MARKET FUNCTIONARY

Some notice has already been given to the important role played by small operators in the earlier stages of the marketing process. The small operator is typified by the stumpage buyer, who at the same time usually manages a small sawmill or other local wood-

using plant or acts as agent or contractor for the users of pulpwood, mine timbers, ties, or other products. He often conducts the logging operation, delivers the logs to a shipping point or arranges for trucking, or performs the primary processing. The functions undertaken by this small operator are numerous and varied. Above all, they include the function of finding timber and getting it out upon the market. It has been seen previously (p. 158) how this function involves others that are akin to those of timber ownership and management.

The operator, and not the timber owner, is often the actual primary producer. The owner holds the land upon which the timber is permitted to grow, but without the small middleman it is inconceivable, under usual conditions, that much of that timber would reach market. Supply responses in the field of timber production thus tend to be conditioned largely by operators' reactions to changes in demand. It is the prospect of a larger or smaller margin that motivates the effort that operators are willing to expend upon the task of collecting timber for the market. In all this, there is a tendency for the owner to stand, as it were, upon the sidelines, just as the small owner of mining land might be expected to do in permitting his holdings to be opened for exploitation by an operating concern.

The question of supply responses and the small operator's part in them bears further thought, because the forces in action at this stage in production constitute a major forestry problem. It is often observed that in areas where the small, exploitative type of forest ownership predominates, stumpage prices, where they are not concealed by lump-sum sales, appear to respond but feebly to increases in demand, at least in all but the later stages of the rise; while in times of high demand the margins of local operators are occasionally very great. No attempt will be made to examine this proposition statistically. The paucity of data and the variability of stumpage as a commodity make such examination difficult and unreliable. If, however, the proposition is true, it dovetails well with other observed facts and serves to clarify the nature of supply.

Apparently the task of the timber buyer and operator is one involving pronounced disutilities, from both the individual and the social standpoint. From the individual standpoint the arduous na-

ture of the work is to be considered; from the social standpoint, the peculiar combination of temperament and experience required. In normal times the supply of operators is apparently such as to hold their returns to a low level. Two outstanding advantages of the occupation — that it gives the individual a large share of independence, an advantage akin to that of farming; and that it occasionally pays high returns — are seemingly sufficient to attract a goodly number of aspirants to the field. But the field is not one to which additional entrepreneurs may be attracted on short notice. Hence an increase in output must come largely through the increased efforts of existing operators. Such an increase is physically possible for the operator because he normally conducts his business on a part-time basis as a supplement to farming or some other rural employment. Nevertheless, to increase the scale of operations greatly increases the disutility of the work, for each addition to production must be accomplished by increasing the number of purchases made, and generally not by increasing their scale. It is necessary to make further negotiations with timber owners, to lengthen the physical distances covered between operations, and to enlarge the burden of administration and supervision, also involving the physical task of covering more ground. At the same time, the operator must curtail his other lines of activity, which may currently be more than normally remunerative. Under these circumstances it is not unreasonable to expect that operators would demand a substantial widening of their margins. The degree to which such widening could be effected would depend first upon the extent to which price has risen in the market where the operator sells his products, and second upon the magnitude of the change in owners' selling prices. As regards the operators' market, it may be assumed that the price has risen.

As regards timber owners, two factors, chiefly, permit them to take a comparatively neutral position in the developments which follow. One of these is the fact that to increase output of all timber owners as a group does not involve any increase in their costs of production. For any short period such as is pertinent here, the total amount of standing merchantable timber is fixed, and its costs of production per unit do not necessarily have any relation to the amount cut. The operators' costs, of course, may rise with increased production, since it may be necessary for him to extend

his operations into less favorable operating chances. The second factor is that the general increase in production is effected by cutting on a greater number of properties and not by cutting on any one of them more intensively; and hence the individual owner is faced merely with the two choices that would face him at any time: to have his timber cut or not to have it cut. If he has it cut, that process is no more costly to him, except perhaps in terms of opportunity, than it would have been at any other time.

A number of circumstances, of course, would operate to mar the distinctness of the adjustments just described. In the first place, the owner may be expected to have some knowledge of the change in prices taking place in outside markets. He will therefore be confronted with a third choice not mentioned: the choice to operate the timber himself. Again, there is sure to be some competition among operators, particularly for the better stands of timber. In the ordinary run of stands operators are often inclined to let one another alone in dealing with owners, especially if there are plenty of such stands to be had.

If stumpage prices in areas of small, exploitative ownership tend to move within a relatively narrow range, it may be presumed that the range hugs closely to the price required to keep operators in business in times of low demand.

Besides the functions of the small operator just discussed, which may be termed the functions of prospecting, logging, and assembly, another important function is financing. The operator must be in a position to pay cash for what he gets. The inability of most operators to meet the full burden of this function has led to a system under which they ally themselves with larger agencies located beyond them in the marketing chain, receiving the necessary financial support from these agencies. The functions of storage and grading are usually undertaken, not by the small operator, but by the agency to which he next transmits his products.

Risk-bearing is a further function of the small operator, the risk in this case being not so much the risk of a change in the market price as the risk involved in paying for standing timber, or even for logs, without knowing just what those materials will yield in the form of products. The timber buyer is sometimes nearly as much in the dark about what he is buying as the seller is. The effect of this circumstance upon prices at which boundary



sales are made has already been mentioned. Operators intentionally make a conservative estimate of timber volume, but beyond due allowance for this fact, there is apparently great variation in their ability to approximate a reasonably accurate figure. On one operation observed near Breathitt County, Kentucky, the operator's records showed an estimate of 300,000 board feet of standing timber. The amount of timber actually harvested was 465,000 board feet.

One mill man in Halifax County [Virginia], purchasing timber by the thousand board feet log scale, estimated that he would get between 15,000 and 20,000 feet from one tract. When the operation was completed he had cut 75,000 feet. A woods owner in Buckingham County, offered a lump sum of \$35 for his timber, decided instead to sell it to another buyer by the thousand board feet. The tract yielded about 125,000 board feet of logs and returned the owner between \$600 and \$700.<sup>7</sup>

As a seller, the small operator is in a position comparable in many respects to that of the small owner. The sort of market in which he negotiates is similar, and he has similar handicaps in knowledge and financial ability. The small middleman operating through contract or ownership arrangements, typical of pulpwood and allied products and of saw timber, has very little freedom of negotiation. On the whole, however, the handicaps of the operator as a free negotiator in the market are much less pronounced than are those of the owner.

What is the nature of the economic position of these operators, who are willing to perform functions of the type described? They are called upon to undertake production both arduous and precarious, production varying widely in the degree to which it keeps them employed and in its returns. On the one hand it is probably true that their occupation calls for a considerable amount of business initiative and venturesomeness. At the same time there are powerful deterrents to increasing the scale of their operations, for the very nature of their business is founded on the necessity to conduct little, detailed, time-consuming negotiations with scattered landowners. The variable nature of their employment makes

<sup>7</sup> William A. Duerr, T. C. Evans, and G. E. Morrill, *The Forest Situation in Piedmont Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 13; iii + 83 pp., processed; Asheville, N. C., 1943), p. 39.

it almost necessary for them to have at hand some additional means of livelihood — frequently a principal means of livelihood outside of timber operating. The combination of farming and timber operation is apparently a satisfactory one in many cases.

To study the great multitude of timber buyers, log dealers, and small mill operators in the Appalachian Region is to be confronted with the picture of a vastly multiplied distribution system — apparently a ponderous system weighing heavily upon the timber owner. But one should not say that there are too many middlemen in this system unless he can point to alternative institutional forms capable and willing to undertake the inherent disutilities of the job. Further, it is necessary to keep in mind that society obtains the services of these middlemen under peculiar circumstances — that they engage in the work on a supplementary basis. Were it not for this fact it is probable that the functions of primary distribution would be costly indeed — so much so that a forest region of small, scattered holdings could scarcely compete in the general market for timber products, so long as that market was substantially supplied with products from other, not-too-distant regions where resources were efficiently organized.

The cost to society involved in primary distribution of timber products in the Appalachian Region may still, however, constitute a problem. From the standpoint of the individual operator these are opportunity costs, which fail to enter into the price of the product because of labor immobility, because of chronic unemployment among productive factors, and because of such value as may be attached by operators to their place of habitation and their mode of existence. From the standpoint of society the cost consists in the loss of product entailed in maintaining a mal-adjusted system in the field of timber production not offset by gains in other fields of production. Hence it is necessary to distinguish between those areas in the Appalachian Region where the inefficient organization of timber production is merely a small cost of the efficient organization of commercial agriculture and those areas where losses in the timber field are accompanied by no such offsetting gains.

It is well to note at this point that the two major fields of rural primary production besides forestry — agriculture and mining — bear quite different relationships to forestry in respect to the ex-

tent to which they influence the efficiency of timber distribution and can produce gains in factor organization to offset losses in the timber-distribution field. Both farming and mining, as activities conducive to an increase in population density, tend to foster local depletion or thinning-out of the timber resource. In addition, both forms of production use wood in the productive process. Distribution costs are thereby increased, forest management being what it is. But beyond this point the two forms of production are greatly different in their effect upon forestry. Agriculture, as a use of land surface and a form of land ownership, sets up two additional obstacles to efficient timber distribution: the breaking-up of the land-use pattern and the creation of closely spaced ownership boundaries. Where farm organization is efficient, and farm labor is employed in the off season upon timber distribution, offsetting gains exist from the social standpoint and such gains may reasonably be held regardless of the level of agricultural production, provided only the demand for labor in timber distribution does not exceed the supply of farm workers available at the price permitting maintenance of competition in the timber market. Mining, on the other hand, results neither in changing the use pattern of the land surface nor in establishing closely spaced ownership boundaries: indeed, surface ownership is not a necessary feature of mine production. And in regard to the supply of part-time labor on a supplementary basis, that supply is directly influenced by the level of production, since mining may be typically a year-'round occupation.

#### RELATION OF MARKETING PROBLEMS TO DEPLETED FORESTS

References have been made elsewhere (pp. 151, 162-163) to the bearing of forest management upon the problems of marketing. One of the principal results of the type of management customarily practiced — that is, low volume of merchantable timber per acre, accompanied by small average size and low quality of trees — has marked significance to distribution problems. The principal aspects of this relationship may be mentioned briefly.<sup>8</sup>

<sup>8</sup> Some interesting parallels with timber-marketing problems in England, where depletion has an important bearing upon marketing, may be found in: Reginald Davey, *Marketing Timber and Other Woodland Products* (108 pp.; London, 1939), pp. 13-20, 95-102.

Depleted forests mean high unit cost of assembly. Not only must a greater number of transactions with owners be effected in order to obtain a given quantity of timber, but more ground must be covered in assembling the products.

Depleted forests mean a limited variety of marketable products. First, the form usually taken by depletion limits production to the products of small-size or low-grade trees, such as pulpwood and ties. Second, by decreasing production per unit of area, depletion decreases the amounts of marketable products of each sort, and may thus eliminate the possibility of gaining some markets, merely on the basis of volume. Timber from depleted stands is very apt to find its way chiefly into one or a very few channels.

Depleted forests make for a weak competitive position of an area and marked fluctuations in the volume of marketings. Since supplies coming into the market from depleted areas are small and unsure, producers in such areas are unable to establish the best market contacts. Their chief opportunity comes at the time when demand is heavy and supply areas must be expanded. Marketings in badly depleted areas thus tend to fluctuate from zero in times of poor markets to the maximum in times of good markets.

Depleted forests mean destruction of facilities for timber distribution and processing, which cannot easily be replaced during the short periods of revived activity and which tend, consequently, to leave a permanent gap in the productive structure of a depleted area. Such facilities include sawmills and other wood-using plants, entrepreneurial ability in the processing and distribution fields, the supply of skilled labor, and roads and other physical facilities.

Depleted forests make for difficulty in reorganizing marketing institutions, and in introducing new institutions, particularly such as depend for success upon efficiencies of scale. For example, to replace existing functionaries with other more unified and direct institutions, in any case a difficult shift, is still more difficult in depleted areas.

#### IS THE TIMBER INDUSTRY SUBSIDIZED BY SMALL OPERATORS?

A review of the situation in the field of forest management reveals the existence of a multitude of small owners, who engage casually in forest production as a sideline or even as a chance concomitant to some other occupation. Following the forest products

into the field of distribution, one finds again that the functions of that field are performed by a great number of small-scale operators who buy stumpage and logs, cut and transport timber, and run small primary processing plants like sawmills, very often as an occupation supplementary to some other like farming. Finally, the ordinary labor engaged in these operations is often performed on a part-time basis, with the laborer's chief source of livelihood (if not of cash income) in some other employment. The questions, then, arise: what is the value of timber products produced under these conditions, and what is the nature of the service to society performed by the factors engaged in this production?

One fact is apparent — namely, that the absence of free competition and of full employment is the factor having the most profound effect upon the roles played by the elements of production. And added to this are the peculiarities of timber, which at any given time tends to resemble an exploitable ore, its existence being more or less independent of past methods and rate of production. The low value of the timber under these circumstances is accentuated by the many institutional factors involved in owners' application of productive factors and their lack of interest and knowledge of the methods and channels by which standing timber may be converted into products for the market. The title to this timber is made available to operators on easy terms by virtue of the fact that the timber exists as a circumstance either of the use of land for some other primary productive purpose or of the occupation of the land by settlers who choose for reasons other than monetary gain to remain where they are.

This low-value product is next taken over by the small operators, who perform their task also on a supplementary basis. And even with the addition of the forest employment, the time that the small operators are prepared to devote to productive work may not be fully occupied. Under these conditions the supply of their labor is relatively great — that is, they are willing to exchange a rather large amount of it for a low return, and this is particularly to be emphasized in view of the high utility to them of cash income received in such marginal employment. It follows that the value added to the product by these operators and laborers tends to be small. And from this it follows that the supply of the product entering the higher channels of the market is

great — that is, the offering price of sellers is comparatively low. Insofar as the lower stages of production and marketing are concerned, then, the presumption is that the product may be had for little, as compared with what it would cost under conditions of freer competition in its widest sense and fuller employment.

Other things being equal, wood users are thus able to obtain their needs at peculiarly low cost. Their opportunity to do this results from the ignorance and poverty of timber owners and from the underemployment of rural resources and rural people.

The experience during World War II is instructive here. National requirements for lumber and other timber products soared. Timber output, however, responded but feebly, and in some major categories actually declined as the war progressed. The principal cause of lagging output was a shortage of labor: with relatively easy and good-paying jobs to be had elsewhere, labor readily forsook the forest industries; and despite industrial and government efforts to hold and recruit labor in logging and milling, the supply remained grossly deficient. The forest industries, geared for the most part to sparing use of capital equipment and lavish use of cheap manpower in every operation, were unable to meet outside competition for labor aggressively.

Are we, then, to conclude that equitable returns to standing timber and to forest and allied labor would result in putting much timber out of the reach of wood users because of high price? Such a result is certainly possible. But it is not inevitable. It can be avoided by building up, through management, an abundant and well located timber supply of good quality and by making efficient use of labor as well as capital in the harvesting, processing, and marketing of that supply.

## CHAPTER VII

### PROBLEMS IN MARKETING PULPWOOD AND ALLIED PRODUCTS

#### DESCRIPTION OF PRODUCTS

THE PRODUCTS to be discussed in this chapter are pulpwood, extract wood and bark, chemical (distillation) wood, and mine timbers.

#### PULPWOOD

Pulpwood is used by pulp mills in the manufacture of pulp for making paper and cellulose products. Most of the pulpwood produced in the Appalachian Region is of yellow pine (including Virginia pine), and is converted by the sulphate process into kraft pulp. A considerable quantity of dead chestnut is converted by a semi-chemical process, most of the product going into paperboard for corrugating. A number of soda pulp mills utilize yellow poplar, basswood, cucumber magnolia, soft maple, gum, and similar "soft hardwoods," while oak (a "hard hardwood") is used in several of the hardwood mills.

Pulpwood is prepared in the woods in the form of bolts, usually five feet long. Sometimes the bark is peeled from the wood so that barking will not need to be done at the pulp mill. Pulpwood is measured in cords or "units" of stacked bolts of specified outside dimensions.

The smallest-diameter bolt customarily accepted by users is four or five inches at the small end, inside bark, though three-inch and even smaller sticks are sometimes accepted when the demand is very great. Depending upon the capacity of their chipping or grinding machines, some mills accept round bolts of any size, while others require larger bolts to be split. One mill buying hardwood pulpwood in round bolts of any size permits the halving of the bolts of some species fourteen inches or larger in diameter, and the quartering of bolts twenty-four inches or larger. Specifications usually call for splitting large pine bolts.

Except for chestnut wood, pulpwood bolts must usually be cut from living trees. The bolts must be free of rot and burnt wood and must be reasonably straight. Knots, if trimmed off flush with the stem, are not a defect.

#### EXTRACT WOOD AND BARK

These raw materials are used by tanning-extract plants, where they are converted to chips and the essential ingredients taken from them by a leaching process.

Chestnut is the chief species used for extract wood, although a limited market exists for the wood of chestnut oak. Bolts are cut in lengths of either four or five feet, depending upon mill specifications. Usual minimum diameters are four or five inches, and bolts exceeding eight to ten inches in diameter are generally required to be split so as to reduce the individual pieces to less than that size.

Since the tannin in the wood is concentrated in the heartwood, lower portions of the stem produce a higher yield than do upper portions and limbs. Trees are cut off as close as possible to the ground. Bolts taken from tops and limbs are acceptable, provided the shipment contains also the material taken from the lower sections. Remnants of trees from which poles, ties, or saw logs have been taken are not acceptable as extract wood.

Because most chestnut extract wood is taken from dead trees, the bark is usually gone. The bark of chestnut oak, however, must be left on the bolts, for this bark is particularly rich in tannin. There is a market also for sawmill slabs of chestnut oak with the bark on. Chestnut wood containing "worm holes" is commonly accepted by users on a par with sound wood, but deductions are made for rotten or burnt wood. The unit of measure is the cord or unit, based upon cubic contents of a stack.

Chestnut oak and hemlock are the chief trees the bark of which is used by extract plants. Such bark is merchantable when "bright, sound, and free from damage." After removal, the bark is piled and allowed to dry. It is then sold by the ton.

#### CHEMICAL WOOD

Chemical wood is used by wood-distillation plants in the manufacture of charcoal, tar, acetate, wood alcohol, and other chemical products. Some plants distill pine and produce, besides the above



products, turpentine, pine oil, and related substances.<sup>1</sup> In the Appalachian Region, however, distillation of hardwoods is the chief process.

The principal woods used are oak, birch, beech, maple, hickory, ash, black walnut, ironwood, sourwood, locust, dogwood, elm, and cherry. The wood is made into bolts five feet long, with the minimum diameter usually three inches inside bark. Bolts must be split so that no piece will measure more than nine inches at the widest point. Any type of material is acceptable, provided it is sound and reasonably straight. The bark is not removed. Measurement is in terms of cords or units.

#### MINE TIMBERS

Mine timbers here include all wood except sawed products used in mining operations. While the Appalachian Region supports a variety of mining operations, those other than bituminous coal mines are of negligible importance as markets for timber, and will not be considered here.

Bituminous coal mines use timber chiefly in the form of props, collars, and ties. Props and collars are used in gangways to support the roof, the collar being held against the roof by the vertical props, one at each end. Sometimes, especially in rooms, single props may be used to support the center of a cap, or cap block (header), placed against the roof. A tight fit is secured by driving wedges between the prop and the collar or cap. Ties support the rails for the mine cars. Where prop and collar sets are spaced apart in the gangways, the openings between sets are often lined with lagging, along both sides and roof, to prevent loose rock from falling into the gangway. Above ground on electric-powered mines, trolley poles are used to support the trolley wires for the mine cars.

A great variety of both hardwoods and softwoods is usable for mine timbers. For props and collars, strength is a prime requisite. For caps, a soft wood which will crush when pressure is exerted from above and thus ease the strain on the prop is desired. Wood, rather than steel or concrete, is preferred for props, partly because when wooden props are subjected to extreme pressure such

<sup>1</sup>Nelson C. Brown, *Forest Products, Their Manufacture and Use* (xix + 471 pp.; New York and London, 1919), pp. 225-234.

as will lead to their failure and the cave-in of the roof, they begin to groan and crack and thus warn the miners to remove themselves to a safe place. Some species, such as the yellow pines, are said to possess this "groaning" property to a greater degree than others. Durability is a requisite in timbers to be called upon for some length of service, as in the main gangways. Very little preservative-treated timber is used.<sup>2</sup> But much timber is in use for so short a time that durability need not be considered. Props, collars, and caps are almost never reused, but are left in place when a gangway or room is abandoned. Wood for lagging may be of almost any species and quality. What species are used for mine timbers thus depends largely upon what is available. This is particularly true of the small and less permanent mines. Some mines buy timber from purchasers of their coal,<sup>3</sup> the species in this case depending in part upon what these purchasers have in their localities. Oak is the chief species used. Yellow pine, chestnut, black locust, gum, and hickory are also of special importance.

Most mine timber is used in round, hewed, or split form. The proportion of sawed material, while it has increased with increasing transportation distance,<sup>4</sup> is still small.<sup>5</sup> The timber must be sound and straight, but specifications for size are greatly variable. One mine in southwest Virginia buys props six to eight inches in diameter at the small end, in standard lengths ranging from three to ten feet by three-inch intervals. Its ties are four by five inches to six by seven inches, five to seven feet long. Collars are four or five by six or more inches, twelve to eighteen feet long. Dimensions for lagging are rarely specified, except that two or three inches is usually the minimum acceptable diameter at the small end. All these products are sold and bought by the piece, or sometimes by the lineal foot.

<sup>2</sup>W. D. Brush, *Timber Requirements for Mines in the United States* (29 pp., processed; Washington, 1938), p. 23.

<sup>3</sup>E. A. Ziegler, *Marketing Forest Products from Pennsylvania State Forest Lands: II, Mine Timbers and Wood Supplies* (13 pp., processed; Harrisburg, Pa., 1935), p. 3.

<sup>4</sup>Brush, *Timber Requirements for Mines*, p. 6.

<sup>5</sup>R. S. Kellogg, *Timber Used in the Mines of the United States in 1905* (U. S. Dept. Agr., Forest Service Cir. 49; 8 pp.; Washington, 1906), p. 3.

U. S. Dept. Commerce, Bureau of the Census, *Mine Timber Used Underground*, 1923 (17 pp.; Washington, 1925), p. 4.

## BACKGROUND OF PROBLEM ANALYSIS

Some  $3\frac{1}{4}$  million cords of pulpwood, extract wood, distillation wood, and mine timbers were produced in the Appalachian states in 1940: about  $9\frac{1}{2}$  per cent of the total quantity of wood produced in the region in that year. The quantities of each product are shown in Tables 12 to 15, inclusive.<sup>6</sup>

## PRESUMPTION OF PROBLEMS

Considering the position of pulpwood as a major forest product of the region, the question of pulpwood-marketing problems is a pertinent one. The question has peculiar interest because many people have long presumed that there was "something rotten" in the pulpwood-marketing situation—something redounding to the disadvantage of the timber owner and pulpwood cutter, to others situated near the lower end of the production and marketing chain, and inferentially to the community as a whole. A number of conditions have seemed to favor the possible existence of an unfair marketing situation: the large size and small numbers of pulp mills; their apparently autocratic control of price; the often devious methods of buying wood; the confusion existing with regard to units of measure.

Unfortunately the data are not at hand for analyzing these ac-

TABLE 12  
PRODUCTION OF PULPWOOD IN THE APPALACHIAN STATES,  
BY KIND OF WOOD, 1940  
(In cords)

State	All kinds of wood	Softwood	Hardwood <sup>a</sup>	Chestnut <sup>b</sup>
Kentucky .....	21,300	.....	10,800	10,500
North Carolina .....	732,700	460,500	107,100	165,100
Tennessee .....	183,200	39,400	45,300	98,500
Virginia .....	837,600	684,700	76,600	76,300
West Virginia .....	102,700	61,800	37,800	3,100
All states .....	1,877,500	1,246,400	277,600	353,500

<sup>a</sup> Other than chestnut.

<sup>b</sup> Includes wood used first as extract wood.

<sup>6</sup> For sources see footnote 1, Chapter X.

TABLE 13  
 PRODUCTION OF TANNING-EXTRACT WOOD AND BARK  
 IN THE APPALACHIAN STATES, 1940

(In cords)

State	All wood and bark	Chestnut wood *	Chestnut oak bark	Hemlock bark
Kentucky	29,400	22,100	5,300	2,000
North Carolina	234,100	216,600	12,200	5,300
Tennessee	151,600	145,300	3,900	2,400
Virginia	166,600	158,800	7,300	500
West Virginia	32,400	19,800	10,600	2,000
All states	614,100	562,600	39,300	12,200

\* Includes wood used subsequently as pulpwood.

TABLE 14  
 PRODUCTION OF HARDWOOD DISTILLATION WOOD IN THE  
 APPALACHIAN STATES, 1940

(In cords)

State	All hardwoods
Kentucky	2,400
North Carolina	8,400
Tennessee	93,600
Virginia	15,600
West Virginia	...
All states	120,000

TABLE 15  
 PRODUCTION OF MINE TIMBERS IN THE APPALACHIAN STATES,  
 BY KIND OF WOOD, 1940

(In cords)

State	All kinds of wood	Softwood	Hardwood
Kentucky	341,300	19,000	322,300
North Carolina	...	...	...
Tennessee	29,300	2,100	27,200
Virginia	101,700	10,300	91,400
West Virginia	510,100	36,300	473,800
All states	982,400	67,700	914,700

cusations competently. Nearly all that can be done is to describe the framework within which gross imperfections in pulpwood marketing may exist. This is a case where thorough-going problem analysis must be preceded by considerable research.

#### CHARACTERISTICS OF THE PULPWOOD GROUP

The marketing of products in the pulpwood group is characterized, first, by the fact that the primary outlets for the products are a few large consumers, who draw their requirements from a relatively wide territory. Pulpwood is the typical case (Figure 5). The case of mine timbers is less typical, for there are a great number of small mines drawing almost exclusively on nearby timber stands for the wood they need. On the other hand, these small mines are considerably less a factor in the market than their numbers seem to indicate — not only because their requirements are small, but also because most of their requirements are supplied from their own lands or are obtained locally on an informal basis, sometimes, for example, through an exchange of coal for wood.

A second characteristic of these products, upon which their grouping was based (p. 176), is that they are typically marketed through a system of buyers who stand in the relation of contractors to the users.

A third characteristic is that the products are all obtainable from small trees or from trees for which the competition among products generally is not great. They are the type of product typically resulting from thinning or from "improvement cutting." They therefore play a vital part in the silvicultural program for depleted woods. All the products furnish important uses for hardwood timber, for which the market is generally less good than for softwood. Their value, compared with that of many other forest products on a volume-for-volume basis, is low. Within the pulpwood group of products, some types of mine timber are undoubtedly of lowest specific value, while pulpwood itself is highest. Following are values of some selected products, at the plant, in cents per cubic foot and per pound, based upon average densities<sup>7</sup> and typical price quotations for 1940:

<sup>7</sup> L. J. Markwardt, *Comparative Strength Properties of Woods Grown in the United States* (U. S. Dept. Agr. Tech. Bull. 158; 39 pp.; Washington, 1930), pp. 6-13.

	<i>Cents per cubic foot</i>	<i>Cents per pound</i>
<b>Pulpwood (green):</b>		
Rough yellow pine .....	8.4	0.17
Peeled yellow pine .....	11.4	0.22
Peeled yellow poplar .....	9.6	0.25
<b>Mine timber (green):</b>		
7-foot round oak props .....	6.8	0.11
7-foot oak ties .....	5.5	0.09
<b>Chemical wood (green):</b>		
Oak .....	10.8	0.18
<b>Extract wood (air dry):</b>		
Chestnut .....	10.8	0.36

Finally, in order to characterize the products of the pulpwood group, it is necessary to describe briefly the methods by which standing timber is put into the hands of the first middlemen. From what has been said about the physical properties and value of these products it might be presumed that they are harvested mostly as by-products in the production of other timber commodities. Such practice actually is not common. In the case of extract wood, dead chestnut is abundant in most localities where this product is harvested, and may be the chief product of value in the timber stand. Its progressive deterioration offers good reason to harvest it in the largest quantities feasible, whether as a by-product or main product and whether or not the timber stand is under a plan of management. Pulpwood usually and chemical wood frequently is harvested as the main product of timber stands operated on a short rotation. The present small size and poor stocking of much Appalachian timber mean that a pulpwood cutting is often a very heavy cutting. Much the same is true of mine timbers, particularly those originating in the woods adjacent to mines. A low-value product, mine timbers may yet be a successfully competitive commodity where the user is near at hand and thus transportation distance short. This is particularly true on forest lands owned by mine operators, and is certainly true of forest lands lying above the mines. Mining areas are characterized by denuded forest land, much of which was logged exclusively for products of very low intrinsic value.

Stumpage sales are characteristic of most of the forest products of the region, and products of the pulpwood group are no exception. There are, however, notable differences within the group.

Stumpage sales are probably more common in the case of extract wood than in the case of the other products. Mine timbers, on the other hand, are prepared in considerable volume by stumpage owners and sold in cut form.

### MARKET ORGANIZATION

Throughout the remainder of this chapter primary attention will be given to pulpwood, as the type product of the group. Some of the general principles and problems of pulpwood marketing may be found applicable to the other products of the group.

### MARKET GEOGRAPHY

At least twenty-five pulp mills draw pulpwood from the Appalachian Region (Figure 5). The region produced about 1.9 million cords of pulpwood to supply these mills in 1940 — 66 per cent pine, 15 per cent hardwood other than chestnut, and 19 per cent chestnut (Table 12).

The seventeen pulp mills within the Appalachian Region are located in two northeast-southwest belts, one along the coastal plain, the other mostly along the Blue Ridge and neighboring Appalachian hills. Eastern, coastal-plain mills consume pine — loblolly, shortleaf, and Virginia — almost exclusively; while mills of the western belt consume principally chestnut and other hardwoods. The eastern mills (average twenty-four-hour capacity 850,000 pounds) are typically larger than the western (average capacity 300,000 pounds).<sup>8</sup>

Through the interlacing of their timber sheds, these mills provide a market for pulpwood nearly throughout the two belts and the intervening piedmont, and into the fringe beyond the western belt. Within the two coastal states, only a small area in northwestern North Carolina is customarily without a market for pulpwood. Furthermore, much of eastern and central Tennessee lies within the timber sheds of the hardwood and chestnut mills. Altogether, a market for pulpwood exists in more than two-thirds of the Appalachian territory.

Pulpwood production in the region is concentrated chiefly in two distinct areas (Figure 6). The eastern area takes the form of

<sup>8</sup>Lockwood Trade Journal Co., Inc., *Lockwood's Directory of the Paper and Allied Trades, 1943* (1208 pp.; New York, 1942), pp. 69-234.

a wedge, its blunt end resting against the coast of Virginia and northeastern Carolina, its point inserted into the southeastern border counties of West Virginia. This wedge, together with the isolated group of producing counties in southeastern Carolina which are really part of a pulpwood region extending from farther south, comprise the main pine territory. The other area centers in western North Carolina, with a gradually thinning extension west and north into Tennessee and Kentucky. This is the main hardwood and chestnut territory.

#### THE CONTRACTOR SYSTEM

Pulp mills in the Appalachian Region buy nearly all their supplies of wood through a formal contract system. Each mill has a group of regular contractors<sup>9</sup> to cover its procurement area, each contractor being assigned a definite territory such as a county or group of counties and, in the case of shipments by railroad, definite loading points. The mill holds its regular contractors on a more or less permanent basis, renewing its agreements with them each year. Good contractors are in demand, and a mill strives to retain such contractors, keeping them busy and satisfied and discouraging their affiliation with other wood users. In times of rising production, when procurement areas are being expanded or procurement operations intensified, competition among users for the services of good contractors may be brisk. Even in other times such competition tends to persist because users desire to hold in readiness an efficient purchasing system, with agents whose full time can be called upon if necessary. In areas of overlapping timber sheds, however, a single man may sometimes be found who holds contracts with as many as half a dozen users. This arrangement may work efficiently in a territory of mixed forest stands where an agent contracts with several different types of wood users — for example, a kraft pulp mill, a soda pulp mill using soft hardwoods, a wood-distillation plant, and a chestnut-extract plant. Under these conditions full and balanced utilization of timber on individual tracts may result, and a favorable opportunity exist for forest management. However, in periods of heavy de-

<sup>9</sup> The term *jobber* is sometimes used as the equivalent of *contractor*. P. L. Buttrick, *Forest Economics and Finance* (xviii + 484 pp.; New York and London, 1943), p. 22.



mand the arrangement may, it will be seen, react to the disadvantage of timber owners.

The contract between user and agent specifies the kind of wood to be furnished, the amount, the time or period of delivery, the place of delivery or shipment, the conditions of shipment, the price, and the conditions of payment. The contract may specify the conditions under which the timber is to be cut — but it rarely does, except for conditions affecting the quality of product. The price is given per unit of wood loaded on railroad cars at the specified siding, or delivered by truck and stacked in the user's yard.

The contractor's job is to obtain the wood demanded by his contract and arrange for it to be prepared, trucked to the railroad, and loaded on cars ready for shipment — or trucked directly to the mill and piled in the yard. The contractor may buy standing timber by the boundary or by unit of measure and hire cutters to prepare the wood and pile it at a truck landing. Or he may buy prepared wood at the landing in case the owner prefers to arrange for the cutting himself. In these cases he hires truckers to take the wood to railroad or mill, or he may engage in the trucking business himself. In other cases he may buy wood loaded on cars or delivered at the mill, the owner himself handling all the steps in harvesting and transportation up to that point. Finally, as an important variation of this last scheme, he may enter into a contract with someone to obtain and deliver a stated quantity of wood for him at a stated price. He may go so far as to divide his territory and execute subcontracts with agents in all the sub-divisions, himself not engaging directly in procurement activities. These agents are then fully constituted contractors, and go about obtaining wood in the ways just described, including contracting, in turn, with still other agents. At least as many as five layers of contractors may be built up in this way. The contractor pyramid tends to grow and shrink with the rise and fall in volume of wood consumption by mills and plants. In normal times two or three layers of contractors are common.

The contractor negotiates his own price for the wood he buys. The maximum that he may pay is determined by his costs and by the price he has agreed to receive from his contractor or from the mill. The minimum that he may pay is determined by the seller's

resistance. The final price is arrived at through individual negotiation, with the seller in most cases in an inferior position as regards knowledge of the product and of the market. Contractors who execute subcontracts generally regard at least a fifty-cent-per-unit margin or "cut" as essential for themselves, and this margin has apparently become the standard minimum in many places. First-line company contractors, however, especially in times of high prices, may set aside a margin of a dollar or more.

In addition to their dealings with their regular contractors, wood users may grant contracts to others. Such contracts are often made with timber owners who wish to sell directly to the mill. The agreement covers only the quantity of wood immediately available on the owner's tract. In some cases wood can be sold when delivered to a mill without prior contract, but in usual times mills discourage this practice since it may result in loss to all concerned through cutters' failure to understand or follow the specifications that the mill requires. Apparently where a mill buys from other than its regular contractors, it customarily pays less than the standard contract price, setting aside the usual margin, which is then turned over to the contractor from whose territory the wood was cut. The justification for this practice is allegedly that the price paid by the mill to its contractors represents payment not merely for wood but also for a number of valuable services (see below). The sporadic seller provides only wood and so is entitled only to the price for wood, not including the margin for services. While this margin might be retained by the company, it is passed on to the regular contractor to maintain the integrity of his territory and keep his good will.

The contractor system exists by virtue of the advantages it offers to wood users: (1) It permits a company to plan its wood procurement and have maximum assurance of receiving required raw materials on schedule. (2) It simplifies procurement, allowing the company to deal with a limited number of fairly large producers, shifting to others the burden of negotiating with the multitude of small owners who provide the ultimate supply. (3) It guarantees a reasonably uniform product, prepared according to specifications. (4) It takes advantage of the knowledge and experience of local men with procurement conditions in their own territories. (5) Through all these means it enables a company to

budget its procurement costs more accurately than would otherwise be possible. (6) It obviates the labor difficulties that might arise if the company itself were to enter the procurement business and hire woods workers and truckers. (7) It relieves the company of the burden of insuring compliance with the various state and federal labor and social security laws. In some cases the cost of complying with these laws is reduced where woods work or trucking is carried on by subcontractors operating on a very small scale. (8) It frees the company of concern over the question of title to the timber procured. The burden of proving title rests with the contractor. (9) It reduces procurement costs, not only because of the efficiencies and savings mentioned, but also because it takes advantage of the willingness and opportunity of many persons to undertake a part-time, supplementary enterprise at a lower rate of remuneration than they would demand if that enterprise were their major occupation. (10) It possibly tends to reduce wood costs by fostering conditions favorable to low stumpage values. This, however, remains to be demonstrated. It will be a subject for discussion in what follows. (11) It allows wood users to shift the social responsibility entailed in timber procurement.

#### NEGOTIATIONS BETWEEN MILL AND CONTRACTOR

Pulpwood marketing falls logically into two divisions: negotiations between users and contractors and negotiations between contractors and timber owners. In considering the first of these divisions, the questions of price and of competitive structure of the market are of chief interest.

#### GENERAL CONSIDERATIONS OF PRICE

A complete analysis of mill prices would involve some investigation of the place of raw-material and procurement costs in the general cost of producing pulp and paper products. This study will not be undertaken here. It is interesting, however, to note that the cost of wood does not represent a large proportion of the total cost of producing pulp. At \$6 per cord, southern pine pulpwood probably represents less than 15 per cent of the cost of sulphate pulp at \$65 per ton. At \$10.50 per cord, wood represents less than 20 per cent of the cost of pulp at \$85 per ton. Percent-

ages for most other types of pulpwood in the region are about as low. This condition would tend to make the demand for pulpwood fairly inelastic.

Incentives on the part of the pulp industry to obtain its raw material cheaply are, however, amply strong. In discussing the problems of the kraft pulp mills using southern yellow pine, Mr. Matthew Rue states that the products of these mills "are all in the low price class of paper and will not admit high costs. This branch of the industry is likewise very highly competitive, and because of the recent expansion there is likelihood of an overproduction, further affecting the price of the finished product for some years ahead." He explains further that initial plant investment is high and operating costs during the early period of development are great, and particularly at this time "the wood procurement division is usually under considerable pressure to hold down costs," and he adds that "as this pressure comes down the line of management it naturally increases, assuming that each man is trying to efficiently execute the duties assigned to him, until it reaches the individual dealing directly with landowners. . . ." <sup>10</sup>

From the user's standpoint, price functions as a major regulator of the quantity of wood procurable. An increase in price operates in two ways to permit procurement of more wood: it allows the timber shed to be enlarged and it makes possible more intensive procurement activities within the old shed. The latter change results, first, from the increased margin afforded contractors, giving them an incentive to step up their purchasing efforts while offering owners the same price as before. These augmented efforts take the form of increased time and energy devoted to the job by first-line contractors or of a widening of margins of the lesser contractors or of a lengthening of the whole contractor system by the addition of new layers. Second, increased production of wood results from the offer of a higher price to timber owners.

Presumably wood users negotiate the lowest price that will stimulate production of needed supplies. The extent of the change in price necessary or possible to permit required changes in production — that is, the elasticity of supply — depends chiefly on three

<sup>10</sup> Association of Southern Agricultural Workers, *Forestry in Relation to Agriculture, Papers Delivered before the Forestry Section of the Association, Atlanta, Georgia, February 2, 3, 4, 1938* (40 pp., processed; Washington, 1938), pp. 26-27.

factors: (1) the resistance of timber owners to buyers' offers — owners' supply schedules; (2) the resistance of contractors, in the light of the foregoing, to doing business with pulpwood users; and (3) the competition of other users — that is, the character of their demand schedules in each locality.

The first consideration belongs to the discussion of the prices paid to owners, and will be postponed to that place. The second consideration, that of contractors' resistance, has two aspects: (1) There is some resistance arising from the disutility of procurement work in general. (2) There may be additional resistance toward work with one particular user arising from the existence of alternative work with another user. The first aspect lies behind the contractor's supply schedule where a single demander occupies the field. The second has to do with the effect upon that schedule of the demand schedule of additional, competing users. The second aspect belongs to the question of users' competition. About the first, only this will be said: However great the innate resistance of a contractor, that resistance is still appreciably lessened as the resistance of subcontractors and owners is lessened. That is to say, it is the margin upon which he operates rather than the gross price he receives that determines a contractor's response. Therefore this must be kept clearly in mind: The nature of mill prices cannot be fully understood until the character of negotiations among subcontractors and owners is evaluated. Even though all conditions relevant to price determination on the user-contractor level point to existence of a reasonably efficient market, the existence of a maladjusted situation on the subcontractor-owner level will offer presumption that the mill price is itself distorted.

#### COMPETITION AMONG PULPWOOD USERS

Some mills consume only pine; others, only certain kinds or groups of hardwoods; a few mills use a variety of woods in the same plant. But these kinds of wood are separately processed; each carries its own price; and even in areas of mixed forests the competitive situation is distinct for each kind of wood.

Of the 161 counties where pine pulpwood was produced in 1940, 105, nearly two-thirds, had access to but one mill in the sale of their wood. Only thirty-four counties had outlets to two

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Of the 161 counties where pine pulpwood was produced in 1940, 105, nearly two-thirds, had access to but one mill in the sale of their wood. Only thirty-four counties had outlets to two

competing mills; eighteen to three mills; three to four mills; and one county lay within the timber sheds of five different competing mills consuming pine pulpwood. It appears that in the case of this particular product a large part of the producing territory was without benefit of competition among pulp mills. From the standpoint of the individual mill this lack of competition is actually understated, since the five-state territory considered includes the competitive periphery of the timber sheds of outside mills, but excludes the noncompetitive interior of those sheds.

A question, now, is whether the existence of a large, noncompetitive procurement area tends to depress the price of pine pulpwood within that area or within the entire region of pulpwood procurement. Pertinent considerations, here, are competition from users other than pulp mills and the nature of the price structure within timber sheds. To consider the quantity of pulpwood obtained by mills from the various categories of counties, first, may throw some light on this question.

About 46 per cent of the pine pulpwood produced in 1940 for the use of the region's mills was produced in counties having an outlet to only one mill. About 26 per cent of the wood was produced in two-mill counties; and 28 per cent in counties with outlets to three or more mills. On the face of it, this is a more competitive situation than reflected by the figures on number of counties, but it must be borne in mind that the product of the more competitive counties is divided among a greater number of mills, and therefore the fact that these competitive counties produced more than their share of the wood does not necessarily mean that the individual mill concentrated its purchases in competitive counties. This question can be answered only by calculating the volume of production per mill in each category of county. Before doing this, however, it will be interesting to observe how the quantity of wood procured in each category varies from mill to mill.

In Table 16 the percentage of total pine procurement obtained in 1940 from one-mill counties, from two-mill counties, and so on is given for each of the region's nine pulp mills using pine. For each mill a competition rating is calculated by striking an average of the number of mills buying from the counties in its timber shed, weighted by the volume of procurement from those counties. A rating of 1 indicates that a mill's timber shed is not en-



tered by any other competing pulp mills purchasing the type of product in question. Higher ratings indicate successively greater degrees of encroachment by competing pulp mills. Mills are arranged in order of increasing degree of competition in their timber sheds, based upon this index.

There is marked correlation between the size of mills, as measured by their twenty-four-hour rated capacity, and their competitive position (Figure 7). The larger mills are consistently freer from competition in their pine timber sheds than are the smaller mills, expressing this freedom from competition in terms

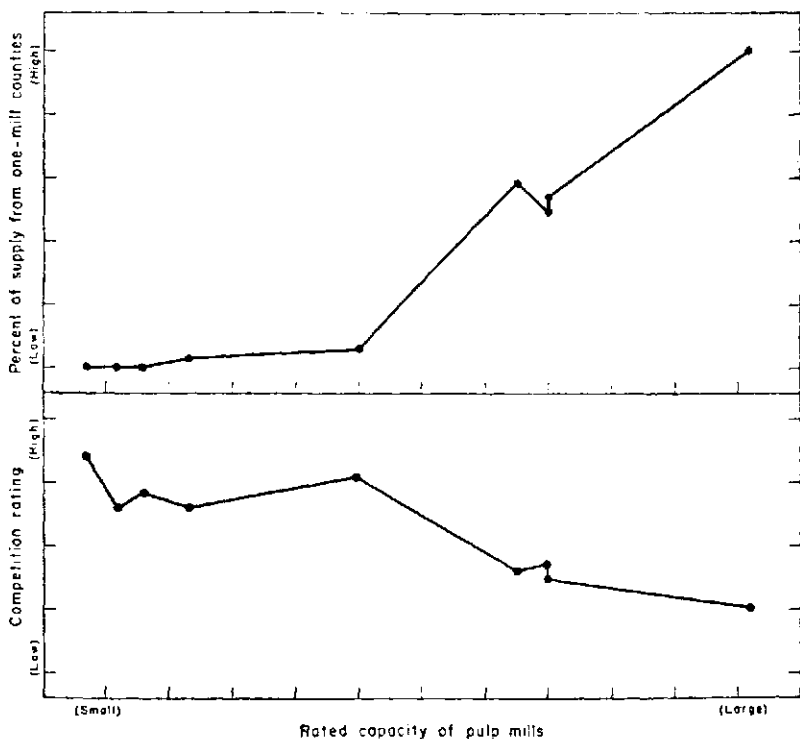


FIGURE 7  
RELATION OF COMPETITIVE POSITION IN PINE PROCUREMENT  
TO SIZE OF PULP MILLS, APPALACHIAN REGION, 1940

either of the competition rating or of the percentage of wood obtained from one-mill counties. The existence of this phenomenon immediately suggests the possibility of a depressed price in the user-contractor market for pine pulpwood. Large mills, which buy a controlling share of the wood produced, are apparently in a position to influence the general price downward. Further, the incentive to reduce price is potentially a significant influence with the larger mills, since they tend to labor under a price disadvantage arising from the greater size of their procurement areas.

TABLE 16  
COMPETITIVE POSITION IN PINE PROCUREMENT BY  
PULP MILLS, 1940

MILL	PER CENT OF PURCHASES FROM COUNTIES SELLING PINE PULPWOOD TO					Any number of mills	COMPE- TITION RATING OF MILL
	1 mill	2 mills	3 mills	4 mills	5 mills		
#1	100.0					100.0	1.0
#2	55.1	40.4	3.8	0.7		100.0	1.5
#3	59.1	23.6	15.8		1.5	100.0	1.6
#4	50.9	36.1	9.7	0.1	3.2	100.0	1.7
#5	2.7	50.1	27.7	19.5		100.0	2.6
#6		46.9	50.3		2.8	100.0	2.6
#7		49.4	18.0	32.6		100.0	2.8
#8	5.6	13.5	60.8	6.9	13.2	100.0	3.1
#9		7.2	44.2	45.1	3.5	100.0	3.4

It is not, therefore, to be expected that the average price paid by mills would show positive correlation with size. In fact, some negative correlation is to be expected, if only as a result of the greater size of large mills' timber sheds. The dominant influence here is that of railroad-wood prices; but the prices of wood hauled by truck are necessarily closely tied to railroad prices. Moreover, the existence of some degree of competition (except in the case of one mill) on the periphery of timber sheds tends to align prices at the periphery.<sup>11</sup> The question is not one of the mill-to-mill variation in price but of the general level of user-contractor prices at the periphery. In the present study the existence of depressing influences upon this price must remain merely a presumption.

<sup>11</sup> Some attention will be devoted below to the question of price variation within the timber shed other than that associated with transportation costs.

In the field of hardwood pulpwood the presumption of depressing, uncompetitive influences is less clear, if not totally lacking. There is, first, a difference between the character of hardwood timber sheds and that of softwood (Table 17).

TABLE 17  
 PRODUCTION OF PULPWOOD IN COUNTIES GROUPED ACCORDING TO  
 NUMBER OF PULPWOOD OUTLETS IN THE COUNTY, 1940  
 PERCENTAGE OF ALL PRODUCING COUNTIES

KIND OF WOOD	COUNTIES SELLING PULPWOOD TO			Any number of mills
	1 mill	2 mills	3 or more mills	
Pine .....	65.2	21.1	13.7	100.0
Hardwood * .....	62.1	34.2	3.7	100.0
Chestnut .....	79.6	18.5	1.9	100.0
PERCENTAGE OF TOTAL PRODUCTION				
Pine .....	45.8	26.3	27.9	100.0
Hardwood * .....	31.8	55.0	13.2	100.0
Chestnut .....	17.8	35.0	47.2	100.0
PRODUCTION IN CORDS PER COUNTY PER MILL				
Pine .....	4,800	4,300	4,400	4,500
Hardwood * .....	700	1,100	1,600	900
Chestnut .....	700	3,100	27,800	2,700

\* Other than chestnut.

While the number of counties with only one outlet for pulpwood is proportionately as high or higher in the case of chestnut and other hardwoods as in the case of pine, the proportion of total production in such noncompetitive areas is much lower. Furthermore, production per county per mill in 1940 showed a much different tendency in hardwoods from that in pine. The typical pine mill obtained about as much wood from each county in its timber shed where it was the only buyer as from counties where other mills were competing for the pine. The average hardwood or chestnut mill, on the other hand, bought more wood per county from counties where other hardwood or chestnut mills were also engaged in buying. Chestnut offers an extreme example of this, purchases being heavily concentrated in the few counties where good, accessible supplies attracted many users.<sup>12</sup>

<sup>12</sup> The statistics are affected by the activities of a few large purchasers concen-

## COMPETITION BETWEEN PULP MILLS AND OTHER WOOD USERS

All pulp mills encounter, in procurement, some competition from other wood users. Asked whether, in procuring raw materials, they met serious competition from other users of wood, representatives of all six of the pine pulp mills in the eastern belt answered in the negative. This was just prior to the entry of the United States into World War II, when procurement activities of nearly all timber users were greatly on the increase. To the same question representatives of six of the eleven mills in the western belt replied affirmatively. Five of these mentioned other pulp mills as major competitors. Three mentioned small sawmills. Other competitors named as offering serious competition were mine-timber buyers, tie manufacturers, and extract plants.

## UNITS OF MEASURE

Two other factors significant to the marketing situation on the user-contractor level will be considered here. The first is the unit of measure used in procuring wood. The second is the transportation and price structure of the timber shed. Both these factors have peculiar significance, also, to the timber owner's dealings with the contractor.

Three units of measure are commonly used by purchasers of pulpwood and allied products. These are the unit of 180 cubic feet of stacked wood, the unit of 160 cubic feet, and the "standard" cord of 128 cubic feet.<sup>13</sup> There is further variation, within these units, of the length of sticks making up the stack, but the variation in over-all cubic contents of the unit is the chief concern. Two of the pine pulp mills employ the 180-foot unit. Most of the remaining pulp mills and extract and distillation plants use

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trated in the Blue Ridge of western North Carolina and eastern Tennessee. Mills to the west and north were not subjected to as extreme a competitive situation. However, these other mills were confronted with a problem of sparser supply, and with the same, or greater, order of competition from wood users other than pulp mills.

<sup>13</sup>The following report of state legislation appeared in the *Raleigh News and Observer* of June 8, 1944: "Effective September 6, all pulpwood sold in North Carolina must be measured by the cord . . . of such dimensions that . . . will equal 128 cubic feet by volume." Pulpwood users are under numerous pressures, legal and otherwise, to standardize their unit of measure, and the actual trend is apparently in that direction.

the 160-foot unit. A few plants use the standard cord. It is often claimed that these various units of measure introduce an element of uncertainty into the marketing scheme from which users may reap a price advantage, and sellers, especially small contractors or owners, a disadvantage.

With the bulk of the industry using the 160-foot unit and prices presumably well geared to that measure, it seems unlikely that any buyer could profit from the use of the standard cord. In fact, resistance to the use of this measure is understandable, and the four-foot stick, which is usually employed with the standard cord, is in some ways less economical than the five-foot stick that ordinarily forms the basis of the 160-foot unit. This unit, on the other hand, is often called a "cord" by purchasers, which may, to the minds of sellers familiar with cords of smaller size, convey the impression that they are being offered an attractively high price.

The 180-foot unit, certainly, may be confusing and perhaps disadvantageous to sellers in a territory where the customary unit is 160 feet. There may be some question whether, in the price-determining process, proper allowance is made for the fact that the 180-foot unit contains more than 10 per cent more wood than the customary unit. Following is a list of comparable average prices paid for rough southern-pine railroad pulpwood during 1940 by six mills. Two of these mills bought wood by the 180-foot unit, the other four by the 160-foot unit. The prices are shown first as quoted by the mills in their own units and then converted to terms of the standard cord as a common basis.

	<i>Dollar Price Per Unit</i>	<i>Dollar Price Per Cord</i>
Mills using the 180-foot unit:		
1. ....	6.75	4.80
2. ....	7.50	5.33
Average .....	7.12	5.06
Mills using the 160-foot unit:		
1. ....	7.36	5.89
2. ....	7.50	6.00
3. ....	8.34	6.67
4. ....	8.42	6.74
Average .....	7.90	6.32

Although prices per unit for mills using the 180-foot measure average less than the others, the quotations are at least roughly

comparable. Converted to the cord basis, however, they fall into a distinctly lower group. The eight items in the unit series show less variation than those in the cord series.

#### PRICE STRUCTURE AND TRANSPORTATION

Price structure within the timber shed, and the configuration of price areas, are largely a function of the location of railroad lines and the structure of freight rates.

More than 60 per cent of the wood received by pulp mills in 1940 came to them by railroad. Most of this wood was taken to the siding by truck and hauled from there to the mill by rail. Only a third of the pulpwood procured by mills of the eastern belt, and less than a fourth of that procured by western mills, was brought all the way by truck. Three eastern mills employed for part of their procurement a combination of truck and barge or lighter; wood transported by these means made up about 10 per cent of the total amount transported to all mills in 1940.

The comparatively low cost of railroad transportation accounts for its dominant position. The average cord of wood hauled to mills by rail in 1940 was hauled a distance of nearly 120 miles for a charge of \$2.05, less than two cents per mile. The average haul to the railroad loading point from the woods was twelve miles, and cost \$1.78 per cord — fifteen cents per mile, including loading and unloading the truck. Wood carried all the way to the mill by truck came from an average distance of twenty-three miles at a cost of ten cents per cord per mile, including loading and unloading.

Transportation exclusively by truck is employed to deliver wood cut near the mill. Farther from the mill, trucks are used to bring wood to the railroad, which then carries it the rest of the way. Railroad transportation thus normally involves two loadings and two unloadings of wood, while truck transportation has the advantage of requiring only one loading and one unloading. Truck transportation, however, has the disadvantage that the running cost of trucks of the type ordinarily used is greater than railroad through rates. The tendency, therefore, is for trucks to be used up to that distance where the total extra running cost equals the saving in loading cost.<sup>14</sup>

<sup>14</sup> William A. Duerr, John B. Roberts, and R. O. Gustafson, *Timber-Products*

The location of the economic margin between truck and rail transportation varies from mill to mill. The average truck haul to individual mills varies from less than fifteen miles to more than thirty-five. The truck haul to eastern mills averaged about twenty miles in 1940; to western mills, about thirty miles. On the other hand, the average truck-rail haul to eastern mills was 145 miles; to western mills, 125 miles.

Mills usually arrive at a standard price for railroad wood on cars at the mill, and then offer to pay at each loading point this amount minus the cost of transportation from that point. This, at least, is the usual basic price pattern forming the background for any bargaining that may take place with individual contractors. Sometimes a mill, when expanding into new territory, will offer a premium price at the new loading points, a price greater than the difference between mill price and transportation cost. This practice is frowned upon, because it tends to "spoil the market" and make later price realignment difficult. Such premiums, once established as a temporary expedient, often persist. In many timber sheds price differentials are to be found that are not explainable on the basis of transportation costs alone.

A simple price pattern is illustrated by the timber shed of one wood-processing plant (Figure 8). Here the mill price is \$7.50 per unit of 160 cubic feet. Resulting price zones are almost entirely the outcome of freight rates. The chief procurement territory is that where the local price is \$6.00 or more per unit. Very little wood is bought in the outlying \$5.00 and \$5.50 zones, although the company has contractors in those zones. It is apparent that prices in this timber shed do not conform in any simple way even to transportation distance. The presence of different rail lines with their different rate schedules is one complicating factor. With timber making its initial journey from the woods by truck, the forces governing the flow of wood and the nature of competition are further masked and confused.

The mill price of \$7.50 per unit at this plant is also the price for truck wood. In this case the company in reality pays somewhat less for its truck wood than for its railroad wood, since truckers are obliged to stack their wood in the yard, while in the

case of railroad wood the shipper's obligation is discharged when the car arrives at the plant siding. Different mills may pay either more or less for their truck wood than for their railroad wood; most of them pay less. Prices for truck wood from mill to mill are considerably more variable than those for railroad wood. This is to be expected in view of the fact that a mill's truck territory is, comparatively speaking, its noncompetitive territory. There is considerably more presumption of a depressing influence upon truck-wood prices than upon railroad-wood prices.

#### NEGOTIATIONS BETWEEN CONTRACTORS AND TIMBER OWNERS

Compared to marketing negotiations on the user-contractor level, those on the subcontractor-owner level are more variable and less easily generalized; and the maladjustments, while undoubtedly more serious, are at the same time more difficult to define precisely.

#### DIFFICULTIES OF THE SMALL SELLER

The maladjustments of the lower stages of marketing pulpwood and allied products revolve to a large extent around the fact that a major portion of these types of wood is bought from farmers and other individual owners of small forest tracts. Characteristically, the marketing process is one of transferring title from a multitude of small owners whose primary business and primary interests lie outside the timber market to a few large dealers whose business is the timber market. Nearly three-fourths of all the wood acquired by the pulp mills of the region in 1940 was bought from farmers. The proportions of all wood obtained from various sources in that year were as follows:

	<i>Per Cent</i>
Farm woods . . . . .	72.7
Other private holdings except company lands . . . . .	16.3
Company lands . . . . .	5.5
Public forests . . . . .	5.5
	<hr/>
All sources . . . . .	100.0

Eight mills out of the seventeen within the region owned lands from which they harvested pulpwood, but only two of these mills obtained more than 10 per cent of their total supply from that source, and no mill obtained more than 20 per cent.



Extract plants get a larger share of their wood from public and large private holdings. Distillation plants, on the other hand, buy at least as great a proportion of their requirements from small owners as do pulp mills. Something has already been said regarding the sources of mine timbers.

The handicaps of the small owner as a seller have been discussed elsewhere (pp. 182-193). In marketing pulpwood, some of the small owner's disadvantages are less pronounced than is true in the marketing of some other products, such as saw logs and specialty items. The outlet for pulpwood is definite and usually known; the product is simple and easily prepared and measured.

Nevertheless, it is still true that the seller's unfamiliarity with outlets and products in general puts him at a disadvantage in weighing the merits of a pulpwood sale. Indeed, the ease with which pulpwood may be produced and sold as compared with many other more valuable products is itself a disadvantage, tending to influence the owner in an unprofitable direction. For small trees pulpwood or chemical wood may be the most profitable use, but for larger trees a variety of outlets is usually available, among which pulpwood and allied products may not be the best. This results from the fact that prices of these products have tended to be adjusted in part to the relatively ample supply of small timber suitable for these products; while the prices of saw logs, veneer logs, poles, and other products requiring larger timber tend to reflect the comparative scarcity of large trees.

#### ABUSES OF THE CONTRACTOR SYSTEM

The prominence of small owners in the supply scheme has given rise to the multiple-contractor system. Under existing conditions that system is best adapted to the job of collecting the little parcels of available wood scattered here and there over the countryside. There may, however, be serious question whether so many layers of contractors are needed to perform this economically useful function. Indeed, it seems obvious that the layer arrangement, arising from a definite need for an efficient organization of multiple activities, has grown well beyond the point of necessity, growing simply because there was room to grow — at the expense of the original seller of the timber and of the subcontractors themselves.

The incentive to heighten the contractor pyramid is obvious: If a man can make fifty cents, or even twenty-five cents, a unit by assigning a task to others, taking on an organizational job and being relieved of the exhausting work of tracking down timber owners and bossing woods crews, he may do it even though his own income is reduced. This describes the secular, rather than the cyclical, phenomenon (the latter has been mentioned previously — p. 213). The opportunity to heighten the pyramid so far as sub-contractors are concerned — that is, their willingness to accept a smaller margin — depends partly on the position of contractors' work in the over-all scheme of their employment. The lower subcontractors, especially, may have farming or some work other than contracting as their chief occupation. The need and the incentive to devote time to the more remunerative job (contracting) regardless of its disutility are not so great as they would be were contracting the main enterprise. Finally, the opportunity to heighten the pyramid as far as timber owners are concerned — that is, their willingness to accept a lower return — is a function mostly of the many market imperfections existing on the side of the owner, not least among them his inability accurately to evaluate his return.

The fact has been pointed out that the contractor has much freedom in the prices he may offer owners, being bound only by the price he himself is to receive for the wood, and considerations of his own cost, as an upper limit. This, of course, is a rigid and impelling limit, for, with the wood on his hands, he could scarcely dispose of it in any other way or at any other price than the one agreed upon. The existence of this rigid upper limit, in combination with owners' weaknesses already named, has peculiar significance in boundary sales, the most usual form of transaction in the sale of farm timber and that of other small owners (pp. 190-191).

Depressive influences upon the woods price of pulpwood are presumably counteracted to some extent by competition between the contractor and other buyers of pulpwood and other products. Much that was said under the heading of mill prices regarding competing buyers has application here. Where there are pulpwood buyers representing two or more companies in a locality, some competition does exist, and actual cases have been observed prior to World War II where such competition resulted in a price much

higher than would otherwise have been determined — a price probably close to the reasonably competitive level under the mill price. Further salutary effects result from the activities of other types of buyers, in the range of sizes and kinds of timber where other products are competitors. On the face of it, competition among local buyers is more vigorous than among users. But in the light of the serious imperfections in the local pulpwood market, the presumption that competition, even in competitive areas, is sufficient to bring the price into reasonable line with mill price, is untenable.

One interesting practice observed in the local pulpwood market and not common, it is believed, in other markets, is what may be called "competitive bidding in reverse" or "purchase by default." This system may operate where several buyers cover a single territory. Under the system, one buyer visits an owner and offers him a lump sum for his boundary of pine timber — say, \$400. Soon thereafter a second buyer appears and, after discussing the severity of insect attacks that year and the susceptibility of pine to such attack, offers \$350 for the tract. He is refused, but this form of psychological warfare has already rendered the owner somewhat uneasy. When, after some time, a third buyer appears, talks about the bad fire season and the danger of timber loss, suggests that rot has already caused much damage on the tract and is advancing fast, and then offers \$300, the owner is in a selling mood. The first two buyers now evidencing disinterest, the sale is made to the third. This example of an infrequent practice serves to illustrate the nature of irregularities in the local pulpwood market which make achievement of a satisfactory price level difficult.

Before leaving the subject of pulpwood marketing, it will be well to take one further look at the contractor system, this time with a broader perspective. Analysis suggests that the system is probably associated with price maladjustments. These are a problem in their own right and through their influence on timber management. In viewing this problem, however, one should not lose sight of the other major problems of timber management that stem from pulpwood-procurement systems: the use of much timber for pulpwood that might better have been put to higher use or left standing and, closely associated, the depletion of timber growing stock through abusive pulpwood-cutting methods. These

latter problems, if not more important than the first, are at least distinctive in that it may prove to be in the interest, not of society alone, but of pulpwood users themselves, to correct them.

For pulpwood users to safeguard their large capital investments, the assurance of continuing raw-material supplies is essential. It will be undesirable, and at least for a time impossible, for these users to acquire enough land in fee simple to become self-sufficient. The alternative is dependence upon the open market or at any rate upon the lands of other owners. Any system, such as the contractor system in its present form, which tends critically to deplete these other lands cannot be endured indefinitely. In clinging to all the "advantages" of the present contractor system, pulpwood users are fostering the fatal disadvantage that they cannot take a direct and effective hand in safeguarding their raw-material supplies.

The future, therefore, may well bring a partial solution of the pulpwood-marketing problem in the form of voluntary improvements, by users, of their own procurement systems. In this, they may sacrifice certain legal and tax advantages for an overbalancing gain in long-term business security, and, incidentally, in contribution to the welfare of the region. Such changes may be spurred by a revolt of the more enlightened timber owners, who surely will not remain always indifferent to exploitation.

## CHAPTER VIII

### PROBLEMS IN MARKETING SAWMILL PRODUCTS

#### DESCRIPTION OF PRODUCTS

LUMBER is the chief product to be discussed in this chapter. By lumber is meant all manner of boards and dimension sawed on at least two plane, parallel faces, and of greater than veneer thickness, but excluding such special materials as cooperage stock and ties. Along with lumber are included the many products of re-manufacture, such as planing-mill products and small dimension stock, insofar as it will be necessary and possible to deal here with the marketing of them. The by-products of lumber production — slabs, edgings, ends, sawdust, and shavings — will be ignored. Railroad ties produced by sawmills will sometimes be included with lumber in the statistics; their marketing, however, will be discussed under the heading of yard products.

TABLE 18  
PRODUCTION OF SAW LOGS FOR SAWMILLS IN THE APPALACHIAN  
STATES, BY KIND OF WOOD, 1940  
(in thousands of board feet)

State	All kinds of wood	Softwood	Hardwood
Kentucky .....	402,500	57,700	344,800
North Carolina .....	1,352,100	1,089,000	263,100
Tennessee .....	627,700	218,700	409,000
Virginia .....	1,072,500	723,800	348,700
West Virginia .....	522,200	54,600	467,600
All states .....	3,977,000	2,143,800	1,833,200

About four billion board feet of saw logs for sawmills were produced in the Appalachian Region in 1940 (Table 18).<sup>1</sup> This was more than three-tenths of the total quantity of wood produced in the region in that year.

<sup>1</sup> For sources see footnote 1, Chapter X.

For descriptive purposes, lumber falls into two broad groups: softwood and hardwood, the former comprised chiefly of the various pines, the latter of the multitude of hardwood species that occur in the Appalachian Region. Eastern red cedar, cypress, and some other less important species are sometimes classified with one group, sometimes with the other. From the standpoint of technology, both cedar and cypress resemble the softwoods; in the character of their use, cedar is probably more like members of the hardwood group, cypress is more like a softwood. In their grading and inspection, however, both species are classed with the hardwoods.<sup>2</sup>

It is in their use that these two main groups of lumber are chiefly distinguished. The major share of softwood lumber is used as boards and dimension, either rough or surfaced, by the construction industry. Softwood lumber used for these purposes is classed as yard lumber (less than five inches thick) and as structural material or timbers (five inches or more in thickness and in width). Only a small proportion of softwood lumber falls into a third class, called factory and shop lumber, which is used by secondary woodworking plants for remanufacture into matched, shiplapped, and patterned lumber and into various wooden articles.<sup>3</sup>

Hardwood lumber, on the other hand, is used very largely as raw material for further manufacture. It is a basic substance used in producing furniture, cars, flooring, fixtures, handles, and many other producers' and consumers' goods. The United States Forest Service and Census report on lumber used in manufacture in 1940<sup>4</sup> lists more than forty broad categories of manufactured goods produced from native hardwood lumber. The quantity of domestic hardwood lumber used for manufacture in the five Appalachian states in 1940<sup>5</sup> was close to 100 per cent of the total

<sup>2</sup> National Hardwood Lumber Association. *Rules for the Measurement and Inspection of Hardwood Lumber, Cypress, Veneers and Thin Lumber* (104 pp.; Chicago, 1942), p. 4.

<sup>3</sup> U. S. Dept. Agr., Forest Service, Forest Products Laboratory, *Wood Handbook* (326 pp., rev.; Washington, 1940), p. 80.

<sup>4</sup> Ralph W. Marquis, *Lumber Used in Manufacture, 1940, Part I* (48 pp.; Washington, 1941), p. 5.

<sup>5</sup> Marquis, *Lumber Used in Manufacture, 1940, Part II* (113 pp.; Washington, 1941).

domestic production of hardwood lumber distributed to primary distributors within those states in that year.<sup>6</sup> The comparable figure for softwood lumber was only about 20 per cent. While neither of these percentages has absolute validity, the comparison between them is of some interest in suggesting the wide difference in manner of use between softwood and hardwood lumber.

#### CHARACTERISTICS OF LUMBER WITH REFERENCE TO MARKETING DIVERSITY OF MARKETING CHANNELS

Differences in the use of softwood and hardwood suggest parallel differences in marketing. Softwood lumber follows in its distribution those channels that lead to the retail lumber yard and the building trade. Hardwood lumber is channeled principally toward the secondary wood-using industry, where it is converted to forms that may permit of much product differentiation and where, consequently, the elements of monopolistic competition may enter strongly into the marketing picture.

Another major division of lumber is based upon the degree of its manufacture and grading. Lumber in rough form — that is, unsurfaced — may be manufactured solely to meet local demand. Such lumber may be sold by the producer in small quantities direct to ultimate consumers. This local lumber — both softwood and hardwood, and sometimes unsorted as to species — is used principally for construction, farm repair, and similar uses. Contrasted with local lumber is grade lumber. This is often remanufactured at some stage in its distribution and, after sorting and grading, has access to the channels of the national lumber market.

The particular species and quality of lumber have much to do with the channels through which the lumber is marketed. This is chiefly a matter of suitability for various uses. In part, however, it is a matter of transportation costs as related to market values; and in part a matter of the relative location of producing and consuming centers.

#### STRATEGIC IMPORTANCE OF LUMBER GRADES

The diversity of lumber as a commodity has further important implications to marketing. Not only do the different species and

<sup>6</sup>R. V. Reynolds and A. H. Pierson, *Lumber Distribution and Consumption*, 1940 (19 pp., processed; Washington, 1942).

forms of lumber differ in their qualities as goods, but lumber of a given species and size and finish varies greatly in respect to those mechanical and aesthetic qualities that the market recognizes as significant. The Southern Pine Inspection Bureau of the Southern Pine Association lists the following "characteristics and causes for grade limitation" in pine lumber: <sup>7</sup>

Checks	Pitch	Splits
Decay	Pitch pockets	Stain or discoloration
Holes	Pitch streaks	Wane
Knots	Pith	Warp
Mis-manufacture	Shakes	

Such characteristics are sometimes classed as (1) defects (departures from an "accepted standard of perfection, which may lower strength, durability, or utility values" of lumber) and (2) blemishes (which affect appearance).<sup>8</sup> Lumber sawed from a single tree or a single log exhibits great variability with respect to these characteristics upon which quotations are based in the market.

Since for all except strictly local transactions purchase of lumber by inspection is usually out of the question, and since variability and transportation difficulties preclude the possibility of sale by sample in the accepted sense, sale by description is necessary in all but the local market, and this calls for establishment of grades.

Most hardwood, cypress, and red-cedar grade lumber is graded under the rules of the National Hardwood Lumber Association. Other manufacturers' associations, however, have established rules for grading special products of hardwood lumber: the Hardwood Dimension Manufacturers Association for hardwood dimension; the Hardwood Interior Trim Manufacturers Association for hardwood interior trim; the Maple Flooring Manufacturers Association for sugar maple, beech, and birch flooring; the Oak Flooring Manufacturers Association of the United States for oak flooring.<sup>9</sup> The rules of the National Hardwood Lumber

<sup>7</sup> Southern Pine Association, *Standard Specifications for Southern Pine Lumber* (iv + 116 pp.; New Orleans, 1939), p. 2.

<sup>8</sup> John G. Glover and William B. Cornell, eds., *The Development of American Industries*, rev. ed. (xxviii + 1005 pp.; New York, 1941), p. 115.

<sup>9</sup> H. S. Betts and R. K. Helphenstine, Jr., *How Lumber Is Graded* (U. S. Dept. Agr. Cir. 64, rev.; 48 pp.; Washington, 1933), p. 3.



Association call for and describe eight "standard grades" of hardwood lumber: firsts, seconds, selects, no. 1 common, no. 2 common, sound wormy, no. 3A common, and no. 3B common. These rules and their descriptions are then modified in a greater or less degree in their application to each of the more than eighty different species and classes of stock recognized by the association.<sup>10</sup> In most hardwood rules, since the lumber is intended for remanufacture, the grade classification is based upon the proportion of clear, usable lumber in the piece, and not upon the number or size of defects present.<sup>11</sup>

"Softwood lumber, unlike hardwood lumber, is graded under a number of different association rules. Not only are the different kinds of softwoods graded under different rules, but the same softwoods in a number of cases are graded under different association rules."<sup>12</sup> Lumber from the yellow pines is graded chiefly under the rules of the Southern Pine Association;<sup>13</sup> white pine and spruce, under those of the former Northern Pine Manufacturers Association;<sup>14</sup> hemlock, the Northern Hemlock and Hardwood Manufacturers Association.<sup>15</sup> These rules conform in principle to the "American lumber standards" developed some years ago in the interests of improving and simplifying an immensely complicated grading situation, under the auspices of the United States Department of Commerce.<sup>16</sup> According to the procedure suggested by these standards, yard lumber is divided into nine grades: A, B, C, and D select, and nos. 1, 2, 3, 4, and 5 common, based upon freedom from defect and blemish in the entire piece. The grading of structural lumber is based upon the strength and use of the entire piece. Factory or shop lumber, intended for remanufacture, is graded according to the proportion of each piece that will yield acceptable cuttings.<sup>17</sup>

<sup>10</sup> National Hardwood Lumber Association, *Rules for the Measurement and Inspection of Hardwood Lumber*.

<sup>11</sup> Betts and Helphenstine, *How Lumber Is Graded*, p. 3.

<sup>12</sup> U. S. Dept. Agr., Forest Service, Forest Products Laboratory, *Wood Handbook*, p. 77.

<sup>13</sup> Southern Pine Association, *Standard Specifications for Southern Pine Lumber*.

<sup>14</sup> Betts and Helphenstine, *How Lumber Is Graded*, p. 26.

<sup>15</sup> *How Lumber Is Graded*, p. 25.

<sup>16</sup> U. S. Dept. Agr., Forest Service, Forest Products Laboratory, *Wood Handbook*, p. 77.

<sup>17</sup> Glover and Cornell, *Development of American Industries*, p. 116.

From what has been said about lumber grades, it is possible to recognize that the job of grading lumber is not a simple matter. General proficiency in grading is achieved only after much training and experience and must be maintained through practice. A competent understanding of grades is apparently too much to expect of any but the largest local producers and handlers of lumber. Indeed, observation suggests that many full-time graders employed by the larger producers and dealers of the region perform their functions in only mediocre fashion.

Aside from the task of comprehending the grades themselves, the recognition of grade in the case of borderline pieces is especially difficult and is reduced in the last analysis to a matter of judgment. Most lumber associations maintain a staff of licensed inspectors in the principal markets, whose judgment of grades sets the standard for the industry. The services of these inspectors are available at an established fee to members of the association and in some cases to outsiders. Where the quantities and values marketed justify it, a seller or buyer may obtain a guaranteed inventory of grades on his shipment, vouched for by the official association inspector. It is recognized, however, that even such first-class inspectors may exhibit some differences in interpretation of the grades.<sup>18</sup> The National Hardwood Lumber Association assumes no liability for errors or variations in official grading amounting to 4 per cent or less of the value (according to the original inspection) of a shipment, as determined by an official reinspection.<sup>19</sup> The Southern Pine Association states, with respect to its grading specifications, that

no arbitrary rules for inspection of lumber can be maintained with satisfaction. The variations from any given rule are suggested by practical common sense; nothing more definite than the general features of different grades should be attempted by rules of inspection. The grading of lumber cannot be considered an exact science, because it is based on a visual inspection of each piece, and on the judgment of the grader. The provisions of these specifications, however, are sufficiently explicit

<sup>18</sup> Ralph C. Bryant, *Lumber: Its Manufacture and Distribution*, 2nd ed. (xxiv + 535 pp.; New York and London, 1938), p. 349.

<sup>19</sup> National Hardwood Lumber Association, *Rules for the Measurement and Inspection of Hardwood Lumber*, pp. 9-10.

to establish 5 percent below grade as a reasonable variation in judgment between inspectors and graders.<sup>20</sup>

The difficulty and specialized character of lumber grading, together with the fact that attendant uncertainties emphasize the role of official association inspection service, are of strategic importance in lumber marketing. They are among the chief factors isolating the small producer from the general market — creating a marked disadvantage in this market for a region of small-scale production. Such a region, in order to reach out to any distance with its products, must create special means for local concentration of these products and must even then operate under a pronounced handicap.

#### THE SAWMILL IN LUMBER MARKETING

The sawmill is the focal point of the local lumber market. It is the first point of concentration for saw logs emerging from the woods. In the case of some of the largest mills and many smaller ones the market for the products of which is strictly local, the mill is also the chief concentration point in marketing, the process of dispersion beginning when the products leave the yard. In most cases, however, further concentration takes place beyond the sawmill stage.

For a number of reasons besides its strategic position in the physical movement of products, the sawmill is a key to marketing conditions and problems. Sawmill technology determines to a considerable extent the economic availability to the market of much timber which, for one reason or another, lies near the economic margin. The sawmill, as the primary processor, is responsible in great measure for the kinds and qualities of material produced for the market. The question of the mechanical suitability of the sawmill to produce what the market demands is often of great moment and implies a first-rank problem allied to marketing. The sawmill owner or operator is also a market functionary, his functions often beginning with the purchase of standing timber; and his personal capacity and efficiency bear closely upon the problems, not only of milling, but of marketing as well. Finally

<sup>20</sup> Southern Pine Association, *Standard Specifications for Southern Pine Lumber*, p. 9.

the economics of sawmill operation — costs, operating period, supplementary relationships, and labor — have the greatest significance to market supply and price. Some of these matters will be considered subsequently in more detail.

In 1942 there were about 11,300 sawmills operating in the Appalachian Region (Table 19).<sup>21</sup> This number was close to three-tenths of all active sawmills in the United States. Census data for the year 1942 indicate that Appalachian mills produced 13 per cent of the national lumber output. They produced less than 9 per cent of all softwood lumber, but 31 per cent of all hardwood.<sup>22</sup>

It is important to understand the character of these Appalachian sawmills. To think of them as 11,300 industrial plants, in any accepted sense, would be a misconception. About 8,500 mills — three-fourths of the total number — are very small mills, with typical average daily output of 2,000 to 4,000 board feet (Table 19). A great many of them are owned and operated by farmers. As farm equipment they have a status somewhat like that of the farm tractor or threshing machine. They are equipped, for the most part, only with the bare essentials for sawing lumber: carriage, feed works, circular saw, and a source of power. Many of them are in poor condition and inexpertly operated on a part-time basis; and they produce, on the whole, a low quality of unfinished material.

A great many of these smallest mills are used by farmers chiefly to produce a little repair lumber to fill the year's needs, or to "custom-saw" some logs for their neighbors. In the piedmont counties of Virginia it was found that in 1940, 52 per cent of all mills with daily output of 1000 to 2000 board feet, and 20 per cent of mills with output from 3000 to 5000 feet — an average of 25 per cent for both groups — were "custom mills," one-third or more of whose output was custom lumber.<sup>23</sup> The greatest share of

<sup>21</sup> Ardie D. Toler, *Preliminary Estimate of 1942 Lumber Production in the Carolinas, Virginia, West Virginia, Kentucky, and Tennessee* (Appalachian For. Exp. Sta., Forest Survey Release 14; 27 pp., processed; Asheville, N. C., 1943).

<sup>22</sup> U. S. Dept. Commerce, Bureau of the Census, *Census of Forest Products, 1942; Production of Lumber, Lath and Shingles, Average Selling Value and Estimated Stocks of Lumber* (28 pp., processed; Washington, 1944), p. 6.

<sup>23</sup> William A. Duerr, T. C. Evans, and G. E. Morrill, *The Forest Situation in Piedmont Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 13; iii + 83 pp., processed; Asheville, N. C., 1943), p. 31.

TABLE 19  
 DESCRIPTIVE SUMMARY OF OPERATING SAWMILLS IN THE APPALACHIAN  
 STATES, BY SIZE CLASS OF MILLS, FOR THE YEAR 1941  
 MILLS PRODUCING 1 TO 49 THOUS. BD. FT. IN THE YEAR

Item of mills	All states	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Number	1,930	713	605	555	613	444
Avg. days operated	11	11	9	10	11	14
Thous. bd. ft. produced						
Avg. per day	2	2	3	2	2	2
Total in the year	64,245	15,179	13,926	11,640	13,221	9,279
MILLS PRODUCING 50 TO 499 THOUS. BD. FT. IN THE YEAR						
Number	5,575	906	1,585	1,016	1,204	864
Avg. days operated	55	54	52	49	56	66
Thous. bd. ft. produced						
Avg. per day	3	3	4	4	3	3
Total in the year	1,029,144	147,956	314,824	187,551	228,784	150,029
MILLS PRODUCING 500 TO 999 THOUS. BD. FT. IN THE YEAR						
Number	1,600	157	575	280	454	134
Avg. days operated	128	127	127	118	132	145
Thous. bd. ft. produced						
Avg. per day	5	5	5	6	5	5
Total in the year	1,099,675	106,946	395,311	189,791	317,896	89,731
MILLS PRODUCING 1,000 TO 4,999 THOUS. BD. FT. IN THE YEAR						
Number	1,713	80	462	155	328	88
Avg. days operated	186	178	181	186	189	212
Thous. bd. ft. produced						
Avg. per day	9	10	9	9	8	9
Total in the year	1,815,423	138,340	752,657	249,336	516,054	159,036
MILLS PRODUCING 5,000 THOUS. BD. FT. OR MORE IN THE YEAR						
Number	72	7	27	13	9	16
Avg. days operated	255	292	238	254	262	264
Thous. bd. ft. produced						
Avg. per day	39	29	35	33	58	44
Total in the year	712,596	59,574	214,165	107,907	135,643	185,307
ALL MILLS						
Number	11,290	1,863	3,254	2,019	2,608	1,546
Avg. days operated	70	51	79	59	79	71
Thous. bd. ft. produced						
Avg. per day	6	5	7	6	6	5
Total in the year	4,721,083	467,995	1,700,883	747,225	1,211,598	593,382

the output, however, even of the very smallest mills, is produced for sale. Mills of this smallest type account for 23 per cent of the lumber production in the region.

Mills in the next larger group, with typical average daily output of 5000 or 6000 board feet, are possibly somewhat better mills from the standpoint of technology. They are, at least, more completely equipped than the smallest mills. They produce almost

entirely for market. This class of mills is often combined with the smaller classes into a group designated as "small sawmills," and a considerable literature on the subject of these small mills has been produced. Telford, in 1936,<sup>24</sup> cited more than sixty references to the technology and economics of small-mill operation. Small mills, in this sense, accounted for 90 per cent of the total number of sawmills and 46 per cent of the lumber production in the Appalachian Region in 1942. The chief characteristics of this class of mills are their flexibility of operation (portability, low capital investment, and part-time operation and employment of labor on a supplementary basis) and their susceptibility to the ills of technical inefficiency.

The larger mills, with typical average daily output of 8,000 to 10,000 board feet or more, are more permanently located, operate on more nearly a full-time schedule, and, generally speaking, may be designated as industrial plants in an accepted sense. The volume of production of the largest units is such that they may efficiently enter the general market and may compete on equal terms with large suppliers of lumber in other regions. Their numerically minor position, however, gives them relatively small weight in the consideration of lumber-marketing conditions in the Appalachian states.

Indeed, large sawmills, in the sense of mills with typical average daily output of 15,000 to 20,000 board feet or more and producing at least 5 million board feet annually, are found in significant numbers only in West Virginia and in the coastal plain of North Carolina and southeastern Virginia (Figure 9).

So far, then, as the sawmill's place in marketing is concerned, it is chiefly the small mill that interests us in the Appalachian Region. The small sawmill has a number of characteristics of significance to marketing. These characteristics might well be considered separately for softwood and hardwood operations, for the two species groups are just as different with respect to their manufacture and marketing as with respect to their uses. Such a separation of softwood and hardwood will not be followed here, but it will be well to bear in mind the following points here and

<sup>24</sup> C. J. Telford. *Operating Small Sawmills, Methods, Bibliography, and Sources of Equipment* (40 pp., processed; U. S. Forest Products Laboratory, Madison, 1936), pp. 17-20.

throughout this chapter. First, hardwood logging, manufacture, and marketing are, or at least are subject to being, far more specialized operations than is true of softwood. Differences in skill can make much greater differences in value and net return in hardwood than in softwood. Second, it follows that the small casual operator has greater handicaps in the hardwood field than in pine, and may create greater social losses. The archetype of successful hardwood operations is the large plant with good equipment, skilled workers, and diversified outlets. Third, because the net value of hardwood is so sensitive to everything that is done to the tree from the moment the axe is first applied to it, and to the log from the moment the saw enters it, the concentration yard-small mill setup has never succeeded in taking over the hardwood field, as it has the pine field, as a substitute for the archetype operation.

Since it can be moved readily and set up almost anywhere, the small mill is customarily taken directly to the site of a logging operation, and lumber sawed out on the spot. This greatly reduces transportation costs and favors the exploitation and marketing of timber from relatively inaccessible areas. One thousand board feet of lumber in the log weighs half again as much as one thousand feet of green sawed lumber, and three times as much as the same quantity of dry lumber, and at the same time is considerably more bulky.

The practice of taking the mill to the raw material derives its advantage in some measure from the fact of heavy waste in manufacture. Low utilization of raw material, wasteful use of manpower and capital, and the small portable mill as we know it are three segments of a vicious circle.

The out-of-pocket cost of operating a small sawmill is typically low. The cost of the mill itself is small, particularly when it is purchased second-hand and powered with some makeshift unit like an old automobile engine, as is frequently the case. The sawmill operator and his laborers are typically part-time workers; their principal means of livelihood may be something other than sawmilling. Often the mill is operated by a farmer and his family, who turn to this occupation in the off season from farming. Such workers do not expect high remuneration, and the influence of labor unionization upon their wages is quite naturally absent.

The lowness of their costs, taken together with their mobility, puts small mills in a peculiarly advantageous position to operate in timber stands of limited area and low stocking, such as are typical of most of the Appalachian Region. The ordinary small mill can, it appears, operate successfully in timber averaging 1,000 to 1,500 board feet per acre. Operators of such mills will move them and set them up for a prospective total cut of as little as 50,000 board feet, perhaps ten days' operation. Some mills are quite customarily set up for an operation of as little as 25,000 to 30,000 board feet, and in timber running 1,000 board feet per acre; while, in extreme cases, mills have been known to move for only 15,000 board feet and to operate in timber with a volume of only 500 board feet per acre, and that in very small trees. The supplementary character of small-sawmill employment, indeed, is a major factor in the low-cost advantage of such mills. It is the best single explanation of how it is economically possible to operate low-grade equipment and in low-grade timber. It largely explains, for example, the fact that men may be found working in a thin stand of pine of scarcely more than pulpwood size, sawing out little four- and six-inch logs and getting no more than a single two-by-three or two-by-four from each log. The economics of this fact has been persistently disregarded in the many studies that have been made dealing with the relation of tree and log size to logging and milling profit.

The advantages of the small sawmill extend beyond operation in restricted stands of dog-eared second-growth. It is true that large blocks of timber, and particularly of virgin timber, are generally considered to be the proper sphere of the large mill, which in this case can capitalize upon the opportunity for large-scale production, for spreading the cost of capital improvements over a large output, for centralized management of operating and marketing, and for diversified, quality output. Yet exceptional cases are to be found. It is said that when J. N. Natwick, an old-time experienced lumberman, undertook to exploit the timber in the region of Wardensville, West Virginia, during the 1930s, he chose to do the job with fifty-two sawmills, only two of them band mills. This system had the advantage that the small-mill operators were willing to contract for the work at a comparatively low rate of return per unit of output, and that they then had the maximum



incentive to push ahead toward completion of the logging and milling job. The central management thus shifted the responsibility for supervising and administering the woods and mill operations. At the same time some of the advantages of large, unified operation were retained by maintaining a single plant for remanufacture of the rough mill products and, of course, a single marketing organization.

Much has been said about the technical inefficiency of small sawmills. While no general statistics are available with which to prove or disprove that small sawmills are inefficient, much evidence is at hand tending to support such a contention. The inefficiency in question, obviously, is not of a type reflected in high supply prices per unit. Indeed, inefficiency has, in the past, been evidenced rather in low price. Nor is the inefficiency one of scale in the ordinary sense. It appears that under comparable conditions sawmilling is very nearly a constant-cost industry, speaking in terms of the long-run minimum or envelope cost function. The inefficiency of small sawmills is rather a matter of opportunity and social costs of the productive process, that do not become reflected in supply price: a *physical* waste of timber, a waste of equipment and capital, and a waste of labor.

Apparently small-mill equipment is typically inadequate and in poor condition. Setup and operation are frequently faulty. The result is lumber sawed without precision. Telford<sup>25</sup> states that even an efficient small mill cuts only one-fifth of its lumber at the thickness intended, the remainder varying up to  $\frac{3}{16}$ -inch each way from the intended thickness. Regular buyers of small-mill lumber customarily specify  $1\frac{1}{4}$ -inch lumber in order to be assured of getting material at least 1 inch in thickness; the result of this is that some of the boards are as thick as  $1\frac{1}{2}$  inches in places. This stock is then all refinished to a nominal thickness of 1 inch, at a considerable waste of the wood in the log.

Small sawmills are frequently ill-powered or underpowered. Breakdowns and slowdowns from this and other causes are one explanation of the typically low output per day and small number of operating days in the year.

The operators of small sawmills are often unskilled in sawmill technology and in the business of lumber production and market-

<sup>25</sup> Telford, *Operating Small Sawmills*, p. 14.

ing. Many operators are farmers. Many are former sawmill workers who have thought they saw an opportunity to get into a good business for themselves with little investment. They are unacquainted with the art of breaking down a log and are quite unfamiliar with lumber grades. This is a particularly great handicap in the sawing of hardwoods. They are in many cases ignorant of proper techniques of piling and caring for lumber after it is sawed. Their knowledge of markets is generally meager.

Because small sawmilling is an easy business to get into, it attracts a considerable number of rural enterprisers. The agricultural agent of one southwest Virginia county was heard to remark that every other adult male in the county was a sawmill man — either active or prospective or retired. Some communities include a surprising number of “retired sawmill men,” which supports the general observation that mortality in this business is high. But there are always many hopeful newcomers and repeaters to replete the ranks.

This floating entrepreneurial population is a source of some annoyance to the more stable and conservative elements of the lumber industry. The small sawmill dumping great though often uncertain quantities of lumber upon the market, creates a considerably competitive situation in that market. When demand is brisk, and providing that exceptional circumstances do not exist to interfere with small-mill operations, the output of these mills tends to dampen undue price increases. In time of depression, on the other hand, when some curtailment of production appears the logical course for large sawmills, small-mill activities may continue at a surprisingly high level, for many rural workers with time on their hands are glad for the opportunity to engage in some attractive occupation that will pay them a little cash, above out-of-pocket costs, for their own labor.

The chief link between the small sawmill and the general market is the so-called concentration yard, an establishment that has reached a high state of development in the pine-lumber field. The concentration yard is equipped to receive the output of a number of mills, store it, remanufacture or refinish it and grade it, and maintain the necessary contacts with wood-using plants, lumber wholesalers, and other dealers and users in order to market it successfully. The concentration yard thus provides the elements of

stability, volume, grading experience, and familiarity with marketing needed to bring to fruit the labors of the small-mill man in selecting and gathering saw timber from the scattered stands of the countryside. The combination of small mill and concentration yard is, at least upon the surface, an efficient one: without ultimate loss of the advantages of large-scale operation, the full genius of the small mill is called upon in attracting labor willing to work for a low return to the difficult task of making lumber out of scattered and depleted timber, not to mention the task of seeking out and bargaining with a thousand separate owners of this timber.

### THE MARKETING PROCESS

Most of the timber cut by sawmills in the Appalachian Region undoubtedly is bought on the stump. The mill operator negotiates with the timber owner for purchase of the stumpage, and himself supervises the logging and the milling operations. Some of the larger, stationary mills buy logs delivered at the mill, obtaining these from timber owners who have done their own logging, or from stumpage or log dealers; and some logs are received by mills for sawing on a custom basis. Small mills quite frequently do contract sawing for a concentration yard, the latter buying the stumpage and taking over whatever the mill produces, for an agreed-upon payment per thousand board feet, lumber tally. Excepting those small farm mills that operate in the home woods, only the largest mills commonly own and lumber their own timber land. The quantitative position of these different types of procurement is suggested in the following tabulation, based upon a canvass of sawmills in Virginia.<sup>26</sup>

	<i>Per cent</i>
Stumpage purchased .....	54
Contract sawing .....	17
Timber from own land .....	15
Logs purchased .....	9
Custom sawing .....	5
All methods .....	<u>100</u>

<sup>26</sup> J. W. Cruikshank, *The Forest Situation in the Coastal Plain of Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 12; iv + 45 + 26 pp.; processed; Asheville, N. C., 1943), p. 24.

William A. Duerr, T. C. Evans, and G. E. Morrill, *The Forest Situation in Piedmont Virginia*, p. 29.

## THE CONCENTRATION YARD

The principal market channel outward from the sawmill— insofar as quantity of lumber is concerned, and certainly so far as the number of mills is concerned—is to the concentration yard, typically the pine yard. These yards take a number of different forms. In their simplest form they are composed of two units: a lumber-storage yard and sheds (usually with dry kiln) and a planing mill for dressing rough lumber. The yard may be equipped to turn out various types of matched and pattern stock as well as plain lumber. In this form the concentration yard acts principally as a lumber processor and wholesaler; it may, of course, sell its products in turn to other wholesalers. Often the yard maintains a retail department, where it sells to local users both its own lumber and those kinds of lumber that must be imported from other regions. Finally, a number of the more specialized secondary processing plants, such as flooring or furniture-stock plants, operate as concentration yards, retaining lumber for their own use and reselling the surplus, if any, after more or less finishing. Sometimes the larger sawmills buy the produce of smaller mills and, also after more or less finishing, add it to their own stocks.

The relations between sawmill and concentration yard take a variety of forms. For convenience these may be grouped into three classes, though it is to be understood that in practice the classes are not distinct, but blend imperceptibly into one another. They vary from a condition of maximum independence of mill and yard, with a maximum of competition in the marketing of each lot of products, to one of complete integration between mill and yard, where there is no competition in marketing— where marketing, in fact, is not that of lumber but of the services of labor.

The mill operator may act as a free agent in the local and general market, buying and cutting stumpage and selling the products wherever the best opportunity seems to be presented. One of his outlets may be the concentration yard. The producer makes advance arrangements for the sale, or he may simply take a truck-

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Thomas Lotti and T. C. Evans, *The Forest Situation in the Mountain Region of Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 15; iv + 70 pp., processed; Asheville, N. C., 1943), p. 21.

load of lumber to the yard and try to dispose of the lumber on the spot. This method permits the mill operator to exercise a maximum of marketing skill — or of incompetence. It exposes him fully to the vicissitudes of the market, with attendant risks that other methods do not entail. In normal times mill operators who intend to use the services of the concentration yard apparently much prefer to have their relations on a more formal and secure basis. In time of depression the yards make little or no purchases from other than formal contractors. When the market is brisk, however, it is believed that as much as one-fourth of their purchases may be on a lot-by-lot basis, for at such a time the need of the sawmill operator for a steady contract is less great, the chances are good of his making an unusual profit by exercising some choice in the matter of marketing, and the concentration yards find their procurement needs increased, and also the need to step out beyond their circle of regular contractors so that they may fill their orders.

Much of the lumber sold by woods owners or log dealers to concentration yards is sold on a lot-by-lot basis. Many farmers, and some log dealers, cut timber and have the logs custom-sawed. What the farmer does not need for his own use he sells for what cash income it may yield. Custom mills frequently take a share of the lumber as payment for sawing, and this lumber is rarely contracted for by the yards. Probably about three-fourths of all custom-sawed lumber is put upon the market. Some farmers make a regular practice of selling their saw timber in the form of lumber, conducting the logging operation themselves and having the logs custom-sawed. This practice insures the timber owner at least a knowledge of the quantity of material that he sells, and provides him an extra income from his own labor; but it does not greatly improve the variety of his outlets. Indeed, in some cases it may actually narrow the apparent market possibilities, reducing them from a number of loggers and mill men to one or two concentration yards.

Probably the most common form of relation between sawmill and concentration yard is that in which the mill operator is bound to the yard through a contract, but is more or less independent insofar as the ownership of his own mill is concerned. Such ownership may take the form of outright possession. Often, however,

the operator is merely the nominal owner of the mill, being in process of purchasing it from the concentration yard on a time-payment plan. Payments are on a time basis, or, more commonly, a fixed amount per thousand board feet delivered at the yard. If the operator does not keep up his payments — in the latter case, his production — the mill reverts to the yard, apparently not an infrequent event. Operators who do business on a shoestring may find themselves unable to make necessary payments for stumpage, or even for labor and supplies, while waiting even the little while necessary before their money comes from the concentration yard. They may then become “retired sawmill men” or be transferred to the status of renters or laborers.

The contract between yard and mill specifies that the yard will accept, per week or per month, a certain quantity of lumber and will pay a certain price for it per thousand board feet. The mill operator, on his part, agrees to follow prescribed practices with regard to sawing and, if he does not have outright ownership of the mill, to take certain measures with regard to its operation and maintenance. He agrees to deliver the stated quantity of lumber to the yard. His failure to live up to this provision may cause the yard to cancel the contract.

Contract prices are subject to change after due notice. They are usually stated net — that is, after deduction of payments of various kinds due the yard. Often it is difficult, perhaps even for the operator, to discover just how much the yard is actually paying for lumber as such.

Purchase and logging of the standing timber may be handled in one of several ways. The mill operator may himself scout out the timber, buy it, and have it logged. In this case he may need to have a considerable capital if the timber is to be paid for in advance in a lump sum. For this and other reasons many mill men prefer to handle only the sawing job — or at most the logging and sawing. In this way has arisen the practice of concentration yards of buying timber and of contracting for logging it. Sometimes a yard employs regular buyers who travel about, arranging for the timber purchases needed to sustain contracting mills. This system is less successful, however, than the more common one, whereunder the yard employs the mill man himself, or some other mill man or logger, to negotiate with the timber owner.

The owner thus believes that he is doing business directly with a small local business man.

Finally, the relation between sawmill and concentration yard may be one of complete integration. Where a yard owns a sawmill, it may either hire someone to operate the mill, or, more commonly, it may rent the mill to an operator for a given sum per thousand board feet of lumber produced, this rental being deducted from the payment made periodically to the mill man by the yard. It is difficult for the observer to learn what deductions, if any, are made from the full price per thousand feet paid by the yard to the mill, and what is the nature of these deductions — whether rent, or principal and interest, or some intermediate category. Where the mill operator stands in the relation of renter or employee to the concentration yard, the yard will almost always be found to be purchasing the stumpage and, generally, assuming responsibility for logging as well.

Under any of the three types of arrangements between yard and mill that have been described, the matter of the price paid for lumber is of primary concern. In theory there appear to be a number of alternative methods by which a yard could determine the prices paid its mills. It could, as a very crude method, pay the same price per thousand for all lumber received, regardless of kind or quality. It could, on the other hand, take the fullest account of variations from mill to mill, and pay on the basis of kind and grade and the condition of the product as determining the expense necessary to convert it to finished lumber. And between these extremes it could follow any number of alternatives.

In actual practice, at least in many areas, the system of price quotation used by concentration yards most closely resembles the first alternative described. Some distinction is usually made among the major species-groups of lumber, but beyond that, lumber is lumber in the eyes of the contractor. This system of maintaining a standard run-of-the-mill price evidently receives the general support of sawmill operators. These operators are inclined to favor the system as evidence of freedom from discrimination or favoritism in their dealings with the concentration yard. According to this view equal treatment is fair treatment, and equal treatment consists in equality of price for the unit of run-of-the-mill lumber. Such a system, in its pure form, offers no incentive to quality pro-

duction — to skill and efficiency in producing lumber from logs, other than that associated with the quantity of output. Indeed, it serves to perpetuate those technological defects that are an outstanding feature of the small-sawmill industry.

That mill operators cling to the system of equal prices for all is evidenced by the method usually employed by concentration yards to recognize the higher-quality output of some mills: to the operators of such mills they give a "bonus" on the side, above the standard price, but this bonus does not appear in the contract, nor is it considered wise to disclose to other operators the existence of this bonus. The bonus is a reward for "good men," to maintain their satisfaction and retain their loyalty to the yard. It is not usually, so far as may be determined, scaled according to the excess of well-sawed or high-grade lumber a man produces. Rather, it resembles an increase in the wages of labor, being the amount judged necessary to retain a man's personal services and properly to stimulate his energies.

This bonus system is further evidence of the wide departure, under the concentration-yard regime, from anything approaching normal incentives to quality production. The concentration yard tends to reduce lumber production to a dead level of mediocrity, and to hold it there. This is another fact usually disregarded in those "logging and milling studies" that purport to determine economical diameters of trees and logs. On the value side, it is as vital a weakness as has already been pointed out with respect to labor on the cost side.

Some concentration yards pay for lumber on the basis of grade. In areas where this is customary, a considerable variation in grading practice is to be observed. Sometimes standard grades are used, often grouped in various ways. Sometimes a yard develops what amounts to its own grading rules. Even a cursory observation of the results of this system throws much light on mill operators' preferences for a run-of-the-mill price. Operators' unfamiliarity with lumber grades throws the burden of grading upon the concentration yard, which in any case would be expected to act as final arbiter in the matter of grade. With the yard as arbiter, and in possession of virtually exclusive knowledge of the commodity — that is, graded lumber — it would be strange if arbitrary practices, more advantageous to the yard than to the mill,



did not come into use in some instances. One such practice is undergrading, usually taking the form of grading-down those boards lying near the border between grades. Another practice is to recognize only the higher grades and to place a low, flat value upon the rest; or even, in some cases, to refuse to accept the low grades. Another practice, considerably more justifiable, is to pay for the  $1\frac{1}{4}$ -inch lumber specified as a measure of protection, as though it were 1-inch lumber. Mill operators object to this practice, claiming that if  $1\frac{1}{4}$ -inch stock is ordered it should be paid for. The operator whose mill produces lumber of widely varying thickness has no legitimate complaint. But the operator who is able to saw lumber more accurately has a just grievance, not for himself alone but for the system which on every hand is adapted to the standards of the least efficient producers.

The striking thing about the operations of the concentration yard is the extent to which it may, in customary times, dictate the terms of the market. Obviously, unless the dictates of the yard could be imagined to coincide with adjustments that would take place freely in the absence of monopolistic elements, or unless sellers are markedly irrational, the power of the yard to dictate must be taken as strong presumption that its competition with other yards and other buyers is of something less than the highest order. Although concentration yards are thickly scattered over much of the region, their numbers are naturally small in comparison with the numbers of sawmills. There is some competition among yards for the services of the most efficient sawmill operators, but this competition, as has been seen, results rather in the payment of semi-secret bonuses than in any general realignment of the market level or the methods of price quotation. By and large, the real competition is normally among sawmills for an outlet, and not among yards for a source of supply. This is the outcome of the whole economics of primary lumber production in the region — the existence of underemployed labor, the value attached to sawmilling as an independent occupation, the ease of entering the sawmill business, and, throughout, the low money value of the raw material upon which the industry depends.

The concentration-yard problem is not uniform throughout the region. The greatest concentration-yard activity is to be found in the piedmont areas, particularly those in North Carolina, where

small-scale operations are nearly the only source of the great quantities of pine lumber entering the general market. Here integration of mills and yards, previously discussed as the last of three general types of yard-mill relationship, is highly developed.

#### SELLERS TO THE SAWMILL

Where sawmilling is not integrated with timber ownership, the mill buys its supplies either directly from the woods owner or through a stumpage or log dealer as intermediary. Direct purchase from the timber owner, either by the mill or by the concentration yard acting in behalf of the mill, is by far the most common form of transaction.

As a seller of stumpage for saw logs, or of saw logs themselves, the typical timber owner in the region is confronted by the same general handicaps already discussed (pp. 182-193). In addition, two circumstances of special significance to saw-timber marketing should be mentioned.

First, while most sawmill operators are at a disadvantage in the lumber market, especially in their dealings with concentration yards, timber owners are, for the most part, at an even more serious disadvantage. They represent one step even below the sawmill in respect to smallness of scale, disunity, and lack of marketing knowledge and experience. For this reason it is to be expected that much of the downward pressure exerted upon price by the concentration yard would be transmitted through the mill to the timber owner.

Second, the timber owner suffers, along with the mill operator and many market agencies and other groups, for sawmill inefficiency. With essentially no outlet for saw timber other than to the small local mill, the owner is rather definitely assigned to a place in the rear ranks of a maladjusted organization; and there is little he can do about it. Few small owners of saw timber have access to a processing plant that is equipped both physically and economically to get the most out of the products it handles.

#### BUYERS FROM THE SAWMILL

While the concentration yard is a chief primary buyer of lumber in the region, other types of buyers are important, especially for particular types of mills. The largest mills, both pine and

hardwood, that dry and finish their own lumber and carry wide stocks of graded material on hand, have the greatest variety of outlets. They may sell to wholesalers or wood-products manufacturers. They may sell to retailers or, through their own retail branches, direct to ultimate buyers. Mills of intermediate size sell their products mainly to wholesalers and secondary processors.

Small mills probably sell more of their lumber direct to ultimate buyers than to any other agency besides the concentration yard. Lumber thus sold by small mills is known as "local lumber": mostly ungraded, it is contrasted with the grade lumber that finds its way into the general market. Buyers are farmers who need a little material for repairs, or other rural people who want rough repair or building lumber. Mills equipped with finishing machinery sometimes take an order for a complete house or barn pattern, and turn out all the necessary dimension, siding, flooring, and other material. In the local-lumber market the user may come to the mill for what he needs, though very often the mill operator takes the initiative and seeks out potential buyers. Market information is disseminated through rumor, the advice of friends, sporadic advertising in local newspapers, and similar informal means. The market is unstable and utterly unpredictable, and sales are most uncertain. Prices in each sale are usually arrived at through individual negotiation, following only in general the local level established by the custom of former transactions and by the general market.

#### POSITION OF THE REGION IN THE GENERAL MARKET

Something has been seen of the advantages and the handicaps faced by the Appalachian Region in the general timber market. For advantages, the region has a favorable location near eastern consuming centers; fairly good rail and water connections with these centers; extensive forest resources which, although badly depleted, still contain much good timber and productive growing stock of a wide variety of species; and much manpower and capital equipment normally available at low compensation (which, nevertheless, represents a major problem). For disadvantages, there are the extreme diffusion and small scale of ownership and management units embracing most of the forest area; the economic inaccessibility of much timber, chiefly a matter of low den-

sity of stocking, but in some cases also a matter of broken topography and scarcity of adequate roads; and inefficiencies in the local organization of timber marketing and processing. On balance, what has been the outcome of these factors with respect to the region's position in the general lumber market? How effective are the channels of distribution lying beyond the local timber dealer, the sawmill, and the concentration yard? A few statistics are available which throw some light on these questions.<sup>27</sup>

The Appalachian Region in 1941 produced 4 per cent more lumber than was distributed to primary distributors within the region (Table 20). This indicates that the region was a net exporter to outside markets, and that the net excess of exports was probably more than 4 per cent, since much of the lumber distributed to primary distributors was not used within the region but was redistributed outside, and since this export after primary distribution probably exceeded in quantity the counterbalancing import of lumber distributed to primary distributors outside the Appalachian Region. The distinction between primary distribution and consumption or ultimate distribution must be borne in mind throughout this discussion. The distinction is of particular importance because the concentration yard, a primary distributor, is at the same time the chief link between small mills and the general market.

TABLE 20  
LUMBER PRODUCED WITHIN THE APPALACHIAN REGION IN 1941, IN PER CENT  
OF THE QUANTITY DISTRIBUTED TO PRIMARY DISTRIBUTORS WITHIN  
THE REGION, BY STATE AND SPECIES GROUP

State	All species	Softwood	Hardwood
Kentucky .....	70	28	106
North Carolina .....	112	124	85
Tennessee .....	93	75	111
Virginia .....	105	97	125
West Virginia .....	138	58	177
All states .....	104	96	117

<sup>27</sup> R. V. Reynolds and A. H. Pierson, *Lumber Distribution and Consumption, 1941* (23 pp., processed; Washington, 1942).

See also: Charles E. Allred and F. M. Fitzgerald, *Market Channels for Forest Products, Tennessee and United States* (Tenn. Agr. Exp. Sta., Agr. Econ. and Rural Soc. Dept., Rural Research Series Monograph 95; ii + 40 pp., processed; Knoxville, Tenn., 1939), pp. 1-13.

The region is outstandingly a hardwood producer for the general market, the net surplus of exports over imports and regional production for regional use amounting to at least 17 per cent. West Virginia showed a surplus of 77 per cent in 1941, and all the other states showed some surplus except North Carolina, which, on the other hand, was the only state to show a surplus in softwood. While no state had a marked deficit in hardwood, Kentucky, Tennessee, and West Virginia all had marked deficits in softwood.

Of all the lumber produced within the region in 1941, 65 per cent went to primary distributors within the producing state, at least 35 per cent being distributed to other states; and 72 per cent went to distributors within the region, at least 28 per cent going to other regions (Table 21). For the whole United States, only 47 per cent of the lumber produced was distributed within the producing state. The Appalachian states thus put their lumber upon the interstate market to a smaller extent than other states, although their interstate marketings loom relatively larger than those of states to the north, or to the west as far as the Rockies. West Virginia shipped out of the state a notably high proportion

TABLE 21  
PERCENTAGE OF ALL LUMBER PRODUCED WITHIN THE APPALACHIAN REGION  
IN 1941, DISTRIBUTED TO PRIMARY DISTRIBUTORS WITHIN THE PRODUCING  
STATE AND WITHIN THE REGION, BY STATE AND SPECIES GROUP  
DISTRIBUTED WITHIN THE STATE

Producing state	All species	Softwood	Hardwood
Kentucky .....	62	58	63
North Carolina .....	70	70	67
Tennessee .....	66	73	60
Virginia .....	70	75	62
West Virginia .....	37	30	38
All states .....	65	70	57
DISTRIBUTED WITHIN THE REGION			
Kentucky .....	70	71	70
North Carolina .....	77	77	77
Tennessee .....	71	77	68
Virginia .....	78	77	80
West Virginia .....	40	38	41
All states .....	72	76	66

of its lumber output: at least 70 per cent of the softwood and 62 per cent of the hardwood, and most of this material was shipped out of the region. The other states more nearly followed the regional average.

On the other hand West Virginia, along with Kentucky, was a major importer of softwood, the two states producing only 16 and 18 per cent, respectively, of the softwood lumber distributed within their boundaries (Table 22). For the whole region about two-thirds of all lumber distributed was produced within the state where distributed, and about three-fourths of all lumber distributed was produced within the region. These proportions hold approximately for both softwood and hardwood lumber.

The primary destination of lumber produced in the Appalachian states is shown in Figure 10. It is obvious that the region is its own best market, and most states within the region their own best market. Virginia and North Carolina marketed notable amounts of lumber in other states of the region. The principal interstate market, however, is outside the region. The Appalachian states market sizable quantities of lumber in most of the states lying to the northeast and north. Southern New England,

TABLE 22

PERCENTAGE OF ALL LUMBER DISTRIBUTED TO PRIMARY DISTRIBUTORS WITHIN THE APPALACHIAN REGION IN 1941, PRODUCED WITHIN THE STATE WHERE DISTRIBUTED AND WITHIN THE REGION, BY STATE AND SPECIES GROUP  
PRODUCED WITHIN THE STATE

State where distributed	All species	Softwood	Hardwood
Kentucky .....	43	16	67
North Carolina .....	78	86	56
Tennessee .....	61	55	67
Virginia .....	74	72	78
West Virginia .....	51	18	68
All states .....	67	68	66
PRODUCED WITHIN THE REGION			
Kentucky .....	50	22	76
North Carolina .....	80	87	62
Tennessee .....	65	57	74
Virginia .....	85	83	91
West Virginia .....	73	37	90
All states .....	74	73	77

the Middle Atlantic region, and bordering Midwestern states provide the best outside market. Ohio, Pennsylvania, and New York receive much hardwood lumber from West Virginia; and the two latter states and Maryland are good markets for softwood from North Carolina and Virginia. Very little lumber moves southward or westward from the region.

The question of how the Appalachian Region stands up in competition with other sections of the country in those regions where it markets lumber is partly answered in Figures 11 and 12. It ap-

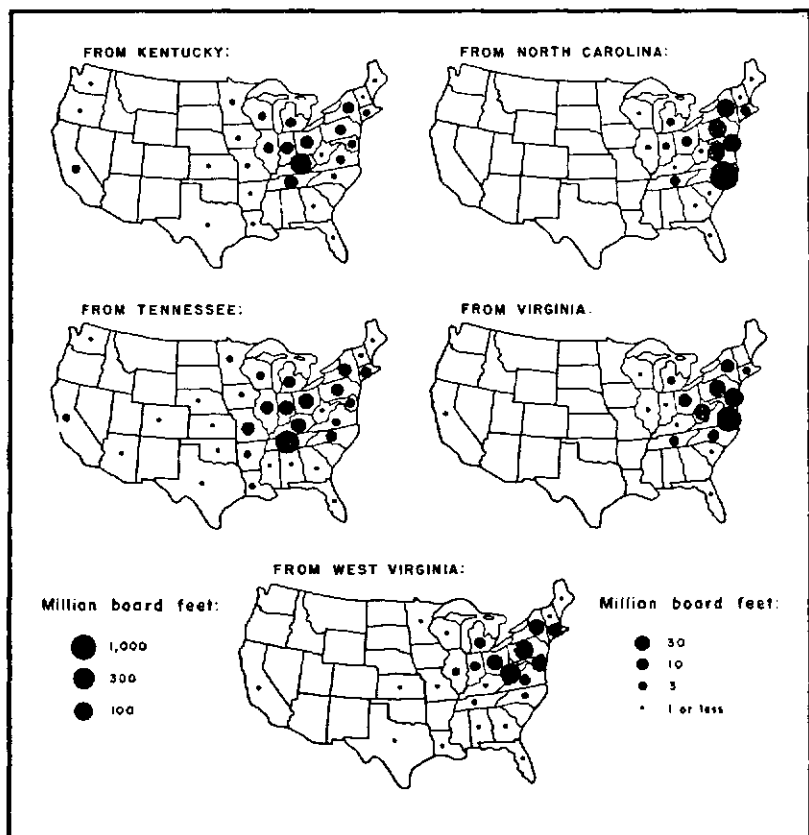


FIGURE 10

DESTINATION AND QUANTITY OF ALL LUMBER DISTRIBUTED FROM EACH OF THE FIVE STATES OF THE APPALACHIAN REGION, 1941

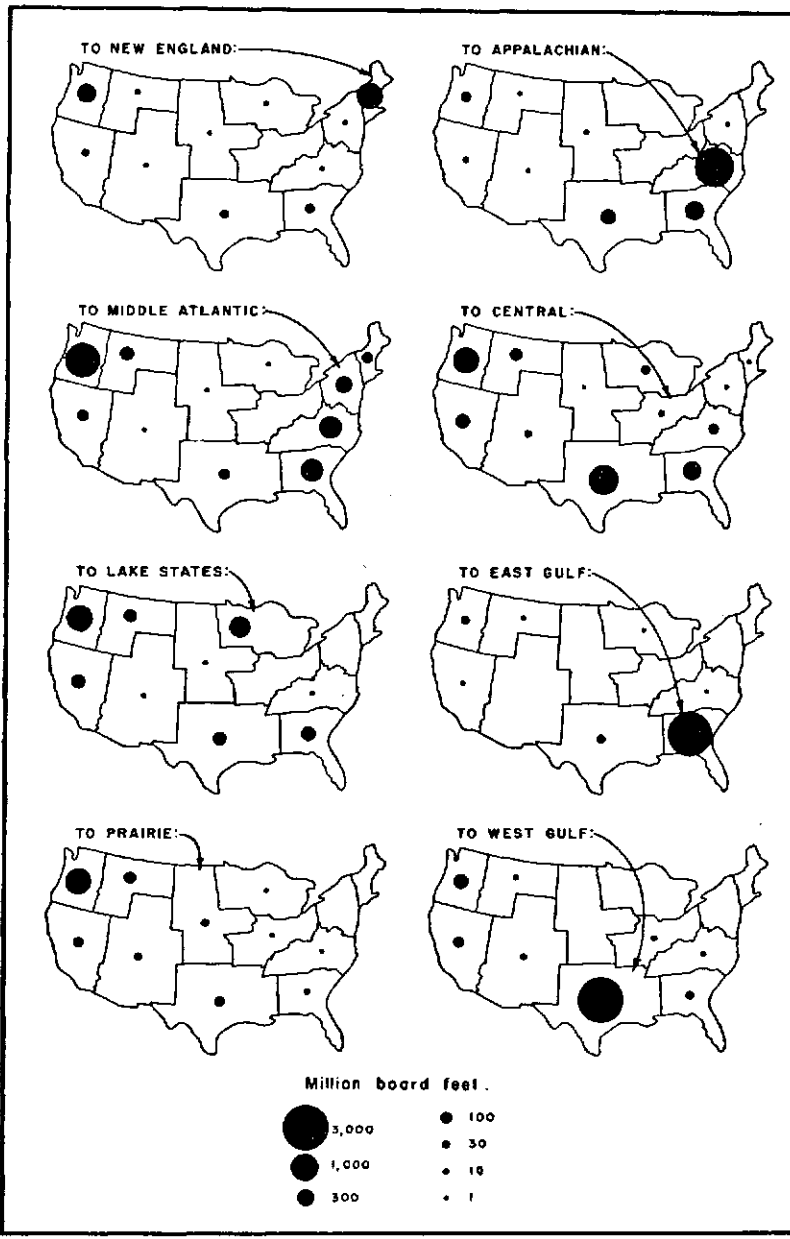


FIGURE 11  
 SOURCE AND QUANTITY OF SOFTWOOD LUMBER DISTRIBUTED TO EACH OF EIGHT  
 EASTERN REGIONS OF THE UNITED STATES, 1941



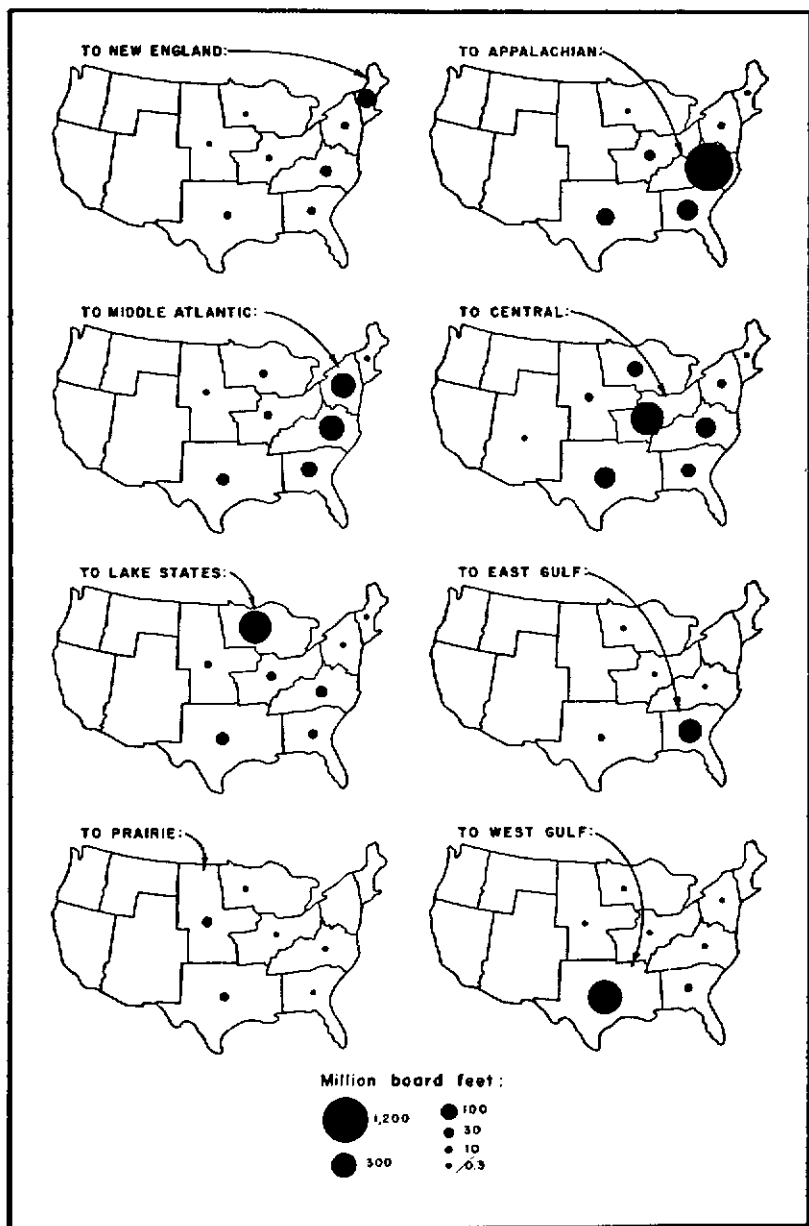


FIGURE 12  
 SOURCE AND QUANTITY OF HARDWOOD LUMBER DISTRIBUTED TO EACH OF EIGHT  
 EASTERN REGIONS OF THE UNITED STATES, 1941

pears that the Appalachian Region competes with some success in the softwood lumber market of the Middle Atlantic States, there being second, among outside regions, only to the East Gulf region. But it is in the hardwood lumber market that the Appalachian Region is most active. It supplies more hardwood lumber to the Middle Atlantic region than is produced by that region itself. In New England and the Central States it is the chief outside supplier. And in the Lake States, as an outside supplier, it runs a close second to the Lower Mississippi region. Since the hardwood market of the United States is almost entirely east of the prairie, it may be said that the Appalachian Region holds a prominent position in that market everywhere except in the states to the south.

The South and the Pacific Coast are the chief outside sources of lumber marketed in the Appalachian states. The four states of South Carolina, Georgia, Alabama, and Mississippi account for the great bulk of both softwood and hardwood lumber imported into the region.

From a review of the statistics it is apparent that the Appalachian Region enters to a considerable extent into the national lumber market. In some segments of the hardwood market it is preëminent as a supplier, West Virginia taking a decided lead in "Appalachian hardwood" species and North Carolina and Virginia competing with some effectiveness in the market for bottomland as well as upland hardwoods. Some channels of softwood distribution also appear to be fairly well established for marketing agencies in the two eastern states, though here the region meets with much severe competition from the West Coast and the South.

The lumber-marketing channels leading outward from the states of the region are apparently chiefly those established by the large sawmills, such as the hardwood mills of West Virginia and some of those in eastern Kentucky, and the concentration yards, such as the pine yards of central and eastern North Carolina and Virginia. The former maintain these channels in the face of rapid disappearance of the type of resources on which their existence is based. The latter maintain their channels at the expense of perpetuating social costs inconsistent with the progress of forestry. Lumber-marketing channels of a type consistent with long-

run forestry objectives — consistent with full rural employment, adequate personal incomes, and forest productivity — do not exist in encouraging numbers. Competition of the Appalachian Region in the national lumber market today is based largely upon facilitating conditions within the region that are at the same time grave problems of the forest economy.

## CHAPTER IX

### PROBLEMS IN MARKETING MISCELLANEOUS PRODUCTS

THE MARKETING of yard products, products of the veneer group and the cooperage group, local products, and minor products will be considered in this chapter. The chief purpose of the discussion is to describe the quantitative position of these products in the timber market and to point out whatever special problems exist in marketing them. Because the essential picture of timber-marketing problems in the region is already contained in foregoing discussions of general problems and the problems of pulp-wood and lumber marketing, the present chapter will be brief and largely descriptive.

#### YARD PRODUCTS

Yard products, as here defined, include railroad ties, poles, and piles.

#### DESCRIPTION OF PRODUCTS

Ties (other than those used in mining, which have been discussed in Chapter VII) are used in the Appalachian Region almost exclusively by railroads: as supports, placed upon the roadbed, to hold the rails. The creosote preservative treatment now given most ties permits the use of almost any species of wood in their manufacture. However, the oaks are greatly preferred and, in areas where they are available, make up the great bulk of ties in use. The hard yellow pines, beech, maple, and locust are frequently used. Ties are manufactured by sawing, hewing, or splitting, the latter two methods resulting in what are classed as hewn ties. They are generally  $8\frac{1}{2}$  feet, sometimes 8 feet, in length (longer in the case of switch ties) and are usually squared, though there is a market for some ties, notably hardwood ties, sawed or hewed on top and bottom only. Five grades are recognized, based on cross-sectional dimensions, with special

reference to the two sections of the tie located between twenty and forty inches from the center:

<i>Grade Number</i>	<i>Thickness (inches)</i>	<i>Width or face (inches)</i>
5	7	9
4	7	8
3	6 or 7	8 or 7
2	6 or 7	7 or 6
1	6	6

Dimensions up to one-fourth inch less than those specified are permitted within the grade. Ties are usually accepted up to one or two inches in excess of grade-5 dimensions. Ties are generally required to be cut green, free of bark, and free of an excess of defect such as rot, sapwood, large knots or holes, and checks. Most ties marketed are of grade 2 or higher.

Poles and piles are timbers, usually in the natural round form and usually sixteen feet in length or longer. The distinction between poles and piles consists mainly in their use and not in their form or other specifications: the former are used chiefly to support wires; while the latter support bridges, wharves, and other structures, the load being carried upon the upper end of the pile. The yellow pines are the chief species used in the region, and of these, loblolly pine is the principal native species, followed by shortleaf and a small quantity of longleaf pine. Southern white cedar, cypress, and oak and other hardwoods are also used, the other hardwoods mostly locally. Poles and piles are marketed in standard lengths, usually running from sixteen to twenty or twenty-two feet in two-foot steps, and from twenty-five to possibly ninety feet in five-foot steps. About three-fourths of all poles produced in the region are twenty to thirty feet in length. Poles and piles are graded or classed according to top diameter, butt diameter, and length. The American Standards Association rules for southern yellow pine poles recognize ten classes based on top diameter, and specify for each class the minimum diameter six feet from the butt end, according to pole length. Acceptable poles must be sound, free of bark, and with no more than maximum allowable crook or sweep. The requirement as to straightness is especially rigid in the case of piles. Most poles and piles are given a creosote treatment before use — poles at least at the

butt end to beyond the ground line, piles usually throughout their length.

#### VOLUME OF PRODUCTION

About 3 million hewed ties and 370,000 poles and piles were produced in the Appalachian states in 1940 (Tables 23 and 24).<sup>1</sup>

TABLE 23  
PRODUCTION OF HEWED TIES IN THE APPALACHIAN STATES,  
BY KIND OF WOOD, 1940

State	All kinds of wood	Softwood	Hardwood
Kentucky	622,000	.....	622,000
North Carolina	689,000	131,000	558,000
Tennessee	1,000,000	50,000	950,000
Virginia	533,000	12,000	521,000
West Virginia	166,000	.....	166,000
All states	3,010,000	193,000	2,817,000

TABLE 24  
PRODUCTION OF POLES AND PILES IN THE APPALACHIAN STATES,  
BY KIND OF WOOD, 1940

State	All kinds of wood	Softwood	Hardwood
Kentucky	.....	.....	.....
North Carolina	196,000	194,000	2,000
Tennessee	50,000	48,000	2,000
Virginia	122,000	118,000	4,000
West Virginia	.....	.....	.....
All states	368,000	360,000	8,000

The cubic volume of wood here represented is 2 per cent of the total volume produced for all commodities in 1940. Nearly 94 per cent of the hewed ties were hardwood; 98 per cent of the poles and piles, softwood.

#### THE MARKETING PROCESS

In what follows, railroad ties will be taken as the type product of the group. Reference will be made to poles and piles only

<sup>1</sup> For sources of these and other production data in this chapter, see footnote 1, Chapter X.

where some outstanding characteristic of these products appears to require explanation.

The following agencies, in order, may stand as sellers and buyers of tie material: timber owner, stumpage or log dealer, sawmill, tie cutter, tie dealer or contractor, tie company, treating plant, and railroad. Where the ties are produced in a sawmill, procurement of logs follows the lines described in Chapter VIII; the ties then go to agencies following the tie cutter in the above list.

The Appalachian Region is well located with respect to the principal railroad territory of the United States. The region is a source of ties for the on-line buying of its own railroads. Some of these roads, and others to the north, buy off-line within the region because they are not self-sufficient along their own rights-of-way.

Railroads buy ties, generally speaking, in three ways.

First, a railroad may buy some of its ties direct from sawmills and tie cutters, usually on-line. The producer delivers his ties to the right-of-way, and in due course the railroad inspects them, takes the acceptable ties, and sends the producer a check. The producer gets a relatively high price, but may have a long wait for his money. Many cannot afford such a wait. Furthermore, some roads will not deal direct with individual small producers.

Second, a railroad may buy part of its ties from local dealers or contractors. These men are often producers, but they usually get most of their ties by purchase from sawmills and tie cutters. The price they pay is not as high as the railroad price, but they pay promptly and accept very small lots. The tie dealer is therefore a most important agency in the marketing chain, particularly for hewed ties. Through his functions of financing and assembly he makes possible the independent operations of many individual tie cutters working on a shoestring: perhaps the best example of truly small-scale industry in the region.

Third, a railroad may buy its ties from a tie company, typically a large concern with extensive storage facilities and often a treating plant. The tie company, in turn, gets its ties from small producers and local dealers. Ordinarily the company also produces some ties itself from its own land or stumpage.

In the marketing of poles and piles — where ultimate buyers are greater in number, less generally known, and usually do not have their own treating plants — the yard or treating plant is almost invariably a market intermediary.

## CHARACTERISTICS OF TIE MARKETING

Tie production is a small-scale operation suited to part-time performance in forest stands of low density and scattered, small timber. It is a major forest industry characterizing many depleted hardwood areas, and its operations sometimes tend to perpetuate the area as a "tie area," which implies forest depletion, predominance of low-grade timber, and prevalence of low returns to forest ownership and labor. (Production of poles and piles, on the other hand, requires timber of fairly good quality.)

Almost anyone able and willing to do hard physical work can produce ties. The necessary raw material is abundant in many areas; almost no capital is required; the production process is simple and the product clearly defined. For these reasons, the supply of ties tends to be relatively abundant except in periods of unusually brisk railroad activity when the general market for common labor is also good.

Ties require a long period of seasoning — up to a year or even more for oak ties — under rather carefully controlled conditions. A large share of all ties is given preservative treatment. These circumstances prevent the small producer from carrying the productive process beyond the first stage. They underline the importance of the tie yard and treating plant. The financial dependence of most small producers requires the services of an additional market intermediary. Nevertheless, direct dealing with the ultimate user, the railroad, is often feasible. Such dealing is on the basis of definite, simple grades and published prices. On the whole, the price aspects of the tie market are much less confused than is true in the case of many other products.

The demand for ties exhibits a number of peculiarities. Perhaps the most important is the fact that there is essentially only one class of ultimate outlet for ties — the railroad — and many producers have access to only one railroad company or large intermediate buyer. Ties are bulky and of low specific value, and from the standpoint of the seller the market for them is strictly local. From the standpoint of the railroad or tie company, however, the market is not local: the supply area extends throughout the company's territory. As a buyer, a railroad is in the peculiar position of being also a carrier, able to plan its own transportation



at negligible cost, in connection with the necessary movement of unused car capacity. Some of this advantage may be shared by a tie company with railroad contracts. The big buyers are thus in a position to play areas against areas in their procurement, profiting by competition not only among local producers but also among areas, themselves meanwhile subject to much less competition.

The demand for ties fluctuates violently with the business cycle. A certain amount of fluctuation would be expected in view of the exclusive character of the tie market and railroads' sensitivity to general business conditions. Additional factors, however, operate to widen fluctuations. When activity increases with the upturn of the cycle and railroad traffic increases in weight and volume, there is sudden call for replacement of many over-age ties that were good enough only to support the previous light traffic. This replacement is added to that resulting from the increased mechanical wear and tear on normal ties. Expecting a continued rise in demand of appreciable duration, the railroad and its immediate suppliers buy heavily not only for replacements to be made as soon as possible, but also to increase the inventory of stocks on hand in the form of seasoning ties, the use of which it is desirable to postpone for as much as a year beyond the purchase date. During peak activity, the demand for immediate use may be so great that tie companies are unable to build up their stocks.<sup>2</sup>

In the downturn and depression stocks normally become ample to last for a considerable period of time. The decline in traffic lessens the need for normal replacement, and reduced revenues incline the company to postpone replacement beyond the normal time as long as possible. Purchases virtually cease in many areas, and there is the fiercest sort of competition among small producers for what little market remains. The existence of the tie yards and larger dealers, however, with whom it pays the railroad to maintain constant and good relations, prevents the price of ties from being forced so low as to counteract materially the decline in purchases.

During recent depressions, other factors have entered to exag-

<sup>2</sup>Railway Tie Association, "Cross-Tie Inventories as Reported by Ten of the Country's Largest Producers through *Railway Age*, Chicago," *Cross Tie Bull.* xxiv:7:18 (1943).

gerate the low demand for railroad ties. Cessation in building of new railroad lines, and even some contraction of mileage, has been one factor. Another has been the general introduction of the creosote treatment, resulting in longer tie life and lower replacement demand. Untreated cross ties require replacement every five to eight years; while treated ties last twenty to thirty years or even longer.<sup>3</sup> Annual cross-tie renewals per mile of track in the United States fell from 264 in 1900 to 183 in 1929, and further to 92 in 1936.<sup>4</sup>

### VENEER GROUP

The veneer group of products includes veneer logs, insulator-pin bolts, shuttle bolts and allied products, handle-stock material, and bolts for special wooden articles and novelties.

### DESCRIPTION OF PRODUCTS

Veneer logs are the raw material from which is turned, sliced, or sawed the veneer to be made into baskets and shipping cases, plywood, and face-veneer products such as furniture. Most of the veneer produced in the region is container and plywood veneer manufactured by the rotary process. Logs used in the lathes are chiefly from 2½ to 6 feet in length, but often the veneer plant buys longer logs and bucks them at the plant. A minimum diameter of at least twelve to fifteen inches is usually required in rotary veneer logs, considering that a center core four to six inches or larger in diameter is unusable in the rotary process. For fruit and vegetable baskets, which account for the major share of veneer produced, a great variety of species is used, depending on the locality; among these are loblolly and shortleaf pines, yellow poplar, ash, maple, sweet gum, sycamore, beech, birch, and elm. Most of these woods are also used for shipping cases. Face veneers and furniture plywood are made from such species as yellow poplar, gum, cypress, sycamore, oak, basswood, maple, walnut, and red cedar. Veneer logs are often classified according to three grades, based upon external evidences of defect (knots, checks,

<sup>3</sup> Nelson C. Brown, *Timber Products and Industries* (xviii + 316 pp.; New York and London, 1937), p. 37.

<sup>4</sup> Grant B. Shipley, *The Wood Preserving Industry and the Conservation of Forests* (35 pp.; Pittsburgh, 1942), p. 12.

decay, and so on). They are measured in board feet, scaled by log rule.

For handle-stock logs and bolts, used in the production of tool handles, hickory is the principal species, though small quantities of ash and oak are employed in some plants. Hickory logs from three to sixteen feet in length and from ten or twelve to eighteen or twenty inches in diameter are acceptable, provided they are second-growth with a high proportion of sapwood. In general, only the sapwood or "white wood" is used for handles, there being a prejudice, apparently unfounded,<sup>5</sup> against heartwood. Some plants use a bleaching process to whiten heart hickory and thus render it acceptable to the handle market.

Shuttle blocks, from which the shuttles used in textile mills are produced, are made almost exclusively from dogwood, usually cut in bolts from eighteen to seventy-two inches long, with five-inch minimum diameter. Bolts must be straight and sound and absolutely clear of knots and blemishes throughout their length over at least one-half their circumference.

Other products in the veneer group are these: insulator-pin bolts (to make the pins that support the glass insulators on telephone and electric poles), chiefly of black locust, and some oak; picker sticks used in weaving, made from hickory; buttons and special machine bearings, of dogwood; golf-club heads, of persimmon; paper-roll plugs, mostly of yellow pine; and a variety of turned articles and carved novelties, made from many species of wood.

#### AMOUNTS PRODUCED

Some 220 million board feet of veneer logs were produced in the region in 1940 (Table 25), of which 3 per cent was softwood, 97 per cent hardwood. In addition, about 71,000 cords of wood were produced for other products of the veneer group (Table 26) — 3 per cent softwood, 97 per cent hardwood. These veneer-group products accounted for 2 per cent of the total cubic volume of wood produced in the Appalachian Region in 1940.

<sup>5</sup> H. S. Betts, *American Woods: Hickory* (11 pp., processed; Washington, 1943), pp. 7-8.

Benson H. Paul, "Why Should Hickory Be Graded on Color Specifications?" *Wood Working Industries* 18:7: 28-29 (April, 1925).

TABLE 25  
 PRODUCTION OF VENEER LOGS IN THE APPALACHIAN STATES,  
 BY KIND OF WOOD, 1940  
*(in thousands of board feet)*

State	All kinds of wood	Softwood	Hardwood
Kentucky .....	20,000	300	19,700
North Carolina .....	137,200	5,200	132,000
Tennessee .....	28,900	500	28,400
Virginia .....	26,200	900	25,300
West Virginia .....	5,200	100	5,100
All states .....	217,500	7,000	210,500

TABLE 26  
 PRODUCTION OF LOGS AND BOLTS FOR HANDLE STOCK, SHUTTLE BLOCKS, INSULATOR  
 PINS, WOODEN SPECIALTIES AND NOVELTIES, AND MINOR PRODUCTS OF THE  
 VENEER GROUP IN THE APPALACHIAN STATES, BY KIND OF WOOD, 1940  
*(in cords)*

State	All kinds of wood	Softwood	Hardwood
Kentucky .....	9,200	...	9,200
North Carolina .....	12,700	1,300	11,400
Tennessee .....	29,500	...	29,500
Virginia .....	16,900	800	16,100
West Virginia .....	3,100	...	3,100
All states .....	71,400	2,100	69,300

#### MARKETING PROCESSES

Products of the veneer group are so classified on the grounds that they all involve in considerable degree selected species usually bought in scattered lots from a rather wide territory, by fairly small-scale plants. Many of the products are further characterized by the fact that they are purchased by primary plants in the log or bolt form rather than as stumpage. This, of course, would tend to follow from the wide radius of operations and the specialized character of products.

Veneer plants are themselves the largest manufacturing units associated with the primary processing of this group of products. A sample of establishments in the two eastern states of the region indicates that these plants have a median employment of about ninety persons, with employment in individual plants ranging

from twenty to more than four hundred. These persons were engaged not only in producing the veneer, but also in fabricating it further into containers, plywood, and other items. Handle and handle-stock plants had a median employment of three; and a group of thirteen plants manufacturing shuttle blocks, insulator pins, and other special products, a median employment of four.

Of fifteen eastern veneer plants for which information was available, only two purchased any raw material in the form of stumpage; and all but one bought logs delivered at the plant or loaded on cars at the point of shipment. Most handle plants and nearly all excelsior and miscellaneous plants buy logs and bolts rather than stumpage.

A more or less far-flung system of small suppliers and quasi-contractors characterizes the procurement scheme for veneer-group products. This system is most highly developed in the procurement of veneer logs. In the hardwood veneer industry, two general methods of procurement have been recognized.<sup>6</sup> The "postcard" method is typically used by mills with less exacting requirements, manufacturing package veneers and plywood. The mills maintain a list of log dealers, timber owners, sawmill operators, and other suppliers to whom they communicate their needs periodically by mail or telephone and from whom they receive logs delivered at the mill. The "traveling-buyer" system must generally be used by mills with more exacting requirements, manufacturing face veneers and other high-quality material. Employees or agents of the mills travel over a territory, inspecting timber and logs and making arrangements with producers (often large sawmills) to supply what is needed. In either case there is a direct transaction between local producer or dealer and veneer plant.

The traveling-buyer type of system makes for efficient and well-regulated marketing of high-quality logs. It tends to favor the large producer. The small owner or producer, unless he has timber of very scarce species or exceptional quality to offer, must usually enter the veneer-log market via the postcard system. His field therefore tends to be restricted to buyers with less exacting requirements and lower price scales.

Many plants of the veneer group which use special and uncom-

<sup>6</sup>William A. Duerr, John B. Roberts, and R. O. Gustafson, *Timber-Products Marketing in Eastern Kentucky* (Ky. Agr. Exp. Sta. Bull. 488; 95 pp.; Lexington, 1946), pp. 58-59.

mon kinds of wood, such as dogwood, walnut, and locust, use any and all methods of procurement. They commonly accept delivery of small lots from all comers, though they encourage prospective sellers to familiarize themselves in advance with product specifications. Once the seller and buyer know of each other, a market transaction can proceed without much difficulty. Making the initial contact is the difficult step.

Broadly speaking, marketing of veneer-group products exhibits to an extreme the general characteristic of timber marketing in the Appalachian Region: low economic accessibility of raw materials. At the best, the cost of finding and concentrating scattered and often scarce material is high. Transportation is also a major item of cost in many instances. As timber of the requisite kind becomes more and more scarce in the vicinity of a plant, it is necessary to reach out further in order to procure supplies. Plants are not often moved, and when they are, it is not to specific new timber stands, as is the case with sawmills, but to new areas where, in general, the chances for procurement over a reasonable territory are better.

Under these circumstances it is easy to see why plants of the veneer group are not, in general, closely spaced.<sup>7</sup> Wide spacing, of course, considering the size of procurement areas, does not preclude competition. Although some plants have free sweep over a wide territory, without interference from others of their kind, most encounter on the borders of their territory some competition from other plants; and nearly all encounter major competition from various other users of timber.

#### COOPERAGE GROUP

Cooperage, excelsior, and shingle bolts are the main products included in this group.

Cooperage bolts, intended for making barrels, hogsheads, and kegs, are of two general kinds, depending upon the use to which the containers are to be put. Tight cooperage, for holding liquids, is made largely from white oak, though some red oak, sweet gum, and other woods are used for low-grade stock ("oils"). Bolts at least eighteen inches in diameter are usually required for white

<sup>7</sup> There are some urban areas of concentration, especially on the Ohio River, but these are not typical of the region.

oak staves, and twenty-four inches or larger for headings. Such timber is becoming increasingly rare in the region, though where found it is sufficiently concentrated so that stumpage purchases are the rule. Slack cooperage, such as tobacco hogsheads, potato barrels, and nail kegs, is made largely from the yellow pines. Other species used are yellow poplar, oak, ash, beech, sycamore, and, indeed, a variety of other hardwoods. Trees as small as six inches in diameter are sometimes utilized for slack cooperage. All types of cooperage bolts are customarily measured in "ricks" or cords of stacked wood.

Excelsior wood, the raw material for producing excelsior, is a cordwood-type product, similar in its specifications and measurement to peeled pulpwood. Bolts are four to eight inches in diameter, or are split to that size. They are cut into eighteen- or twenty-four-inch lengths before being placed in the machine, but the sticks produced in the woods are of usual cordwood length — four to five feet. Loblolly and shortleaf pines, with some Virginia pine, account for nearly the entire production of plants in the pine belt; while elsewhere cottonwood, basswood, and yellow poplar are most commonly used.

Shingle bolts, the raw material of shingle mills, are produced chiefly from cedar (both red and southern white) and white pine. The region produces few shingles, and the general market is dominated by products of western manufacture.

The quantity of cooperage, excelsior, and shingle bolts produced in 1940 is shown in Table 27.

TABLE 27  
PRODUCTION OF LOGS AND BOLTS FOR COOPERAGE, EXCELSIOR, SHINGLES, AND  
OTHER PRODUCTS OF THE COOPERAGE GROUP IN THE APPALACHIAN  
STATES, BY KIND OF WOOD, 1940  
(in cords)

State	All kinds of wood	Softwood	Hardwood
Kentucky .....	25,400	..	25,400
North Carolina .....	100,800	33,200	67,600
Tennessee .....	45,400	400	45,000
Virginia .....	155,600	145,600	10,000
West Virginia .....	4,900	..	4,900
All states .....	332,100	179,200	152,900

Products of the coopeage group are usually marketed as stumpage, the utilization plant employing loggers and truckers, or contracting for the performance of these jobs. The typical plant is small, employing fewer than ten men, and may be moved with considerable ease.

### LOCAL PRODUCTS

The products included here are fuel wood, tobacco wood (burned to cure tobacco), charcoal wood, posts, shake bolts (from which shakes, resembling large shingles, are cut), paling wood (for fence paling), unsawed tobacco sticks (upon which the hands of tobacco are hung for curing), and poles and short stakes for farm crops. These products are used very largely on farms. The quantities of them produced in 1940 are shown in Tables 28 and 29.

TABLE 28  
PRODUCTION OF FUEL WOOD AND TOBACCO WOOD IN THE APPALACHIAN STATES, BY KIND OF WOOD, 1940  
(in cords)

State	All kinds of wood	Softwood	Hardwood
Kentucky .....	1,779,200	88,500	1,690,700
North Carolina .....	6,236,900	3,785,300	2,451,600
Tennessee .....	5,105,700	1,273,600	3,832,100
Virginia .....	3,897,100	1,405,400	2,491,700
West Virginia .....	710,000	71,000	639,000
All states .....	17,728,900	6,623,800	11,105,100

TABLE 29  
PRODUCTION OF POSTS, SHAKE BOLTS, PALING WOOD, SPLIT TOBACCO STICKS, POLES, STAKES, AND CHARCOAL WOOD IN THE APPALACHIAN STATES, BY KIND OF WOOD, 1940  
(in cords)

State	All kinds of wood	Softwood	Hardwood
Kentucky .....	178,500	14,300	164,200
North Carolina .....	134,900	81,300	53,600
Tennessee .....	151,500	22,700	128,800
Virginia .....	113,300	27,500	85,800
West Virginia .....	58,400	3,500	54,900
All states .....	636,600	149,300	487,300



Only relatively small quantities of these products are bought and sold. Farmers market some fuel wood and posts, selling them to neighbors or to consumers and small dealers in nearby towns, but most of these products move only short distances.

Charcoal wood, as here defined, is cordwood burned in ovens or pits for the sole purpose of producing charcoal. This method of production has been largely superseded by distillation, in which many products are recovered in addition to charcoal. Oak, beech, maple, and other heavy hardwoods are the chief species. Charcoal wood is remarkable for the fact that there is virtually no lower limit to the usable size of sticks, and little restriction relating to physical defect, so that a forest operation for charcoal may remove nearly every bit of tree growth from the land; or it may utilize inferior timber good for no other purpose, and so improve the quality of the growing stock.

It is an interesting and significant fact that local products, in cubic volume, account for more than 54 per cent of the total volume of all timber products produced in the Appalachian Region, and fuel wood alone (including tobacco wood), nearly 53 per cent. It is apparent that a very large share of the timber cut in the region does not enter market channels at all, but is utilized by owners for relatively low-grade uses for which, particularly in the case of fuel, material of almost any species and quality will suffice. A great deal of this fuel wood and of other low-grade products is nevertheless cut from relatively high-grade timber, as will be seen in Chapter X (p. 277).

## CHAPTER X

### PROBLEMS IN THE CONSUMPTION OF FOREST PRODUCTS

FOREGOING CHAPTERS have considered the problems of timber growing and cutting, and the problems of distributing timber products to pulp mills, sawmills, and other users. These were the problems of production—of supplying the needs of users of wood. The present chapter continues in the same vein, but lays special emphasis upon those phases of the problems that concern the use of timber products.<sup>1</sup> These are here called the problems of consumption. This is not, in general, consumption by ultimate consumers: it is chiefly that by industrial users.

#### CONSUMPTION OF TIMBER PRODUCTS<sup>2</sup>

From the data on the cut of various timber products given in Chapters VII, VIII, and IX, it is possible to prepare Table 30, where the quantities of each type of product are converted to cords as a common denominator. Table 30 is entitled "production," but is just as appropriately regarded as consumption. To review the highlights of this table:

<sup>1</sup> The data on production, drain, and growth summarized in this chapter were taken from the following sources:

Data for Virginia in 1940 were taken directly from United States Forest Service (Forest Survey) records, appropriately revised to allow for differences in boundaries of the subdivisions of the state and for the inclusion of "non-commercial" lands excluded in the Forest Survey. Data for North Carolina were taken from the same source, brought up to the year 1940 on the basis of field canvasses in that year.

Data for Tennessee, West Virginia, and Kentucky were compiled or estimated in such a way as to be comparable to those for Virginia and North Carolina. Production and drain figures for lumber were taken from records gathered coöperatively by the United States Forest Service and Bureau of the Census. Figures for other products in part are based upon field canvasses of the Forest Service and Tennessee Valley Authority, and in part are estimates. Growth figures for Tennessee are estimates by the Department of Forestry Relations of the Tennessee Valley Authority, based on surveys of the Tennessee River drainage basin. Growth figures for West Virginia and Kentucky are estimates by the United States Forest Service.

<sup>2</sup> The writer is indebted to Mr. William N. Sparhawk, formerly of the United States Forest Service, for exceedingly helpful criticism of this section as it previously stood in manuscript.

**TABLE 30**  
**PRODUCTION OF ALL USABLE TIMBER IN THE APPALACHIAN STATES, BY KIND OF WOOD**  
**AND TYPE OF PRODUCT, 1940**  
*(in cords)*

Kind of wood and type of product	All states	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
<b>Softwood</b>						
Pulpwood .....	1,246,400	.....	460,500	39,400	684,700	61,800
Mine timbers .....	67,700	19,000	.....	2,100	10,300	36,300
Saw logs and tie logs .....	5,913,900	158,500	3,008,600	606,800	1,989,900	150,100
Poles and piles .....	119,700	.....	60,300	17,200	42,200	.....
Veneer logs .....	17,800	600	13,400	1,300	2,300	200
Other veneer-group products .....	2,100	.....	1,300	.....	800	.....
Cooperage-group products .....	179,200	.....	33,200	400	145,600	.....
Fuel and tobacco wood .....	6,623,800	88,500	3,785,300	1,273,600	1,405,400	71,000
Other local products .....	149,300	14,300	81,300	22,700	27,500	3,500
All products .....	14,319,900	280,900	7,443,900	1,963,500	4,308,700	322,900
<b>Hardwood</b>						
Pulp, distillation, and extract wood * .....	989,500	40,600	344,300	288,100	258,300	58,200
Mine timbers .....	914,700	322,300	.....	27,200	91,400	473,800
Saw logs and tie logs .....	5,148,400	977,200	767,400	1,184,600	975,300	1,243,900
Poles and piles .....	2,700	.....	700	600	1,400	.....
Veneer logs .....	518,400	48,400	325,100	70,000	62,300	12,600
Other veneer-group products .....	69,300	9,200	11,400	29,500	16,100	3,100
Cooperage-group products .....	152,900	25,400	67,600	45,000	10,000	4,900
Fuel and tobacco wood .....	11,105,100	1,690,700	2,451,600	3,832,100	2,491,700	639,000
Other local products .....	487,300	104,200	53,600	128,800	85,800	54,900
All products .....	19,388,300	3,278,000	4,021,700	5,605,900	3,992,300	2,490,400
<b>All kinds of wood</b>						
Pulp, distillation, and extract wood .....	2,235,900	40,600	804,800	327,500	943,000	120,000
Mine timbers .....	982,400	341,300	.....	29,300	101,700	510,100
Saw logs and tie logs .....	11,062,300	1,135,700	3,776,000	1,791,400	2,965,200	1,394,000
Poles and piles .....	122,400	.....	61,000	17,800	43,600	.....
Veneer logs .....	536,200	49,000	338,500	71,300	64,600	12,800
Other veneer-group products .....	71,400	9,200	12,700	29,500	16,900	3,100
Cooperage-group products .....	332,100	25,400	100,800	45,400	155,600	4,900
Fuel and tobacco wood .....	17,728,900	1,779,200	6,236,900	5,105,700	3,897,100	710,000
Other local products .....	636,600	178,500	134,900	151,500	113,309	58,400
All products .....	33,708,200	3,558,900	11,465,600	7,569,400	8,301,000	2,813,300

\* Chestnut used both for extract wood (Table 13) and pulpwood (Table 12) is here counted only once.

Of the  $33\frac{3}{4}$  million cords of wood taken from the forest in 1940,  $17\frac{3}{4}$  million, or nearly 53 per cent of the total, was fuel wood. About 33 per cent was lumber and ties (both sawed and hewed); roughly 10 per cent was pulpwood and allied products; and among the remaining items, none of which amounted to more than 2 per cent of the total, local products other than fuel wood stood in first place.

The use of fuel wood in relation to the use of all products stood at a remarkably high level (more than two-thirds) in Tennessee, and at substantial levels (about one-half) in Kentucky, North Carolina, and Virginia. Even in West Virginia, where the accessibility of coal militates against the use of wood for fuel, this use accounted for one-fourth of the total.

Apparently throughout the Appalachian Region fuel wood, and some other products as well, provide a vast potential outlet for forest material of inferior quality, such as cull trees, hardwood tops, and dead chestnut.

In practice, the inferior, non-growing-stock material of the forest is not used as generally as might be expected in the cutting of fuel wood and other low-grade products. It is estimated that 62 per cent of all fuel wood is cut from such material, and only 31 per cent of all pulpwood, distillation wood, and extract wood;  $3\frac{1}{2}$  per cent of all local products other than fuel; and 1 per cent of all mine timbers. Considering all types of products in the region in 1940,  $11\frac{3}{4}$  million cords (35 per cent) of the entire consumption of  $33\frac{3}{4}$  million cords was derived from timber other than growing stock.

On the whole, however, the total annual cut of non-growing-stock wood represents a very significant portion of the total standing quantity of such wood. The  $11\frac{3}{4}$  million cords is about 4.5 per cent of the 261 million cords of standing non-growing-stock (Table 9). While it would be well if this percentage were much larger, there is no question that utilization of inferior timber is going forward, at substantial saving of timber suited to higher uses.

On the other hand, there is no evidence to show that growing stock itself, as a whole, is being drawn upon much less heavily than this. In fact that part of 1940 consumption which was derived from growing stock — 22 million cords — amounted to 4.1

per cent of the total standing volume of growing stock. This is a little less than the rate of growth.

Before conclusions may be drawn as to the meaning of these consumption rates, it will be necessary to investigate the situation with respect to particular species of trees, sizes and grades of trees, and geographic areas. For this purpose, more refinement is called for than to deal simply with consumption as a whole. But first, reference may be made to the data on consumption by major species groups, Table 30.

Of the  $33\frac{3}{4}$  million cords of total consumption, more than  $19\frac{1}{3}$  million cords ( $57\frac{1}{2}$  per cent) were hardwood timber. Holding aside the large item of fuel wood, the balance was about equally divided between softwood and hardwood. Among the states, North Carolina and Virginia showed a preponderance of softwood over hardwood; while in the other three states the reverse was very decidedly the case. If the consumption of each group of species is compared with the total volume of standing timber, one finds that hardwood consumption represented 3.3 per cent of standing volume; but that softwood consumption was 6.9 per cent. Here is some evidence of maladjustment between species groups. Additional evidence will be given and discussed on following pages.

#### COMPARING ACTUAL CONSUMPTION WITH THE IDEAL

It is necessary to compare consumption, not with standing timber, but with the ideal consumption under some rational plan, before it can be ascertained whether problems exist. Such a plan for consumption is really a plan for harvesting forest crops—that is, it is part of a timber-management plan, and as such is beset with all the difficulties and uncertainties described in Chapter IV. This plan must budget the amounts of timber to be cut in successive periods, based upon considerations of supply and of price. In dealing with supply, it must consider first the physical potentialities of the forest, as limited by existing growing stock and by the economic level of timber loss from fire and other controllable destructive agencies; and second the economic potentialities as limited by cost. These supply considerations must be integrated with the considerations of timber requirements, both locally and generally, as conditioned by the effective price, the

costs of distribution being allowed for. Furthermore, the plan cannot well deal with broad geographic areas, but must in effect be tied down to specific management units — that is, specific forest holdings. The development of such a plan will not be attempted here.

A crude substitute for such a plan might be an estimate of the maximum allowable cut of timber, in management units or small areas, based upon judgment of the economically best silvicultural practice. The actual cut, by categories of the stand, might then be compared with this maximum allowable cut. The fact of "overcutting" in any stand category or area might then be discovered, though the recognition of a problem would be difficult in cases of "undercutting." Unfortunately, even such an analysis as this cannot be attempted here, because of a want of basic data.

The best approximation of the allowable cut that can be given here is the current periodic annual net growth of timber. Because this is the growth of growing stock alone, it must be compared with the consumption of growing stock alone, which will be called "drain," in conformity with the usage of the United States Forest Service.<sup>3</sup> This comparison of growth and drain must be confined to entire states within the region. Only within limited sections can it be given for subdivisions smaller than a state.

Admittedly, the analysis will be rough. In the first place, while an estimate of net growth may be prepared that has fire, insect, decay, and other mortality losses deducted from it, there is still no reason to suppose that this net growth is an approximation of the cut in any year under a rational plan. It would not be such an approximation unless the volume of current growing stock were equal to the planned future volume and unless the year in question happened to be one of average harvest, the ups and downs of the business cycle considered. If it were possible, it would be much better to compare growth and drain over a period of years of such length and location as to minimize the cyclical influence.

In the second place, it will not be possible to deal adequately with the separate categories of the forest stand, such as are re-

<sup>3</sup> In the present analysis, only cutting (that is, "commodity drain") will be included as drain. All other subtractions from growing stock, such as may be caused by fire, pests, storm, and the like, will be handled as deductions in the calculation of net growth.

flected in tree species, quality, and size. It may be found that the over-all growth is insufficient to sustain the current level of cutting, but in what particular categories of the stand the pinch is felt may not be known. Or an excess of over-all growth over drain may suggest that there is reason for optimism concerning the development of the growing stock; whereas, in fact, heavy deficits may be accumulating in the favored species, qualities, or sizes of trees, masked, however, by even heavier surpluses in the less desirable categories of the growing stock. Furthermore, the analysis of growth and drain will reveal nothing of what is happening to those elements of the timber stand not classed as growing stock.

Finally, any kind of growing-stock balance struck for an area as large as a state, or even a major section of a state, is almost certain to be misleading, because it covers over the variations from locality to locality and from tract to tract that are the most significant phase of the situation. For example, one-half an area may suffer such serious depletion of its timber that its economy is on the point of disruption; the other half of this same area may have abundant supplies that are reserved altogether from cutting, so that large surpluses are accumulating. Of these two situations, both may represent maladjustments; and the first, a critical one. Yet for the whole area the allowable cut and the consumption may be about equal.

One farm woodland with a large surplus and a neighboring one with a large deficit may together show a perfect balance, and yet each represent a problem. Overcutting of a block of commercial forest in the highlands may be exactly counterbalanced by the surpluses on an adjoining national park; but these surpluses, not being available for harvest as timber, bear no relation whatever to the deficits of the commercial forest, and should not be grouped with them. The same is true of less obvious cases where timber, either public or private, is reserved for any cause whatsoever, including the possible cause that there is nothing on the land worth cutting.

For these reasons, data on growth and drain do not necessarily mean very much in problem analysis. It must be emphasized that data for large, heterogeneous areas, which show a balance or surplus of growth as compared with drain, are by themselves utterly inconclusive; and, if taken at their face value, are invariably mis-

leading. Where drain exceeds growth, however, these data, taken in conjunction with data on growing stock, may be definitely conclusive. Furthermore, growth-drain statistics in general, if adequately qualified and interpreted, are helpful in an understanding of the problems of timber consumption.

#### GROWTH AND DRAIN OF SAW TIMBER

By separating out the saw-timber component of the growing stock, one may consider by itself one broad category of the stand of particular significance. As defined here, the saw-timber component includes all usable saw-log portions of softwood trees nine inches or larger in diameter and of hardwood trees thirteen inches or larger. This is the part of the growing stock that is commonly regarded as usable for lumber. It is the part upon which has been based the region's principal forest-industrial development of the past. It is the part which has undergone the heaviest use, to judge by the present condition of the growing stock. What are the current trends in use as compared with growth?

For the Appalachian Region as a whole, drain upon saw-log growing stock in 1940 totaled  $5\frac{3}{4}$  billion board feet (Table 31). Total net growth in that year was  $6\frac{1}{2}$  billion board feet (Table 33), indicating a regional surplus of  $13\frac{1}{2}$  per cent of drain (Table 34). Some of the variation of which this surplus is the net result becomes apparent upon considering the two main groups of tree species. In hardwoods, growth represented 132.9 per cent of drain; but in softwoods, only 96.9 per cent: a net deficit in softwood for the region.

It is seen in Table 33 that only about  $4\frac{1}{2}$  billion board feet out of the total net growth of  $6\frac{1}{2}$  billion was accumulated in forest stands having a sufficiently heavy growing stock to be merchantable for saw timber. The remaining 2 billion board feet (three-tenths of the total) occurred in unmerchantable stands, upon small or scattered trees. This latter part of the growth is just as surely a credit against drain as is the former part. Except on properties where the cutting cycle is only about a year in length (and there are few of them in the region), drain in the harvest year is almost certain to exceed growth of the stands harvested; and in stands not harvested in that year, growth naturally must exceed drain. It is only on the average, over a period of years,



TABLE 31  
DRAIN ON SAW-LOG GROWING STOCK DUE TO CUTTING IN THE APPALACHIAN STATES,  
BY KIND OF WOOD AND TYPE OF PRODUCT, 1940  
(in thousands of board feet)

Kind of wood and type of product	All states	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
<b>Softwood</b>						
Pulpwood .....	245,400	...	104,500	5,800	121,300	13,800
Mine timbers .....	10,100	2,800	...	300	1,600	5,400
Saw logs and tie logs .....	2,101,000	57,700	1,142,000	221,700	626,000	54,600
Poles and piles .....	43,400	...	22,600	6,000	14,800	...
Veneer logs .....	7,000	300	5,200	500	900	100
Other veneer-group products .....	600	...	400	...	200	...
Cooperage-group products .....	48,000	...	13,500	100	34,400	...
Fuel and tobacco wood .....	605,300	11,000	385,700	134,000	70,300	4,300
Other local products .....	19,100	1,900	9,700	3,000	4,000	500
All products .....	3,080,900	73,700	1,683,600	371,400	873,500	78,700
<b>Hardwood</b>						
Pulp and distillation wood .....	67,000	2,000	13,700	31,400	10,300	9,600
Mine timbers .....	55,900	19,800	...	1,700	5,600	28,800
Saw logs and tie logs .....	1,856,900	367,500	279,600	424,200	329,000	456,600
Poles and piles .....	2,000	...	300	600	1,100	...
Veneer logs .....	227,700	21,600	142,600	30,700	27,300	5,500
Other veneer-group products .....	17,200	1,900	3,300	7,500	3,800	700
Cooperage-group products .....	51,200	8,200	25,100	13,700	2,600	1,600
Fuel and tobacco wood .....	363,500	63,000	116,000	137,000	29,300	18,200
Other local products .....	16,400	2,700	7,200	2,200	3,400	900
All products .....	2,657,800	486,700	587,800	649,000	412,400	521,900
<b>All kinds of wood</b>						
Pulp and distillation wood .....	312,400	2,000	118,200	37,200	131,600	23,400
Mine timbers .....	66,000	22,600	...	2,000	7,200	34,200
Saw logs and tie logs .....	3,958,900	425,200	1,421,600	645,900	955,000	511,200
Poles and piles .....	45,400	...	22,900	6,600	15,900	...
Veneer logs .....	234,700	21,900	147,800	31,200	28,200	5,600
Other veneer-group products .....	17,800	1,900	3,700	7,500	4,000	700
Cooperage-group products .....	99,200	8,200	38,600	13,800	37,000	1,600
Fuel and tobacco wood .....	968,800	74,000	501,700	271,000	99,600	22,500
Other local products .....	35,500	4,600	16,900	5,200	7,400	1,400
All products .....	5,738,700	560,400	2,271,400	1,020,400	1,285,900	600,600

TABLE 32  
DRAIN ON TOTAL GROWING STOCK DUE TO CUTTING IN THE APPALACHIAN STATES,  
BY KIND OF WOOD AND TYPE OF PRODUCT, 1940  
(in cords)

Kind of wood and type of product	All states	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
<b>Softwood</b>						
Pulpwood .....	1,158,600	...	431,200	59,000	601,200	67,200
Mine timbers .....	67,600	19,000	...	2,100	10,200	36,300
Saw logs and tie logs .....	5,911,200	160,700	3,137,300	619,700	1,831,900	161,600
Poles and piles .....	125,500	...	63,200	18,000	44,300	...
Veneer logs .....	25,700	700	21,300	1,400	2,200	100
Other veneer-group products .....	2,100	...	1,300	...	800	...
Cooperage-group products .....	184,700	...	38,100	300	146,300	...
Fuel and tobacco wood .....	3,136,200	57,100	1,970,300	637,100	446,700	25,000
Other local products .....	147,200	14,000	81,300	22,200	26,400	3,300
All products .....	10,758,800	251,500	5,744,000	1,359,800	3,110,000	293,500
<b>Hardwood</b>						
Pulp and distillation wood .....	379,600	10,400	80,900	165,000	85,300	38,000
Mine timbers .....	902,100	319,100	...	27,200	91,500	464,300
Saw logs and tie logs .....	5,102,100	958,900	731,200	1,136,200	988,600	1,287,200
Poles and piles .....	5,500	...	800	1,600	3,100	...
Veneer logs .....	581,100	62,300	351,200	81,200	70,700	15,700
Other veneer-group products .....	67,500	9,200	11,000	29,500	14,700	3,100
Cooperage-group products .....	161,500	25,400	72,500	49,500	9,200	4,900
Fuel and tobacco wood .....	3,522,000	504,900	1,217,800	950,200	683,100	160,000
Other local products .....	467,700	160,900	53,600	126,200	74,800	52,200
All products .....	11,189,100	2,051,100	2,519,000	2,572,600	2,021,000	2,025,400
<b>All kinds of wood</b>						
Pulp and distillation wood .....	1,538,200	10,400	512,100	224,000	686,500	105,200
Mine timbers .....	969,700	338,100	...	29,300	101,700	500,600
Saw logs and tie logs .....	11,013,300	1,119,600	3,868,500	1,755,900	2,820,500	1,448,800
Poles and piles .....	131,000	...	64,000	19,600	47,400	...
Veneer logs .....	606,800	63,000	372,500	82,600	72,900	15,800
Other veneer-group products .....	69,600	9,100	12,300	29,500	15,500	3,100
Cooperage-group products .....	346,200	25,400	110,600	49,800	155,500	4,900
Fuel and tobacco wood .....	6,658,200	562,000	3,188,100	1,593,300	1,129,800	185,000
Other local products .....	614,900	174,900	134,900	148,400	101,200	55,500
All products .....	21,947,900	2,302,600	8,263,000	3,932,400	5,131,000	2,315,900

**TABLE 33**  
**TOTAL NET GROWTH OF TIMBER IN THE APPALACHIAN STATES, BY TYPE OF MATERIAL,**  
**CONDITION CLASS, AND KIND OF WOOD, 1940**  
 SAW-LOG GROWING STOCK (in thousands of board feet)

Condition class and kind of wood	All states	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
<b>Stands merchantable for saw timber</b>						
Softwood .....	2,236,900	39,800	1,338,000	153,800	674,200	31,100
Hardwood .....	2,294,400	229,600	546,000	673,300	603,000	242,500
All kinds of wood .....	4,531,300	269,400	1,884,000	827,100	1,277,200	273,600
<b>Stands not merchantable for saw timber</b>						
Softwood .....	747,000	49,200	344,200	130,700	201,700	21,200
Hardwood .....	1,236,600	356,000	106,400	346,300	163,100	264,800
All kinds of wood .....	1,983,600	405,200	450,600	477,000	364,800	286,000
<b>All stands</b>						
Softwood .....	2,983,900	89,000	1,682,200	284,500	875,900	52,300
Hardwood .....	3,531,000	585,600	652,400	1,019,600	766,100	507,300
All kinds of wood .....	6,514,900	674,600	2,334,600	1,304,100	1,642,000	559,600
<b>TOTAL GROWING STOCK (in cords)</b>						
<b>Stands merchantable for saw timber</b>						
Softwood .....	6,512,200	140,000	3,645,600	442,800	2,187,500	106,300
Hardwood .....	9,614,400	1,017,600	2,414,500	2,499,500	2,616,600	1,066,200
All kinds of wood .....	16,126,600	1,157,600	6,060,100	2,942,300	4,804,100	1,172,500
<b>Stands not merchantable for saw timber</b>						
Softwood .....	4,594,800	339,300	2,222,700	374,800	1,492,700	165,300
Hardwood .....	8,099,300	1,643,800	1,308,900	2,351,000	1,737,500	1,058,100
All kinds of wood .....	12,694,100	1,983,100	3,531,600	2,725,800	3,230,200	1,223,400
<b>All stands</b>						
Softwood .....	11,117,000	479,300	5,868,300	817,600	3,680,200	271,600
Hardwood .....	17,713,700	2,661,400	3,723,400	4,850,500	4,354,100	2,124,300
All kinds of wood .....	28,830,700	3,140,700	9,591,700	5,668,100	8,034,300	2,395,900

TABLE 34  
COMPARISON OF TIMBER GROWTH WITH DRAIN IN THE APPALACHIAN STATES,  
BY TYPE OF MATERIAL AND KIND OF WOOD, 1940  
SAW-LOG GROWING STOCK

Kind of wood and growth-drain item	All states	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
<b>Softwood</b>						
Drain (Thousand bd. ft.)	3,080,900	73,700	1,683,600	371,400	873,500	78,700
Growth (Thousand bd. ft.)	2,983,900	89,000	1,682,200	284,500	875,900	52,300
Growth (Per cent of drain)	96.9	120.8	99.9	76.6	100.3	66.4
<b>Hardwood</b>						
Drain (Thousand bd. ft.)	2,657,800	486,700	587,800	649,000	412,400	521,900
Growth (Thousand bd. ft.)	3,531,000	585,600	651,400	1,019,600	766,100	507,300
Growth (Per cent of drain)	132.9	120.3	111.0	157.1	185.8	97.2
<b>All kinds of wood</b>						
Drain (Thousand bd. ft.)	5,738,700	560,400	2,271,400	1,020,400	1,285,900	600,600
Growth (Thousand bd. ft.)	6,514,900	674,600	2,334,600	1,304,100	1,642,000	559,600
Growth (Per cent of drain)	113.5	120.4	102.8	127.8	127.7	93.2
<b>TOTAL GROWING STOCK</b>						
<b>Softwood</b>						
Drain (Cords)	10,758,800	251,500	5,744,000	1,359,800	3,110,000	293,500
Growth (Cords)	11,117,000	479,300	5,868,300	817,600	3,680,200	271,600
Growth (Per cent of drain)	103.3	190.6	102.2	60.1	118.3	92.5
<b>Hardwood</b>						
Drain (Cords)	11,189,100	2,051,100	2,519,000	2,572,600	2,021,000	2,025,400
Growth (Cords)	17,713,700	2,661,400	3,723,400	4,850,500	4,354,100	2,124,300
Growth (Per cent of drain)	158.3	129.8	147.8	188.5	215.4	104.9
<b>All kinds of wood</b>						
Drain (Cords)	21,947,900	2,302,600	8,263,000	3,932,400	5,131,000	2,318,900
Growth (Cords)	28,830,700	3,140,700	9,591,700	5,668,100	8,034,300	2,395,900
Growth (Per cent of drain)	131.4	136.2	116.1	144.1	156.6	103.3

that any stable relation between growth and drain may be expected for a single cutting area.

In any given year it is therefore justifiable (to the extent that the growth-drain comparison is itself justifiable) to enter the growth of unmerchantable stands on the credit side of the ledger. Whether a problem exists in this case depends again upon the detailed make-up of a geographic pattern concerning which the data are not to be had. Management policies designed to create an unmerchantable stand within entire holdings, and especially within entire contiguous blocks of holdings, create a hiatus in production which is very likely to diminish the welfare of the local economy; on the other hand, where policies aim at a dispersal of unmerchantable stands among the merchantable, even within individual holdings, the likelihood that a problem exists is much less. In actual fact, the pattern of unmerchantable areas appears to be more of the contiguous, rather than of the dispersed, type within much of the Appalachian Region.

Turning from the region as a whole to the situation in individual states, one finds that the entire growing stock of saw timber, both softwood and hardwood, showed a surplus in 1940 in four out of the five states. In West Virginia, the one deficit state, heavy cutting in old-growth timber was apparently responsible for the large size of the deficit. The surplus in North Carolina was very small. With respect to hardwoods alone, much the same story was true, except that surpluses in Virginia, Tennessee, and North Carolina were much larger. The surplus of hardwood saw timber in Virginia was between eight- and nine-tenths of the drain itself. The situation with respect to softwood, on the other hand, was altogether different. Only one state of the five showed a significant surplus: Kentucky, where softwood timber is of relatively slight moment.

For a portion of the region it is possible to consider areas smaller than a state. For example, statistics are available for each of the three provinces of North Carolina (with boundaries slightly changed) for the year 1938.<sup>4</sup> In that year there was, in the state as a whole, a net surplus of growth over drain amounting to 77.5 million board feet (3.5 per cent of drain). This was composed of 106.9 million board feet (20.2 per cent) of surplus in hardwood,

<sup>4</sup>J. W. Cruikshank, *North Carolina Forest Resources and Industries* (U. S. Dept. Agr. Misc. Pub. 533; iv + 76 pp.; Washington, 1944), p. 75.

29.4 million feet (1.7 per cent) of deficit in softwood. When the state is subdivided, the picture looks somewhat as follows: in the coastal plain a surplus of both softwood and hardwood, amounting on the average to 16 per cent; in the highlands an approximate equality of growth and drain, composed of a 7.6 per cent surplus in softwood, a 4.7 per cent deficit in hardwood; in the piedmont an over-all deficit of 13.2 per cent, with a deficit of 23.4 per cent in softwood, a surplus of 35 per cent in hardwood. The great diversity of the local situations masked beneath the state average now begins to be apparent, and there is little doubt that this diversity increases as the size of the locality under consideration diminishes.

In the state of Virginia, it is possible to consider in some detail the relation of growth to drain within four subdivisions of the state: (1) the highlands and great valley provinces, (2) the coastal plain, together with Chesterfield, Dinwiddie, and Brunswick Counties; (3) the piedmont north of the James River; and (4) the piedmont south of the James River, excepting the three counties named above. It will be recalled that in Virginia as a whole there was in 1940 at least a slight surplus of growth over drain in both softwood and hardwood saw-log growing stock. The sort of situation that lay beneath this general average may now be examined.

In the highlands-great valley section of Virginia, growth exceeded drain in both softwoods and hardwoods, the average surplus amounting to 12.6 per cent of drain.<sup>5</sup> The per cent of surplus or deficit in each of six groups of species was as follows:

	<i>Per cent</i>
Softwoods	
Shortleaf pine .....	+40.8
Virginia pine .....	+94.1
Other softwoods .....	-24.9
All softwoods .....	+14.7
Hardwoods	
Oaks .....	- 4.1
Yellow poplar .....	+43.0
Other hardwoods .....	+44.2
All hardwoods .....	+12.0
All species .....	+12.6

<sup>5</sup> Thomas Lotti and T. C. Evans, *The Forest Situation in the Mountain Region of Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 15; iv + 70 pp., processed; Asheville, N. C., 1943), pp. 67-68.

And the situation with respect to groups of trees classified according to diameter, in inches:

	<i>Per cent</i>
Softwoods	
9.0-12.9 .....	+109.3
13.0-18.9 .....	- 16.7
19.0 or more .....	- 37.9
Hardwoods	
13.0-18.9 .....	+ 28.2
19.0 or more .....	- 3.4

In the coastal plain section of Virginia, also, both softwood and hardwood species showed an over-all surplus of growth over drain.<sup>6</sup> Surpluses or deficits in each of six groups of species were:

	<i>Per cent</i>
Softwoods	
Loblolly, short leaf pines .....	+ 4.8
Virginia pine .....	- 10.6
Other softwoods .....	- 49.2
All softwoods .....	+ 2.3
Hardwoods	
Oaks .....	+ 65.6
Gums .....	+118.8
Other hardwoods .....	+957.9
All hardwoods .....	+125.4
All species .....	+ 23.5

And surpluses or deficits by tree-diameter groups were:

	<i>Per cent</i>
Softwoods	
9.0-12.9 .....	- 7.8
13.0-18.9 .....	+ 24.9
19.0 or more .....	- 18.8
Hardwoods	
13.0-18.9 .....	+192.8
19.0 or more .....	+ 55.9

Turning next to the northern piedmont of Virginia, it will be of interest to study the balance of growth and drain in even more detail as to stand category, noting the situation in each species

<sup>6</sup>J. W. Cruikshank, *The Forest Situation in the Coastal Plain of Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 12; iv + 45 + 26 pp., processed; Asheville, N. C., 1943), p. A-21.

group within each diameter group.<sup>7</sup> Surpluses and deficits were as follows, in per cent:

	All diameters	9.0-12.9	13.0-18.9	19.0 or more
<b>Softwoods</b>				
Shortleaf, loblolly pines	- 27.2	- 6.6	- 42.7	- 52.4
Other softwoods	+ 68.7	+77.4	+ 40.2	+700.0
All softwoods	+ 19.9	+42.9	- 10.6	+ 13.0
<b>Hardwoods</b>				
Oaks	+150.5	...	+125.9	+214.4
Gums, yellow poplar	+245.2	...	+245.3	+244.9
Other hardwoods	+596.0	...	+552.4	+700.0
All hardwoods	+205.3	...	+185.2	+252.8
All species	+ 92.6	+42.9	+ 91.9	+219.0

Finally, there are parallel figures for the southern piedmont of Virginia:<sup>8</sup>

	All diameters	9.0-12.9	13.0-18.9	19.0 or more
<b>Softwoods</b>				
Shortleaf, loblolly pines	- 33.1	-30.7	- 25.3	- 67.4
Other softwoods	+ 36.0	+70.9	+ 5.0	- 50.0
All softwoods	- 17.4	- 4.7	- 18.5	- 65.4
<b>Hardwoods</b>				
Oaks	+ 73.8	...	+121.1	+ 20.0
Gums, yellow poplar	+ 56.0	...	+ 70.6	+ 35.7
Other hardwoods	+557.4	...	+719.7	+372.7
All hardwoods	+ 88.3	...	+123.4	+ 44.5
All species	+ 12.8	- 4.7	+ 29.8	+ 2.1

The inspection of these data on saw-log growth and drain reveals several significant facts:

1. The relation of growth to drain exhibits an increasing diversity, and suggests increasingly a state of maladjustment, as the size of area under consideration is reduced and as the detail of stand categories considered is increased. The very definite implication is that local situations, as well as the general situation with respect to individual categories of the stand, tend to be critical.

2. As regards individual species of trees, there is a clear tendency for deficits to appear in the ranks of those favored commercially and for surpluses to appear elsewhere. In the mountainous

<sup>7</sup> William A. Duerr, T. C. Evans and G. E. Morrill, *The Forest Situation in Piedmont Virginia* (Appalachian For. Exp. Sta., Forest Survey Release 13; iii + 83 pp., processed; Asheville, N. C., 1943), p. 79.

<sup>8</sup> Duerr, Evans, and Morrill, *The Forest Situation in Piedmont Virginia*, p. 80.



sections of the region, where the lumber industry is largely geared to production of hardwood, there is occasional evidence of over-all hardwood depletion and much evidence of the depletion of specific, desirable hardwoods like yellow poplar and certain oaks. In those sections, particularly in the coastal plain and piedmont, where the lumber industry is geared to softwood production, this is the category that most consistently exhibits a deficit, while hardwoods are usually in surplus. Among the softwoods, obviously loblolly and shortleaf pines are drawn upon very heavily; while Virginia pine, less favored because of its smaller size and poor form, tends to be left standing in the woods.

The fact that hardwoods are favored in some localities, pine in others, makes it possible for a heterogeneous area to show a surplus of growth over drain in both species groups, and at the same time for there to be a deficit in the most important stand category in each part of the area.

3. There appears to be a nearly universal tendency toward surpluses in the small diameter classes of trees and deficits in the large. Lest there be any misunderstanding on this point, it is well to emphasize that a "deficit" of large-size trees indicates more than the mere fact that these trees are being cut in preference to small trees, for that fact is to be accepted, and need not be inconsistent with the best principles of timber management. What the "deficit" means is that large trees are preferred to such an extent, and cut so heavily, and that trees just smaller than the large class are being cut so heavily, that large trees are not re-appearing in the stand as fast as they are being cut, and that the inventory of such trees is declining.

4. Generally speaking, then, the observations made in Chapter IV are here borne out, at least with respect to the year 1940: that not only is the forest as a whole precariously close to general depletion, but the character of the entire growing stock of timber is undergoing a marked change, the species and sizes of trees favored commercially being on the decline, those less favored being on the increase.

#### SIGNIFICANCE OF THE SAW-TIMBER SITUATION

Obviously there is belt-tightening ahead for those industries of the Appalachian Region that subsist upon the long-established

products of large-tree and board forestry. Taking the ups and downs of the cycles, such belt-tightening has already been in process for some time — indeed, ever since the areas of the region reached their peak of lumber production based upon virgin timber. The process of using these long-established products cannot very well continue until exhaustion; because long before that point is reached, the timber industry will have run out of accessible and operable stands, except for what the national forests and other few stable holdings are able to supply.

The seriousness of the problem depends upon the nature of alternative opportunities for economic activity, the mobility of productive factors, and the rate and evenness of decline of established industry. If timber as a raw material continues to be of significant value, and if population, particularly, continues somewhat immobile, then the seriousness of the problem may depend heavily upon alternative opportunities for timber production, and these, in turn, upon the opportunities for marketing the products. Some light may be thrown upon these questions by examining the relation of growth to drain for the entire growing stock of timber, cordwood as well as saw logs.

#### GROWTH AND DRAIN OF ALL TIMBER

By entire growing stock is meant the total quantity of usable wood, expressed in cords, in trees five inches and larger in diameter, exclusive of dead and cull trees and the tops of hardwood trees. The entire growing stock includes, besides the saw-timber growing stock, the usable tops of softwood saw-log trees and the entire usable stems of sound trees ranging in diameter from five inches to saw-log size.

For the Appalachian Region as a whole, drain upon total growing stock in 1940 amounted to nearly 22 million cords (Table 32). Growth was 28.8 million cords (Table 33), amounting to 131.4 per cent of drain (Table 34). This surplus of 31.4 per cent is to be compared with that of 13.5 per cent of the growing stock of saw timber alone. There was an over-all surplus of both softwoods and hardwoods: 3.3 and 58.3 per cent, respectively.

In each of the five states of the region there was a surplus of growth over drain of all usable timber. All states showed a surplus of hardwood; and all but two, Tennessee and West Virginia, a

surplus of softwood. The important point to be noted, however, is that of the ten items (other than totals) given in Table 34, the surplus of all timber exceeded that of saw timber, or the deficit was less, in all cases except one — that is, softwood in Tennessee, where softwood is of relatively infrequent occurrence. In the other nine cases, there is good reason to believe that substantial surpluses existed in the stand categories included in "total growing stock" but excluded from "saw-log growing stock" — that is, small trees and softwood tops.

It will not be necessary to deal in detail with the surpluses and deficits by stand categories in the subdivisions of the two states where this is possible, as was done for saw-timber growth and drain. It is of much interest, however, to note whether surpluses are higher and deficits lower in all timber than in saw timber, for here is the key to the situation in non-saw-log growing stock, the category of primary concern here.

In North Carolina, of the six items for which data are available (softwoods and hardwoods in each of the three provinces), all but one showed substantially greater surpluses or smaller deficits in total growing stock than in saw-log growing stock. The one exception was softwood in the coastal plain, probably to be accounted for by heavy cutting of pulpwood in that area.

In Virginia, the fact that data are available by tree-diameter class makes it possible to review more directly the situation with respect to non-saw-log growing stock, at least the small-tree part of it. A review of the figures for each of the four subdivisions of the state reveals only one case of deficit in 5 to 8.9-inch trees of any softwood species group or 5 to 12.9-inch trees of any hardwood species group. This item of deficit occurred in the southern piedmont, in the class of oaks ranging from 9 to 12.9 inches in diameter.

These data support the observation already made: that surpluses occur in the smallest sizes of trees and in species other than those most favored commercially.

#### OUTLOOK FOR THE FUTURE

The surplus of non-saw-timber growing stock which is accumulating is not large. If, by way of illustration, the 1940 surplus of 6.9 million cords of total growing stock were to be imagined as

accumulating year after year, it would take more than seventy-five years for the total growing stock of the region to be doubled.

On the other hand, the surplus of non-saw-timber growing stock is sufficiently large, and apparently distributed from locality to locality with sufficient consistency, so that it is capable of playing an important role in the shifts in timber consumption that will inevitably occur within the region. That consumption of the region's timber will decline (at least during the period of recuperation of the growing stock in those categories of timber now so seriously in deficit) there can be little doubt. It must decline if forests are placed under good management. But so far as the physical possibilities are concerned, total consumption may be shifted toward other categories of the growing stock and also to non-growing-stock material of various sorts: and thus be not merely sustained, but actually increased while the productivity of the timber capital is also being increased. These are the sources available for relieving the burden upon the timber categories now in deficit:

1. Surplus categories of the growing stock. Reference is made here not to the 6.9 million cords of over-all surplus, but to the individual items of surplus which go to counterbalance the deficits. Much of this consumable material is hardwood. Much, legitimately, is of small size.

2. Non-growing-stock timber. This includes usable cull trees, dead chestnut, and hardwood tops. The standing volume of this timber in 1940 was about 261 million cords. If new material is being recruited to this element of the stand at the same rate as to the growing stock, the amount of such recruitment annually is more than 14 million cords, which is greater by about 20 per cent than the current annual consumption of non-growing-stock timber. No allowance is made here for the additional amounts of such timber that would become available in a program of liquidating the cull element of the forest. Beyond this, if the consumption of fuel wood should decline in future (which surely will happen if incomes rise and people turn to more convenient sources of heat), then additional quantities of non-growing-stock as well as better timber will be released for other uses.

3. Woods waste. While there is a considerable quantity of usable material left behind in the woods when timber is harvested

for such products as veneer and cooperage, the degree of utilization practiced in harvesting such other products as saw logs and pulpwood is in many parts of the region actually closer than has been allowed for in estimating the standing volume of usable timber. On the whole, woods waste physically available for use probably does not amount to more than 300,000 cords annually.

4. Mill waste. Most of the mill waste in the region consists of slabs, edgings, and sawdust produced in sawing lumber. In the consumption of timber of small average size, the quantity of such material produced is rather high — perhaps about one cord for every thousand board feet of lumber sawed. This would mean an annual output approaching four million cords. Much of this waste is currently being used for fuel, pulpwood, and other purposes.

5. Timber now destroyed. Wildfire and pests now destroy much standing timber. Though perhaps only a small fraction of this loss is economically preventable, the amount of timber saved under adequate forest protection would in the aggregate comprise a substantial addition to the woodpile.

By no means all the wood here described is suitable for use under present standards of utilization. Even under altered standards, some of it would be unavailable because inaccessible. But there can be no question that the forest resource now offers a very large physical quantity of wood, the use of which is consistent with higher physical productivity.

A great problem is implied in the need for altering the pattern of consumption — or, to put it differently, for sustaining or even increasing consumption in the face of inevitable changes in pattern. That this is one of the most critical and all-inclusive problems of forestry in the Appalachian Region can be seen in its close relation to other major phases of the forest situation. On the side of timber management, the need for stand improvement can be met only through greater consumption of the less productive elements in the stand, and the need for rebuilding the growing stock can be met only through lessened consumption of other elements. And on the side of marketing as well as of logging and processing, increased efficiency is needed in order to make economically possible a higher consumption of the products now available as well as of those yet to be produced in abundance through timber management.

## APPENDIX

## APPENDIX

### DEFINITIONS OF FORESTRY ECONOMICS

Fernow defines the field of *forestry* as consisting of three branches: forest politics (economic aspects), forest production (technical aspects), and forest economy (business aspects).<sup>1</sup> The first branch, forest politics, he subdivides into statistics, history, policy, and economics — the last-named including what he elsewhere calls “forest influences,” the relation of forests to climate, soil, water, health, and ethics. The third branch, forest economy, he subdivides into survey, mensuration, finance, regulation, and administration. Thus he includes, under the term economics, a number of segments of the forestry field excluded from consideration in this book. Under the title “economics of forestry” he includes a very large share of the whole forestry field: biological and physical aspects of forestry practice, forest description and statistics, public policy, and history.

Hiley follows, in the main, the outlines of the field of forestry economics as established in Germany by such writers as Heyer, Pressler, Martin, and Endres.

These writers maintained a distinction between *forest valuation* (Forstwertrechnung) and *forest statics* (Forststatik); the former branch of the subject dealt with the valuation, by means of formulae, of forest land, immature crops, and forests in general; the latter with the relative profitableness of various systems of forest management.<sup>2</sup>

Hiley's treatise on the economics of forestry is concerned primarily with forest valuation, finance, and accounting, with an introductory part on timber supplies, consumption, prices, and general economic theory with some applications to forestry.

The subcommittee on scope and status of research in forest

<sup>1</sup>Bernhard E. Fernow, *Economics of Forestry* (xii + 520 pp.; New York, 1902), pp. 103-105.

<sup>2</sup>W. E. Hiley, *The Economics of Forestry* (xiii + 256 pp.; Oxford, 1930), p. 4.

economics, of the Social Science Research Council, regards forest economics as

covering the entire range of economic and social problems involved in the production and utilization of forest resources, including all of the various commodities derived from forest land and all of the services rendered by forests. Thus, broadly considered, it clearly passes beyond the strict confines of economics into the domain of some of the other social sciences. This is essential because of the difficulty in separating the economic and social ramifications in a field such as forestry where both objectives are usually present.<sup>3</sup>

The subcommittee breaks the field of forestry economics down into the following divisions:<sup>4</sup> (1) inventory of the forest resources, (2) forest-land classification, (3) forest production, (4) manufacture of forest products, (5) marketing and distribution of forest products, (6) consumption of forest products, (7) prices of forest products, (8) forest and forest-industry finance, (9) public finance in relation to forest enterprises, (10) public policies in relation to forest enterprises, (11) social aspects of forest enterprises, (12) interrelation between forestry and other enterprises.

Buttrick writes

*Forest economics* and *forest finance* are those branches of forestry which treat of the economic and financial aspects of the establishment, care, harvesting, and general economic usefulness of forests. Sometimes they are considered as one subject, sometimes as two. Forest economics when treated by itself is generally concerned only with the broader economic value of forests to mankind or with statistics of forest areas, amount and value of forest products, and similar data. Finance as a general subject may be thought of as that branch of economics which treats economic factors in terms of money and accounting. Forest finance in its special field covers these same factors in similar terms. The specific task of forest finance is the consideration of forests and forestry as business and investments, both in general and as applied to particular areas and conditions. In practical affairs it is impossible, except in a limited way, to consider economics and finance as separate entities.<sup>5</sup>

<sup>3</sup> Social Science Research Council, Subcommittee on Scope and Status of Research in Forest Economics, *A Survey of Research in Forest Economics* (Soc. Sci. Research Council Bull. 24; vii + 52 pp.; New York, 1936), p. 4.

<sup>4</sup> *A Survey of Research in Forest Economics*, p. 5.

<sup>5</sup> P. L. Buttrick, *Forest Economics and Finance* (xviii + 484 pp.; New York and London, 1943), p. 3.



Buttrick groups the subject matter of forestry under three heads — biological, engineering, and economic — and under the economic head lists economics, sociology, finance, policy, management, and administration.<sup>6</sup>

#### QUANTITATIVE POSITION OF TIMBER IN THE ECONOMY

What part does forestry represent of the whole economy? A few data are available for a partial answer.

#### EMPLOYMENT

Estimates are made in this book (Chapters VII, VIII, and IX) of the quantity of timber produced for each type of product in each of the Appalachian states in 1940. In Chapter X these quantities are converted to terms of standard cords.

For each of the same types of products, estimates have been compiled from unpublished sources, of the number of man-days of labor required to fell, buck, skid, and truck a cord of wood. Following are the factors arrived at: woods and primary transportation labor, in eight-hour man-days, per cord of product, by state:

	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulpwood	1.60	1.63	1.70	1.50	1.60
Distillation wood	1.50	1.50	1.50	1.50	..
Extract wood	1.45	1.41	1.51	1.45	1.45
Mine timbers	1.24	1.24	1.24	1.24	1.24
Saw logs	0.60	0.53	0.56	0.54	0.60
Hewed ties	1.00	1.00	1.00	1.00	1.00
Poles and piles		1.24	0.80	1.20	
Veneer logs	0.80	1.02	1.00	0.70	0.80
Misc. veneer group	2.00	3.03	2.00	2.00	2.00
Cooperage group	0.75	0.84	0.75	0.80	0.75
Fuel wood	1.50	1.28	1.50	1.10	1.40
Other local products	1.35	1.27	1.50	1.25	1.35

When the production figures are multiplied by these factors, the following data on woods and primary-transportation employment in 1940 are obtained, expressed in thousands of man-days:

<sup>6</sup> Buttrick, *Forest Economics and Finance*, p. 4

	All States	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulp, dist., & ext. wood . . .	3,350	60	1,206	499	1,405	180
Mine timbers . . . . .	1,218	424	...	36	126	632
Saw logs & hewed ties . . . .	6,404	706	2,105	1,076	1,637	880
Poles and piles . . . . .	142	...	76	14	52	...
Veneer logs . . . . .	510	39	345	71	45	10
Misc. veneer group . . . . .	155	18	38	59	34	6
Cooperage group . . . . .	266	19	85	34	124	4
Fuel wood . . . . .	23,591	2,669	7,983	7,658	4,287	994
Other local products . . . . .	860	241	171	227	142	79
All products . . . . .	36,496	4,176	12,009	9,674	7,852	2,785

Estimates and scattered, unpublished data are also available regarding the average period of employment of men engaged in woods work and primary transportation. For each type of product, the figures are as follows, in numbers of days per year:

Pulpwood . . . . .	80
Distillation wood . . . . .	80
Extract wood . . . . .	80
Mine timbers . . . . .	100
Saw logs . . . . .	100-130
Hewed ties . . . . .	100
Poles and piles . . . . .	120-150
Veneer logs . . . . .	224
Misc. veneer group . . . . .	140
Cooperage group . . . . .	140
Commercial fuel wood . . . . .	35

The man-day estimates may be divided by these factors. After making allowance for men who engage in producing more than one type of product, a figure is obtained for each state, indicative of the number of men employed (part time or full time) in 1940 in woods work and primary transportation. These figures do not include men who merely produced fuel wood or other local products for home use:

Kentucky . . . . .	26,480
North Carolina . . . . .	85,880
Tennessee . . . . .	63,940
Virginia . . . . .	60,030
West Virginia . . . . .	21,410
All states . . . . .	257,740

A somewhat similar scheme may be followed in estimating employment in manufacturing establishments. Here, however, two distinct types of establishments will be recognized: those whose raw material is logs or bolts direct from the woods, here called

primary plants; and those whose raw material is a product of primary manufacture, here called secondary plants.

Numbers of men employed in primary plants in 1940 may be estimated from data on the quantity of wood processed in these plants, by using man-day factors per unit of quantity processed and estimates of the average period of employment per man during the year. Quantities of wood processed in 1940 are expressed in million board feet in the case of sawmills and veneer mills, and in thousand cords in the case of other establishments:

	All States	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulp mills .....	1,625	...	638	153	834	...
Distillation plants .....	120	...	...	120	...	...
Extract plants .....	295	8	70	100	106	11
Sawmills .....	3,976	402	1,352	628	1,072	522
Veneer mills .....	243	20	139	43	37	4
Misc. veneer group .....	82	9	11	30	29	3
Cooperage group .....	332	25	101	45	156	5

Man-days of plant employment are calculated on a per-thousand-board-foot basis for sawmills and veneer mills, and on a per-cord basis for other plants:

	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulp mills .....	..	2.07	1.10	1.60	..
Distillation plants .....	..	..	3.00	..	..
Extract plants .....	1.15	1.21	1.10	1.15	1.15
Sawmills .....	1.50	1.61	1.40	1.40	1.50
Veneer mills .....	10.00	7.42	8.50	10.00	10.00
Misc. veneer group .....	3.50	3.31	2.91	4.00	3.50
Cooperage group .....	2.00	1.18	2.13	1.20	1.20

Man-days per man per year appear to vary somewhat from state to state. The range for each type of plant is as follows:

Pulp mills .....	300
Distillation plants .....	300
Extract plants .....	200-300
Sawmills .....	120-160
Veneer mills .....	200-250
Misc. veneer group .....	210-230
Cooperage group .....	220-250

The rates for sawmills have been set high enough so as to give less than unit weight to workers in single, small operations. This treatment is consistent with that accorded fuel-wood cutters, above.

A partial coverage of employment in secondary wood-using establishments may be made by referring to the Census of Population for 1940.<sup>7</sup>

From the total number of employed persons listed under "sawmills and planing mills," "furniture, store fixtures, and miscellaneous wooden goods," and "paper and allied products" are subtracted the number of primary-plant employees believed to be included in those categories. The balance is taken as representative of the number of employees in secondary wood-using establishments. Man-days of work are computed from this figure in each state by using a factor of 250 man-days per man per year in North Carolina and Virginia and 275 man-days in the other three states.

Following is the resulting estimate of the employment in wood-using plants in 1940, expressed in thousand man-days:

	All States	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulp, dist., & ext. plants ..	3,517	9	1,405	638	1,452	13
Sawmills .....	5,944	603	2,177	879	1,502	783
Veneer mills .....	2,016	199	1,034	368	371	44
Misc. veneer group .....	283	32	38	86	116	11
Cooperage group .....	459	51	119	96	187	6
Secondary plants .....	24,717	2,393	9,395	4,960	6,469	1,500
All plants .....	36,936	3,287	14,168	7,027	10,097	2,357

And after making allowance for men employed in both woods and mill work, the number employed in mill work alone, in both primary and secondary plants, in 1940 appears to be as follows:

Kentucky .....	14,990
North Carolina .....	62,370
Tennessee .....	29,860
Virginia .....	45,860
West Virginia .....	10,670
All states .....	163,750

In this way an estimate is obtained of (1) the number of workers engaged in timber production and processing and (2) the percentage of all employed workers, as given in the *Census of Population for 1940*, engaged in timber production and processing, on a part-time or full-time basis in that year:

<sup>7</sup> U. S. Dept. Commerce, Bureau of the Census, *Census of Population for 1940, 2nd series* (Washington, 1943), Table 18.

	<i>Number</i>	<i>Per cent</i>
Kentucky .....	41,470	4.9
North Carolina .....	148,250	12.3
Tennessee .....	93,800	10.0
Virginia .....	105,890	11.3
West Virginia .....	32,080	6.2
All states .....	421,490	9.4

## INCOME

A rough calculation may be made of the value of timber products produced in the Appalachian states. For this purpose it is here assumed, with respect to those products which normally pass through a primary processing plant, that the value of such products shipped out of a state in 1940 in unprocessed form was about equal to the value of such unprocessed products shipped from outside for processing in the state. The value of primary and unprocessed products may then be estimated by assigning unit values to (1) the product of primary plants and (2) the quantities of timber produced for products not passing through processing plants. Since treating plants are not here included among the timber industries, the latter category of products consists of mine timbers, hewed ties, poles and piles, and fuel wood and other local products.

The following unit values of the primary products (wood pulp, tanning extract, lumber, and so on) are assumed — per thousand board feet of saw logs and veneer logs, per tie, per pole or pile, and per cord of other products — as of 1940:

	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulpwood .....		\$20.50	\$35.90	\$30.00	
Distillation wood .....			50.00		
Extract wood .....	\$15.00	16.00	14.40	15.00	\$15.00
Mine timbers .....	7.00		7.00	7.00	7.00
Saw logs .....	30.00	32.00	29.00	32.00	30.00
Hewed ties .....	0.80	0.78	1.00	0.80	0.80
Poles and piles .....		3.00	1.73	2.50	
Veneer logs .....	60.00	55.00	102.00	60.00	60.00
Misc. veneer group .....	40.00	35.00	65.90	40.00	40.00
Cooperage group .....	20.00	13.50	44.50	15.00	20.00
Fuel for sale .....	7.00	8.00	7.00	7.00	7.00
Fuel for home use .....	2.00	2.00	2.00	2.00	2.00
Local prod. for sale .....	15.00	12.00	15.00	13.00	15.00
Local prod. for home .....	4.00	3.00	4.00	4.00	4.00

These data were derived in part from field records of the United States Forest Service and in part from published sources.<sup>8</sup>

Next, the value added in secondary manufacture may be estimated. For this purpose, the reports of the Census of Manufactures<sup>9</sup> may be used to derive factors for the value added per worker in each state and type of industry. Following are factors so derived, and assumed to be applicable to 1940 data:

	Planing mill products	Furniture	Paper and allied products
Kentucky .....	\$1,803	\$1,500	\$2,800
North Carolina .....	1,423	1,381	2,853
Tennessee .....	1,470	1,500	2,040
Virginia .....	1,565	1,500	2,925
West Virginia .....	1,960	1,500	2,475

Multiplying the numbers of workers, already obtained, by these factors gives estimates of total values added by manufacture in 1940.

Resulting data on value of unprocessed products and products of primary manufacture and value added by secondary manufacture in 1940 are as follows, in thousands of dollars:

	All States	Kentucky	North Carolina	Tennessee	Virginia	West Virginia
Pulp, dist., & ext. prod ..	54,553	234	14,210	12,933	26,951	225
Mine timbers .....	6,877	2,389	...	205	712	3,571
Lumber and ties .....	126,123	12,572	43,805	19,202	34,746	15,798
Poles and piles .....	980	...	588	87	305	...
Veneer .....	15,765	1,193	7,661	4,419	2,226	266
Misc. veneer group .....	3,746	368	399	1,944	912	123
Cooperage group .....	6,320	508	1,361	2,018	2,334	99
Fuel wood .....	55,677	5,338	21,201	15,317	11,691	2,130
Other local products .....	3,713	1,107	648	939	657	362
Secondary products .....	163,317	14,610	59,948	28,204	49,523	11,032
All products .....	437,071	38,319	149,821	85,268	130,057	33,606

<sup>8</sup> Henry B. Steer, *Stumpage and Log Prices for the Calendar Year 1940* (U. S. Dept. Agr. Stat. Bull. 76; 67 pp.; Washington, 1942).

U. S. Dept. Agr., Forest Service, Div. of Forest Economics, *Lumber Prices, Southern Pine, Fourth Quarter 1940 and Calendar Year 1940* (14 pp., processed; Washington, 1941).

— *Lumber Prices, Calendar Year 1940. Compiled from Data Furnished by the Southern Hardwood Producers, Inc.* (27 pp., processed; Washington, 1941).

<sup>9</sup> U. S. Dept. Commerce, Bureau of the Census, *Manufactures, 1939, the Furniture Industries* (vi + 30 pp.; Washington, 1941).

If the total value for each state is expressed as a percentage of the total state income payments in 1940,<sup>10</sup> the results are as follows:

Kentucky .....	4.3
North Carolina .....	13.1
Tennessee .....	9.2
Virginia .....	11.8
West Virginia .....	4.3
All states .....	9.0

## OMISSIONS

The data given here are incomplete. Within the field of timber itself, significant omissions include such secondary processing as timber-treating and most of the field of distribution. Income from professional services is omitted. Furthermore, nothing has been said about income from non-timber uses of the forest, particularly recreation.

## CONTRIBUTION OF FARM WOODS TO ON-FARM INCOME

The 1940 Census of Agriculture classifies farms according to major sources of income in 1939. The number of farms in each of the five Appalachian states for which "forest products sold" was the major source of income, and the percentage which these farms were of all farms in the state, were as follows:

	<i>Number</i>	<i>Per cent</i>
Kentucky .....	663	0.26
North Carolina .....	1,094	0.39
Tennessee .....	877	0.35
Virginia .....	1,310	0.75
West Virginia .....	544	0.55
All states .....	4,488	0.43

The census also records the value of forest products sold; this value, expressed as a percentage of the value of all farm products sold or traded, is given in the first column, below. In the second column is an estimate of the percentage of the value of all farm

--- *Manufactures, 1939, Lumber and Timber Basic Products Group* (vi + 40 pp.; Washington, 1941).

--- *Manufactures, 1939, Paper and Allied Products* (vi + 47 pp.; Washington, 1941).

<sup>10</sup> Daniel Creamer and C. F. Schwartz, "State Income Payments in 1942," *Survey of Current Business* 23:6: 10-22 (1943), pp. 21-22.

products sold, traded, or used at home which is accounted for by all farm-forest products:

	<i>Forest products sold</i>	<i>All farm-forest products</i>
Kentucky .....	0.7	2.5
North Carolina .....	1.2	4.6
Tennessee .....	1.3	6.5
Virginia .....	2.2	6.0
West Virginia .....	2.5	3.9
All states .....	1.4	4.7

Apparently the farm woods contribute more largely to products used than to products sold.



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