Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

YOUNG-GROWTH TIMBER TAXATION

IN MENDOCINO COUNTY

An Economic Survey by Henry J. Vaux

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YOUNG-GROWTH

THIS BULLETIN analyzes the operation of young-growth timber taxation in Mendocino County, the effects of such taxation on the county's current forest economy, and the long-term outlook for that economy. Specifically, it analyzes and answers the following questions:

On the importance of young-growth:

What is the extent of young-growth timber stands in the county?

What is the extent and trend of young-growth cutting?

What is the present contribution of young-growth stands to the county's tax base?

What share of the county tax bill is young-growth timber now paying?

What basis do young-growth stands provide for economic activity, present and prospective?

To what extent can better management of young-growth contribute to the county's economic future?

On the effect of taxation on forest management:

How is tax-paying young-growth assessed? How is the tax determined?

What is the relationship between tax costs and such other costs as administration and protection from fire, insects, and disease?

What is the effect of taxation on time of cutting and on income from investments from timber?

Are there special impacts on timber growing arising out of current assessment practices?

Does taxation bear more heavily on well-managed stands than on poorly managed ones?

Are alternative assessment practices available which would modify these impacts?

What is the potential impact of different levels of young-growth taxation on the future of the forest economy?

Will present taxing policies jeopardize the economic basis for the county's future?

R TAXATION IN MENDOCINO COUNTY¹

An Economic Analysis by HENRY J. VAUX

CONTENTS

The Background	5	Age class and stocking of timber.....	40
The Findings	7	Timber growth and prospective timber supplies	41
Tax Policy Versus Forestry Policy.....	7	The importance of young-growth stands	46
Are There Economic Inequities Under the Present System?	11	Ownership of Timberland	46
Are Present Tax Policies Affecting the Future Economy?	12	Size of ownership.....	47
Would More Inclusive Taxation of Young- Growth Jeopardize the Future Economy?	13	Type of ownership.....	48
Conclusion	14	Changes in ownership.....	49
Part I: Importance of Timber to Mendocino County	15	Typical kinds of forest ownership.....	50
The Place of Wood-Using Industries in Mendocino County's Economy	15	Marketing advantages	50
Sources of employment	16	Management advantages	51
Trends in primary sources of employment	18	Utilization advantages	52
Trends in agriculture	18	Part II: The Taxation of Youth-Growth Timber	53
Trends in service industries	19	Forests in Mendocino County's Tax Base..	53
Sources of payrolls and individual incomes	21	Trends in taxes levied.....	54
Recreation as a source of economic activity	22	Sources of assessed value.....	56
Forest Products Industries of Mendocino County	23	The outlook for timber in the tax base..	58
The lumber industry	23	Young-Growth Taxation and Assessment..	59
Establishment of Douglas-fir industry..	25	Assessment practice	61
Growth of small and medium-size mills	27	Young-growth in the tax base.....	64
Utilization of young-growth timber..	28	Economic Effects of Young-Growth Taxation	66
The market for Mendocino lumber..	29	Effects of taxation on young-growth management	67
The plywood and veneer industry.....	32	Effect of tax on time of cutting— small holdings	69
The pulp and hardboard industry.....	33	Liquidation versus sustained yield— larger holdings	72
Other wood-using industries	34	Impact on stand improvement cutting... ..	77
Prospective trends in markets	35	Tax instability	81
Aggregate demand for wood.....	35	Tax uncertainty	83
Diversification of output	37	Equity Aspects	83
Timber Supply: The Resource Base for Wood-Using Industries	38	Property tax problems.....	84
Timber inventory on private land.....	38	Maturity problems	85
		Administrative cost	86
		Appendix	87
		Literature Cited	90

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The Background

In 1926, Section 123 $\frac{1}{4}$, Article XIII, of the State Constitution was amended to exempt immature forest trees on planted or cutover lands from property taxation for a certain period.

Under provisions in the amendment "immature forest trees, either planted or of natural growth on cutover lands from which 70 per cent of the merchantable original growth timber in trees over 16 inches in diameter have been removed," shall be exempt from taxation. The exemption period specified is 40 years and until such time as a timber maturity board determines, that the timber is mature. The land, however, is to be taxed on its "bare" land value.

At the time this amendment was enacted, cutover timberlands were generally being assessed on the basis of land value alone. Thus, the immediate effect of the amendment was to serve as a guarantee to land owners that the then existing assessment methods would continue during the period when timber crops were immature.

For two decades following amendment of Section 123 $\frac{1}{4}$ there was no active market for young-growth timber in any of California's timbered counties. Market demand and silvicultural condition of old-growth forests were such that harvesting was concentrated on the oldest timber age classes. Property tax administration under the amendment simply required classifying land from which 70 per cent or more of the old growth had been removed and assessing it on the basis of land value alone.

The increased lumber demand after World War II altered conditions in California's forest-based industries tremendously. Between 1946 and 1956 output of timber products rose from 3.2 billion board feet to 7.0 billion (May and Baker, 1958).² Before 1941, Douglas-fir amounted to about 10 per cent of the state's lumber production; by 1956 it jumped to 44 per cent of the total. During the same period redwood production more than doubled. These production gains were accomplished primarily by additions to the industry's lumber manufacturing capacity, particularly through the establishment of many new mills that competed with existing mills for available timber supplies. As a consequence, stumpage values rose sharply, bringing

Immature forest trees exempt from taxation

No active market for young-growth timber before WWII

Postwar lumber demands lead to young-growth cutting

² References in parenthesis are to sources listed in Literature Cited, page 89.

timber which previously was commercially unmerchandiseable into a highly active market. By 1952, the impact of logging in young-growth timber which had been sporadic and unimportant became significant in several parts of the state. Young-growth timber well over 40 years of age was being harvested in significant quantities. The cutting of timber from land classified as "cutover" for many years apparently became financially attractive to its owners and operators.

These developments caused many persons to become concerned about the cutting of untaxed young-growth. The assessor of Humboldt County, feeling that such timber was taxable, initiated steps in 1952 to have it declared mature in accordance with Section 12 $\frac{3}{4}$. His request to the State Board of Forestry and the State Board of Equalization to appoint members to the Humboldt County Timber Maturity Board prompted a series of meetings and studies to consider the problems of administering the section. One problem was to define the word "maturity"—did it mean physiological, financial, or marketable maturity? Early in 1953, the State Board of Forestry adopted the policy that "timber be mature for assessment purposes when after 40 years the owner initiates cutting, except for stand improvement or sanitation purposes; or when 70 per cent by volume of the trees over 16 inches d.b.h. and larger is of a class which is generally and substantially dealt in and sold or operated within the county as commercial saw timber."

*Mature timber
defined*

From 1955, when the first timber maturity board was activated in Humboldt County, to the present the "maturity" policy of the State Board of Forestry has been used as a basis for decisions by maturity boards in considering the return of young-growth timber to the tax rolls. However, in the administration of the law in accordance with the current maturity policy, the assessors and maturity boards have encountered perplexing problems. One is that cutting on small timber tracts may be completed before maturity board action can be taken. Even when the young-growth stands are returned to the tax roll before cutting has begun, the timber is often on the rolls for only a year or two before cutting is completed and most or all of the taxable timber value has been removed. This situation has an impact on the relationships between assessments and tax burdens on different forest ownerships and between young-growth forest property and other types of real property.

*New law brings
administrative
problems*

A second kind of problem lies in the large money and

time expenditures which must be incurred in locating, examining, and obtaining maturity board action on exempt timber properties in order to return them to the tax roll.

These problems and others connected with Section 12 $\frac{3}{4}$ led to the establishment of the Joint Timber Taxation Study Committee in 1957. It included representatives of the Assessors' Association, the State Board of Equalization, the State Board of Forestry, and the University of California School of Forestry. Its purpose was to study the operation of Section 12 $\frac{3}{4}$, Article XIII, in order to develop guide lines and policies for taxing young-growth timber. The study was to include Section 12 $\frac{3}{4}$, but was not to be limited to it. After several months of investigation, the Joint Study Committee recommended research into certain aspects of the tax problem. The School of Forestry at the University of California was requested to conduct an independent economic study of young-growth timber taxation, using Mendocino County as a case area. The study was to provide certain factual information and analysis needed for the work of the Joint Study Committee. Funds to conduct the study were provided by 16 concerned counties, the Board of Equalization, and the California Forest Protective Association, representing certain forest land owners. The School of Forestry contributed space, facilities, and personnel. This bulletin contains the findings of the study carried out in Mendocino County by the School of Forestry during the period 1958 to 1960.

*Joint Timber
Taxation Study
Committee
established*

*Pilot study in
Mendocino County*

The Findings

The economics of young-growth timber taxation in Mendocino County have been examined from the standpoints of (1) the role which the timber plays and is likely to play in the economy of the county, and (2) the effects of timber tax policy on young-growth forest management, on the tax base and on equalization matters. Our principal conclusions are summarized here.

TAX POLICY VERSUS FORESTRY POLICY

Taxing young-growth timber on an annual *ad valorem* basis tends to encourage liquidation of such timber at an earlier date than would otherwise be the case and to discourage certain types of forest management practices that would increase forest growth and yield. From the standpoint of maintaining a timber

*Effect of taxation
on cutting and forest
management*

supply in Mendocino County which will support wood-using industries on a stable basis, deferred liquidation of the young-growth and much more intensive management are highly desirable. Tax policy and forestry policy may thus be in direct conflict with each other. To what extent does this conflict exist in young-growth timber taxation in Mendocino County, and how important are the economic stakes?

**Careful husbanding
of young-growth
timber important**

The careful husbanding of young-growth timber in Mendocino County is of great economic importance for the following reasons:

1. **Wood using industries are the largest primary economic activity in Mendocino County**, and have occupied this position for many years. The resources of the county, its location near major population centers, and other economic factors suggest that the economic fortunes of the county will continue to be closely geared to those of the wood-using industries. Recreation, based to a substantial degree on the use of forest land, is likely to increase in importance but is unlikely to displace forest industry as the county's economic keystone.

2. **The lumber industry remains the predominant element** in the county although other forest products industries exist. From the standpoint of economic development, further diversification of industry, more extensive remanufacture of wood products, and introduction and fuller use of additional industries using low-grade wood are the most promising and essential avenues for growth. To encourage such growth the prospect of a sustained supply of timber must be assured.

3. **Timber supply is thus the critical factor** in determining the future trend of the forest economy of the county. The average annual log production of the county during the nine-year period 1950-58 was 839 million b.f. A steady flow of raw material close to this amount is essential for the maintenance of a vigorous forest economy.

4. **The economic future of the county's forest industries depends on the ability of existing young-growth stands** to meet most of the volume of raw material needs before the end of the next 15 years. Total volume of timber in the county was estimated as 35.7 billion b.f. by the Forest Service in 1948. In 1958 the volume is estimated at 30.2 billion b.f. Privately owned old-growth timber declined in volume even more than the county total, showing a decrease from 22.6 billion b.f. in 1948 to 15.1 billion in 1958. If old-growth cutting

were to continue at the average rate of recent years, old-growth volumes in the county would be reduced to 9.1 billion feet by 1968 and 2.9 billion by 1978.

5. **The growth potential of the county's forest land is sufficient, if well managed,** to provide a perpetual wood supply about equal to present levels of drain. But this fact does not assure the future stability of the county's timber economy. There must also be sufficient young-growth timber reaching maturity during the decades after 1968 to provide merchantable sized timber in sufficient quantities to meet industry's raw material needs. The extent of existing young-growth forests and the way they are handled during the next decade or two will largely determine whether or not forest industries are faced with a critical raw material shortage by 1970 or 1975.

6. **Analysis of available stand data suggests** that under conditions of (1) annual drain sustained at 800 million b.f. per year, and (2) continuation of the present proportion of young-growth in the cut (20 per cent), the large young-growth remaining by 1978 will be only $\frac{2}{3}$ of that needed to sustain the present level of cut. Such a curtailment in raw material supply would produce serious economic consequences for the entire county.

7. **The key factor in minimizing this potential disruption** to the future forest economy is the management given to large young-growth stands during the next 15 years. If liquidation continues at the present estimated rate of about 160 million b.f. per year (or, as seems probable, at an even higher rate) drastic curtailment of forest-products output during the decades following 1975 appears inevitable. On the other hand, careful management of the young-growth stands aimed (1) at maintaining the maximum possible volume for harvesting during the period after 1975, (2) salvaging the normal mortality which will occur in such stands during the interim, and (3) increasing the net growth and quality of those stands by judicious thinning operations could greatly reduce the prospective dearth of timber supply.

Taxation of young-growth under practices so far employed in Mendocino County does not appear to have stimulated liquidation of such timber; there is some evidence that it is discouraging the spread of more intensive forest management practices.

Young-growth timber in Mendocino County was first declared mature for tax purposes in 1957. Timber has been declared mature primarily in those situations

Taxation has not stimulated liquidation of immature timber but tends to discourage intensive management

where cutting of the young stands had already begun or appeared to be imminent. Under such a policy little impact of taxation on time of cutting is to be expected. A modified policy which subjected young-growth to taxation *before* the decision to cut it had been reached, would set-up significant financial pressures on owners to accelerate young-growth cutting.

Present uncertainties as to the legal interpretation of "maturity" and as to how the tax status of young-growth may be affected by stand improvement cuttings are discouraging to more intensive forest management. Policies should be clarified so that there is a clear understanding of what constitutes "improvement cutting" and that such cutting will not be interpreted as evidence of maturity for purposes of taxation. But it must be borne in mind that taxation is not the only obstacle to the needed more intensive forest management and that, in many cases, it may not be the most important obstacle.

***Maturity Board
rulings on maturity
1957-1960***

By Maturity Board actions in 1957-1960, 96 ownerships including 55,947 acres of second-growth had been declared mature for purposes of taxation. The total volume of young-growth thus declared mature was 478.4 million b.f. Of 320 million b.f. declared mature in 1957, 1958 and 1959, only 39 per cent remained on the tax roll in 1960. In 1958 7 per cent of the total assessed timber volume was mature young-growth. The total assessment against such timber is estimated at \$700,000, or less than 1 per cent of the 1958 tax base.

Standing timber of all kinds has dwindled in relative importance as a source of county tax revenue, accounting for 35 per cent of real property assessments in 1932 and for less than 10 per cent in 1958. The existing timber inventory and the outlook for future drain indicate clearly that aggregate assessments on old-growth timber will continue to decline and that these declines will not be offset by commensurate increases in taxable young-growth. Given present classification and assessment practices, the maximum assessed valuation on young-growth during the next 20 years appears unlikely to exceed \$1 million.

***The role of timber
in the tax base***

The role of timber in the tax base has changed significantly during the last three decades. In 1932 the assessed value of timber-dependent property such as sawmills and logging equipment amounted to \$110 per million b.f. of assessed timber; in 1958 the comparable figure had risen to \$2,460 per million b.f.

In recent years the assessed value of plants and equipment dependent on timber has been 1.7 times the as-

essed value of the timber itself. Thus, from the standpoint of tax revenues, timber's indirect contribution through taxes on plants and equipment dependent on it is greater than the direct contribution of taxes paid on the timber itself. As Mendocino County moves further toward a second-growth forest economy, the importance of the indirect contribution of timber to taxes will increase further. This suggests that tax revenues will be favored by timber tax policies which encourage the permanence and diversification of wood-using industries. This means timber taxation which is not discouraging to stable and intensive management of young-growth stands.

From these facts one may draw the following conclusions: Young-growth timber and its management hold the key to much of the county's future economic development. To date young-growth taxation has had limited effects on young-growth management because of the nature of the specific guide-lines which have been used in determining maturity. Future changes in either tax policy or administrative guide-lines could intensify the effect of taxation on young-growth management and hence on future timber supply.

The structure of the economy of Mendocino County appears to be such that the manufacturing plants and equipment which depend for their value on timber supply provide more taxable wealth than does the timber itself. Under such conditions the potential conflict between forestry policy and timber tax policy is reduced; a policy for young-growth timber taxation conducive to the maintenance of maximum sustained timber supply will also be conducive to the broadest possible timber-dependent tax base. If this point is clearly understood and recognized, it can help to bring tax policy and forestry policy into a consistent relationship with each other.

ARE THERE ECONOMIC INEQUITIES UNDER THE PRESENT SYSTEM?

Economic aspects of tax equalization are usually reflected in the proportion of tax free value absorbed by taxes. Substantial variations in this proportion can be found among young-growth timber properties subject to taxation under Section 123 $\frac{1}{4}$. Revised assessment procedures initiated in 1959 have eliminated some significant equalization problems. However, other problems remain which do not arise primarily from the nature of the present system of taxing young-growth. Rather, they reflect inherent characteristics

Conclusions

Equalization problems

of the general property tax when applied to any timber, young or old. These equalization problems arise because the owner of merchantable timber always has, in effect, the option of avoiding some timber taxes by cutting the timber. He can reduce, or enlarge, the proportion of timber value taken by taxes by his own action in determining cutting policy. Thus, mere revision of the guide-lines or administrative procedures applied to young-growth timber taxation is likely to do little or nothing toward eliminating present equalization problems.

*Basis for economic
inequities*

There is frequent criticism over the fact that some young timber is untaxed or that some is only subject to tax for a year or two before being removed from the rolls by cutting. This circumstance is cited by some as evidence of inequity. It should be clearly recognized that tax administrators are neither responsible for the situation nor do they have the power to correct it. So long as the State Constitution provides exemption for immature young-growth, and the landowner retains the option of deciding when he will cut his timber, the basis for unequalized tax burdens on different young-growth properties exists, and no changes in maturity guide-lines or in tax administration can remove it.

To illustrate the point, consider the effect on equalization of a drastic change in existing maturity guide-lines resulting in all young timber more than 40 years after harvest of the original growth being declared mature. Under such circumstances, all timber owners would undoubtedly try to accelerate their plans for cutting in order to avoid a prolonged period of tax paying. But owners of small or highly accessible tracts would find it considerably easier to do this than owners of large or remote tracts. Equalization would be as difficult to achieve under such a guide-line as under the present one because a key factor in determining the tax burden—the decision as to when to cut the timber—is under control of the owner, not of the taxing authorities.

Under these circumstances it becomes extremely difficult to apply the ordinary concepts of tax equalization to the question of the most appropriate guide-lines for use in determining timber maturity.

**ARE PRESENT TAX POLICIES AFFECTING
THE FUTURE ECONOMY?**

As already indicated, there is no evidence that Section 12¾ as presently interpreted is having an impact on the county's future economy by affecting the rate of

young-growth liquidation. There is some evidence that the uncertainty surrounding the present young-growth tax situation may be retarding more intensive management of certain ownerships. Removal of this uncertainty by clarification of the legal aspects of the maturity concept and by firm establishment of the guidelines to be used for interpreting maturity should be sought as promptly as possible. This is a matter both of good tax policy and good forestry policy.

*Needed: clarification
of legal aspects of
maturity concepts*

Elimination of these uncertainties would remove one of the existing obstacles to more intensive young-growth management; but other important obstacles to such management would remain. In the case of some ownerships, tax considerations seem to be the principal existing impediment. In the case of others they are not. Thus, clarification of young-growth tax policy can be helpful in encouraging needed economic development in timber growing but it is by no means a cure-all for future timber-supply problems.

WOULD MORE INCLUSIVE TAXATION OF YOUNG-GROWTH JEOPARDIZE THE FUTURE ECONOMY?

This question concerns the probable effects if the guide-lines were changed so as to bring a larger proportion of the existing young-growth onto the tax rolls. Present practice taxes young-growth only when it can be determined that a decision to cut the timber has been made. If policies were adopted which placed additional timber under taxation, accelerated liquidation of young-growth and a curtailment of sustained yield forms of young-growth management would be expected.

There is no basis in experience for judging what the quantitative effects of this in terms of future timber supply would be. The management of small ownerships and ownerships not integrated with timber-using plants would probably be more sharply affected than that of larger integrated ownerships. As more than 60 per cent of the forest land in the county is owned by such small or nonintegrated owners, the impact of broadened young-growth taxation on future timber supply might be substantial. The principal effect of extended taxation of young-growth would be to speed up cutting. If a change in policy resulted in the average owner cutting his timber two years sooner than under present tax policies the effect on marketable timber supply in the county 20 years hence would appear to be a 5 to 10 per cent reduction in supply.

*Extended taxation of
young-growth would
speed up cutting
but not increase
revenues*

A broadening of the volume of young-growth subject to tax would be unlikely to produce a proportionate increase in tax revenues. The existing market for young-growth timber is limited in size, relatively new, and subject to certain problems which do not affect old-growth timber. If a change in tax policy induced more rapid liquidation of young-growth, the value of such timber would undoubtedly decline. Thus, gains in assessable volume obtained by such a policy would be offset in part by declines in unit values, at least during the years when accelerated liquidation was taking place.

CONCLUSION

Definitive conclusions on a matter as complex as the economic effects of a forest tax system can hardly be drawn on the basis of three years experience in a single county. But the preceding examination of operations under Section 12 $\frac{3}{4}$ in Mendocino County leads to the following preliminary evaluation.

In short:

*Reclassification of
young timber has had
little effect on
management*

*Extension of taxation
would be
unfavorable to forest
management*

*Certain economic
inequities cannot be
eliminated by further
modifications*

1. Reclassification of young timber has had relatively minor effects on the management of young-growth in Mendocino up to this time. This reflects the fact that the reclassification policies which have been applied virtually eliminated the possibility of effect on timber management decisions. Uncertainty as to the tax outlook appears to be the principal cause of such impacts on management as do exist.

2. A modification of policies for taxing young-growth which would subject such timber to taxation at an earlier age than is the case under present policies may be expected to have unfavorable impact on young-growth forest management. This impact would be of substantial economic importance to Mendocino County because the young-growth timber will be the key factor in determining the raw material supply on which the whole forest economy of the County will rest within the next 15 or 20 years.

3. Problems of equalization have arisen in the administration of young-growth taxation. The cause of some of these appears to have been eliminated by changes in assessment practice introduced in 1959 and provided for in the recently published assessor's handbook "The Appraisal of Timber Property." Other causes remain, however. These are inherent in the nature of the general property tax applied to timber and cannot be eliminated by modification of the maturity guide lines.

Part I: The Importance of Timber to Mendocino County

THE PLACE OF WOOD-USING INDUSTRIES

Wood-using industries have been the largest primary economic activity in Mendocino County for many years, and probably will continue to dominate the county's economic future because of its forest resources, its nearness to major population centers, and other factors. Recreation, based to a substantial degree on the use of forest land, is likely to increase in importance. Such an increase could be a principal source of continued growth if its impact is not dulled by contraction in other segments of the economy.

Mendocino County has large forests and its economy is predominantly dependent upon wood-using industries. For a century, the growth of the forest industry and agriculture has been the major basis for growth in population, income, and other indicators of county wealth. Since World War II, economic expansion has been largely sustained by the sudden spectacular increase in lumber production which permitted continuing population and income increases despite the decline in agricultural output (figures 1 and 2).

*Spectacular postwar
economic growth*

Fig. 1. Mendocino County lumber production outdistanced population increase in the postwar period.

Fig. 2. Lumbering in Mendocino County increased steeply since the war while agriculture leveled off or decreased.

Sources of Employment

The economy of Mendocino County is resource oriented

The economy of Mendocino County is resource oriented. In 1950, 48 per cent of all persons employed in the county were in the basic agricultural, mining, and manufacturing industries (see table 1). For California as a whole, the figure was only 26 per cent.

The county's agricultural and lumber industries alone employ 44 per cent of the labor force. The remainder is in service industries such as wholesale and retail trades, professional and personal services, construction, and utilities—sectors of the economy which depend heavily upon the basic industries.

Distribution of the labor force

Three persons out of every ten employed in the county work in the forest industries. Wood-using industries constitute by far the most important occupational field within the basic-industry group, employing 60 per cent of the total. For each person employed in agriculture—the second ranking basic industry—two people are employed in the wood-using industry. As figure 3 shows, forest industry and agriculture together account for 92 per cent of the employment in basic industry. California Department of Employment data show that the pattern of employment today is not

TABLE 1

PERSONS GAINFULLY EMPLOYED IN
MENDOCINO COUNTY, BY
OCCUPATION, 1950

Occupation	Number of persons employed	Per cent of all persons employed
Basic Industries		
Agriculture.....	2,147	15.2
Mining.....	15	0.1
Forestry and fisheries.....	189	1.3
Manufacturing:		
Lumber, wood products, and furniture.....	4,127	29.2
Food processing.....	134	0.9
Printing and publishing..	66	0.5
All other manufacturing..	148	1.0
Total, Basic Industries.....	6,826	48.2
Service Industries		
Wholesale, retail trade.....	2,064	14.6
Business, personal, professional.....	2,511	17.8
Construction.....	1,115	7.9
Transportation, utilities.....	844	6.0
Finance, insurance, real estate.....	180	1.3
Public administration.....	381	2.7
Total, Service Industries.....	7,095	50.3
Industry not reported.....	216	1.5
Total, all occupations.....	14,137	100.0

SOURCE: U.S. Bureau of Census, Population Census of 1950.

TABLE 2

PROPORTION OF PERSONS
GAINFULLY EMPLOYED IN
MENDOCINO COUNTY, BY
INDUSTRY GROUPS,
1930, 1940, 1950

Industry group	Per cent of all persons employed		
	1930	1940	1950
Basic Industries			
Agriculture.....	31.7	24.6	15.2
Mining.....	0.4	0.1	0.1
Forestry and fisheries.....	10.4	0.6	1.3
Lumber and wood products	6.7	18.6	29.2
Food processing	0.6	0.9	0.9
All other manufactures.....	3.7	0.9	1.5
Total, basic industries.....	53.5	45.7	48.2
Service Industries			
Trade, business, personal professional.....	28.9	36.6	33.7
Transportation and utilities	5.5	6.3	6.0
Construction.....	6.8	7.0	7.9
Public administration.....	2.2	3.1	2.7
Total, service industries.....	43.4	53.0	50.3
Industry not reported.....	3.1	1.3	1.5
Total, all groups.....	100.0	100.0	100.0

SOURCE: U.S. Bureau of Census, Population Census of 1930, 1940, 1950

greatly different from that indicated by the 1950 data in the tables.

Mendocino County produces far more forest and agricultural products than it can market and consume

Fig. 3. Forest industry and agriculture dominate employment in the county's basic industries.

Workers in wood-using industries outnumber those in agriculture almost two to one

Source: U. S. Bureau of Census, Population Census of 1950.

locally. Both industries export to intrastate, national, and international markets. Since Mendocino County has a resource-oriented economy, levels of employment and income depend heavily upon the availability of land resources which support timber and farm production and provide, in turn, the raw materials for the county's processing industries. In contrast, economic activity in many other parts of the state is based on distribution of goods and services to local market centers with dense population.

Trends in Primary Sources of Employment

Employment pattern 1930-1950

Mendocino's 1950 employment pattern was the result of two decades of rapid expansion and contraction in certain sectors of the economy. The period was marked by:

- increasing dependence on the forest industries
- reduction in land area cultivated and pastured
- growing service industries.

Employment in wood manufacturing increased sevenfold

Between 1930 and 1950, total employment in the county increased by 59 per cent. Since total employment declined between 1930 and 1940, all this growth occurred after 1940. Table 2 shows the shifts in employment of which the change in the forest industry is the most striking. In 1930 the wood-using industries employed only 13 per cent of all workers in the basic industries; 20 years later they employed 60 per cent (figure 4). In absolute numbers, employment in wood manufacturing was seven times greater in 1950 than in 1930. Employment data exactly comparable to census figures are not available for the years following 1950, but lumber production continued to rise until 1957 and remains well above 1950. An estimate for 1956 places employment in lumber manufacturing at 6,539 (California Chamber of Commerce), a figure 11 times the 1930 level. Thus, the county since 1930 has grown primarily because its forest industry has grown, and today is more heavily dependent on this industry than it was on agriculture 30 years ago.

Trends in Agriculture

Employment in agriculture declined

The county's wood-using industry became relatively more important as agriculture declined. In 1930, agriculture employed 32 per cent of the county's total employment; by 1950 only 15 per cent. Within the basic-industry group, agriculture fell from 59 per cent to 32 per cent. These relative changes were accompanied by an actual decline in the number of persons employed in agriculture; this took place over a period when gains

Fig. 4. The proportion of employment in the forest industries increased heavily between 1930 and 1950.

were made by every other major sector of economy. The total number of farms in the county remained about the same, and the land in farms increased, but the total area of cropland harvested declined (figure 5). Increases in farm-land area resulted from a 30 per cent gain in pastured land, and the value of livestock and livestock products was 2.2 times greater in 1950 than in 1930. But 72 per cent of the increase was due to rising farm prices, and only 28 per cent to greater output. Value of crops such as fruits, nuts, and hay declined by 16 per cent when adjusted for rising prices. Considering the current agricultural outlook, there seems little reason to suppose that these trends will be reversed enough to affect markedly the county's present dependence on timber industries.

Trends in Service Industries

A third significant change in Mendocino's economy has been the rise of service industries as the county's major employer. Overall, there was a relative decline in basic industry employment and an increase in the service sector between 1930 and 1950 (see table 2). The service industries made greater relative gains in employment than the basic industries. Three major reasons account for the rise of the service industries. As family income increased, a larger proportion of its purchasing

Rise of the service industries

*While every other
major sector of
economy gained,
cropland declined*

Fig. 5. Farmland tended to increase, cropland declined.

*Reasons for the
growth of service
industries*

power became available for service-type consumption. Secondly, servicing activity tends to be heavier in industrialized communities than in agricultural ones, and thus was favored by the relative shift from farming to manufacturing. Thirdly, the growth of the service industry went hand in hand with the increase in recreational activity. In 1957, 14 per cent of all rural land owners in the county were nonresident, recreational-type owners (Casamajor et al., 1960). Their expenditures, and those of non-property holding recreationists and tourists represent income originating from outside the county and are chiefly directed toward service establishments. In view of the role of industrialization and recreation in the growth of service industry, forests and their dependent economy appear likely to continue as a major determinant of service industry trends.

Sources of Payrolls and Individual Incomes

Analysis of income by source confirms the economic picture of Mendocino County as derived from the employment data—the strength of the current economy rests primarily on the timber industries. One person in 3.3 is employed by the wood-using industries, and one out of every three dollars of income originates from them.

The level of income to county residents, along with increases in population and industrial activity, has been rising rapidly since the war (estimates of the State Chamber of Commerce):

1940	\$17 million
1947	47
1950	62
1952	84
1953	89
1955	102
1956	108

Wood-using industries: leading source of income

Figure 6 shows the proportion of county income originating from various sources, especially the increase of income from wages and salaries.

Complete data are not available to show the exact distribution of county income according to industries, but the State Department of Employment reports payrolls, by industry groups, for employees covered by unemployment and compensation insurance (shown in table 3 for July–September, 1957). Although uninsured income, including much of the county's agricultural income is omitted, the data probably reflect with fair accuracy the origin of the wages and salaries shown in figure 6. On this basis it appears that about one-third of the county's income originates from wages and salaries paid by the wood-using industries.

Almost two-thirds of the county income comes from wages and salaries

Fig. 6. Shifts in personal income, 1947–1957.

Source: California State Chamber of Commerce, Economic Survey Series.

TABLE 3
INSURED PAYROLLS IN MENDOCINO
COUNTY BY INDUSTRY GROUP,
JULY-SEPTEMBER, 1957

Industry group	Payroll nearest \$1,000	Per cent of total payroll
Agriculture, forestry, and fishing	61	0.5
Construction.....	1,182	9.2
Manufacturing		
Food and kindred products.....	104	0.8
Lumber and wood products.....	6,403	49.6
Other manufacturing.....	1,152	8.9
Transportation and utilities.....	897	7.0
Wholesale, retail trade.....	1,996	15.5
Service, finance, and other.....	1,096	8.5
	12,891	100.0

SOURCE: State of California, Department of Employment.

Recreation as a Source of Economic Activity

Recreation based on use of forest lands

Recreation is largely based on the use of forest lands in Mendocino County. In 1957, 6 per cent (110 thousand acres) of the county's rural land area was used specifically for recreation and undoubtedly much additional land was used for the same purpose. A portion of the growth in service-industry activity has also been ascribed to recreation.

grew more rapidly than other economic segments

Recreational growth is also indicated by the rapid rise in land values where recreation potential is high, and by the notable increase in such service-type accommodations as motels. While recreation activity cannot be measured on the basis of available information, it is apparent that during the last decade it has grown more rapidly than any other economic segment of the county.

Some qualitative aspects should be noted. To the extent that recreational use comes from people who derive their incomes from *outside* Mendocino County, recreation fulfills much the same economic role as basic industry; it is a source of in-county employment and income which is independent of other activities in the county. To the extent that recreation expenditures come from those who derive their income from *within* Mendocino County, recreation provides no economic benefits not already recognized in the preceding employment and income analysis.

Recreational activity, particularly by those from outside the county, is highly seasonal, which reduces to some degree its economic contribution in comparison

with other less seasonal activities. It may also be noted that the recreational advantages of Mendocino County stem to a considerable degree from its forest land. How that land is managed will therefore affect future recreational potentials.

There is little doubt that outdoor recreation in California will continue to increase rapidly because of the population expansion, the continued increases in leisure time and family income, and the accessibility of the county to the all-important non-resident recreationist, particularly from the San Francisco Bay Area.

Although any forecast is highly conjectural, well informed analysts have suggested that outdoor recreation in the forested areas of California may double within the next 10 or 15 years. The evidence suggests that Mendocino County will have at least its proportionate share of this increase.

Recreation potential depends on forest management

California outdoor recreation may double within 15 years, with Mendocino County receiving its share

**FOREST PRODUCTS INDUSTRIES
OF MENDOCINO COUNTY**

The lumber industry dominates the numerous forest products industries existing in Mendocino County. The greatest promise for economic growth lies in further diversification, more extensive remanufacture of wood products, and introduction and fuller use of additional industries using low-grade wood. To encourage such growth, a sustained supply of timber must be assured and well-organized market-development programs will be needed, particularly to strengthen the market position of young-growth redwood.

The forest-based wood-using industry of Mendocino County consists of manufacturing activities processing some 16 different types of commodities. Lumber, plywood, hardboard, shingles, grape stakes, and Christmas trees are among the important products produced in the county. Lumber and veneer and plywood comprise the biggest part of the industry and together utilize 98 per cent of the timber cut (figure 7). Table 4 shows the trends in output of these products since 1948.

Of 16 forest products in the county, lumber, veneer and plywood are most important

The Lumber Industry

Lumber manufacturing is Mendocino's oldest major industry. In 1852, the county's first sawmill was established at the mouth of Big River. Within two decades, 19 mills were in operation. Sawmills were built on all major coastal streams and, after 1856, in the interior (May, 1954). During this early period production was largely centered in the coastal forests with the industry depending on water-borne transport to reach its mar-

TABLE 4
FOREST PRODUCTS OUTPUT IN MENDOCINO COUNTY

Year	Operators reporting	Products							Total
		Sawlogs*	Veneer logs*	Pulpwood	Split products	Piling & poles	Fence posts	Fuel-wood	
	Number	Thousand b.f.			Pieces		Cords	Thousand b.f.	
1948	81	314,991		*	524	1,167	.....	...	315,632
1949	130	356,181		*	8,541	500	.....	300	364,922
1950	139	483,612		24,037	2,216	500	.....	...	509,915
1951	172	689,106		57,517	5,627	6,499	.....	128	752,964
1952	220	727,090		74,378	3,270	5,660	.....	265	805,437
1953	263	886,028		40,786	.....	3,426	1,100	45	927,191
1954	273	957,618		29,436	6,258	3,214	4,750	98	993,734
1955	277	961,700	36,583	23,449	7,520	9,123	100	312	1,030,321
1956	263	926,816	41,098	11,636	7,389	30,260	.....	125	990,027
1957	216	741,998	36,327	5,048	5,930	22,597	2,700	195	791,690
1958	255	742,006	38,972	5,148	8,254	12,070	300	85	795,632
Total Volume Cut:									8,277,465

* Sawlog, veneer log and pulplog production were combined prior to 1950; sawlog and veneer log production were combined through 1954.
Source: Annual reports of California Division of Forestry.

Fig. 7. Lumber and veneer use 98 per cent of the timber cut.

Source: Forest Survey Release No. 35; California Division of Forestry compilation of production reported by timber operators, 1956.

kets in San Francisco, other California coastal points, and overseas areas.

As figure 1 indicates, output between 1860 and 1880 averaged about 50 million b.f. per year and by the latter year something like 1.1 billion b.f. of timber had been cut (Palmer, 1880). By the turn of the century, technological changes in the industry plus expanding markets brought production up to about 100 million b.f. per year. The total number of mills had increased to 27. Production generally continued to move upward and by 1922 reached its pre-World War II peak. Then followed a period of decline and a disastrous fall after 1929 when the depression forced nearly all the mills in the county to close. In 1932, production was below that of any year of record since 1862, a period of 70 years.

1932 marked a turning point for Mendocino's lumber industry. With the establishment of new mills and re-activation of old ones, output continued to climb rather steadily until 1946, when the pent-up demand for housing and other consumer goods was released. With a readily available supply of timber, Mendocino felt this impact immediately. In one year, 1946 to 1947, production doubled although the number of mills operating remained the same. During the following year, output was up another 100 million board feet, and the number of mills was increased by 36 to 129. Expansion in the industry continued at this rapid rate. The 1951 production was four times greater than 1946; the 1956 production was six times greater than 1946 and half again as large as 1951 (table 5). Increases over the 1951-56 period were made in spite of a net loss in number of operating mills.

Because of sketchy records and an unmeasurable amount of home-use consumption of forest products, the exact amount of timber cut in the county since 1852 cannot be determined. The estimated volume cut from 1852 to 1958 is about 25 billion b.f. This compares with an estimated 20 billion b.f. of old-growth remaining in the county in 1958. An estimated 9.4 billion, or 38 per cent of the total, was cut in the decade 1949 to 1958. Clearly, further forest industry expansion, or even maintenance of existing industry output, cannot be sustained indefinitely by old-growth timber.

Establishment of Douglas-fir industry. The prewar Mendocino County forest industry almost entirely centered on redwood lumber. Although Douglas-fir timber was present in large volumes, comparatively small amounts were cut, mostly in conjunction with redwood

Lumber output averaged 50 million b.f. during the early years

rose to a peak in 1922, but dropped sharply in 1929

started to climb again in 1932

rose steeply in 1946 and continued to climb rapidly until 1956

Rate of timber volume cut in the past indicates that industry output cannot be maintained on old-growth timber alone

Prewar industry of the county was based on redwood lumber

TABLE 5
THE INCREASE OF MILLS AND LUMBER PRODUCTION,
MENDOCINO COUNTY, 1940-57

Year	Number of mills	Total lumber production	Redwood	Douglas-fir	Pine	True fir	Other
		Million b.f.					
1940.....	25	123.7					
1941.....	28	148.2					
1942.....	26	161.6					
1943.....	33	173.8					
1944.....	42	188.0					
1945.....	47	194.7					
1946.....	93	144.7	67.4*	63.2	11.4	1.7	0.9
1947.....	93	283.7					
1948.....	129	386.9	242.3	119.6	5.3	0.3	0.2
1949.....	...	376.0					
1950.....	...	440.0					
1951.....	126	585.6	321.5	237.2	24.4	2.3	0.1
1952.....	...	610.0					
1953.....	...	698.0					
1954.....	...	791.7	360.5	310.2	50.1	48.0	3.2
1955.....	...	774.0					
1956.....	105	874.4	361.2	463.5	37.3	12.3	0.1
1957.....	...	759.0					

* Redwood production in 1946 was abnormally low due to a labor dispute.
SOURCES: California Forest & Range Experiment Station, Forest Survey Releases Nos. 10, 17, and 30; and Forest Research Note No. 55; Census of Manufactures; Estimates by R. H. May, U.S. Forest Service, for years 1949, 1950, 1952, 1953, 1955, 1957.

operations in mixed stands. In contrast to redwood, most Douglas-fir stands were held by owners who were not timber operators. Fifty-two per cent of such acreage was owned by ranchers. Many were converting their stands to grass for grazing uses because they considered Douglas-fir timber a liability rather than an asset. Douglas-fir timber had little or no commercial value and most such land was carried on the tax rolls at a nominal assessment.

The great postwar increase in demand for building materials coincided with the ready availability of this Douglas-fir timber. Before they discovered the new commercial value of their stands, many ranch owners had virtually given their timber away in exchange for having the land cleared. Since Douglas-fir occurs mainly in the eastern half of the county where an established road system made it accessible, its utilization required comparatively modest capital investment in plant and road facilities. Large numbers of small mills sprang up. By 1951 production of Douglas-fir was four times greater than in 1945, while redwood had risen only about two and a half fold. By 1956 Douglas-fir surpassed redwood as the leading species, accounting

*Postwar demand
encouraged cutting
of Douglas-fir*

*By 1956 Douglas-fir
surpassed redwood as
leading species*

Fig. 8. Douglas-fir is now the leading lumber species in Mendocino County.

for 53 per cent of the lumber produced (figure 8). In the period 1946–56, output of Douglas-fir jumped from 63 million b.f. annually to 463 million. Lumber production from the mixed conifer species (mainly pines and white fir) also increased, but their output remains relatively unimportant compared to that of redwood and Douglas-fir.

Growth of small and medium-size mills. The sudden emergence of the Douglas-fir industry quickly altered the overall structure of the county's lumber industry. Pre-war production was centered in a few, large redwood mills. Between 1940 and 1948, more than 100 new sawmills went into operation. By 1948, 94 per cent of the mills were very small or small-size plants, producing 51 per cent of the output (table 6). Since then additional medium and large mills have been built, small ones were enlarged or shut down, thus the trend of the industry has again been towards larger plants. As shown in figure 9 the small mills are characteristic of Douglas-fir production while redwood lumber is produced mainly in large and medium-sized plants.

Postwar ownership of sawmills changed extensively. Only 9 of 93 mills operating in 1946 were still operating or were under the same ownership in 1956. Seventy-two per cent of the production was by mills that had been built or had new owners since 1946.

Use of Douglas-fir encourages development of small mills

Mills change ownership frequently

TABLE 6
LUMBER PRODUCTION BY MILL SIZE: THE TREND IS TOWARD
LARGER PLANTS

Mill-size class (by annual production, million b.f.)	1948				1951				1956			
	Active sawmills		Lumber production		Active sawmills		Lumber production		Active sawmills		Lumber production	
	Num- ber	Per cent	mmb.f.	Per cent	Num- ber	Per cent	mmb.f.	Per cent	Num- ber	Per cent	mmb.f.	Per cent
Large (25.0 or more) . . .	1	0.8	180.8	49.2	2	1.6	294.4	50.3	7	6.7	277.8	31.8
Medium (10.0-24.9)	6	4.8			12	9.5			25	23.8	352.5	40.3
Small (1.0-9.9)	46	37.1			70	55.6			51	48.6	231.9	26.5
Very small (less than 1.0)	71	57.3	34.0	9.2	34	27.0	10.6	1.8	18	17.1	6.2	0.7
Total reported	124	100.0	367.6	100.0	118	93.7	578.2	98.8	101	96.2	868.4	99.3
Estimated	...	...	...	...	8	6.3	7.4	1.2	4	3.8	5.9	0.7
Grand total	124	100.0	367.6	100.0	126	100.0	585.6	100.0	105	100.0	874.3	100.0

SOURCE: Division of Forest Economics, California Forest and Range Experiment Station, U.S. Forest Service.

These structural features of the lumber industry and the changes in them are significant because, taken together with the forest ownership situation to be discussed later, they influence the markets for standing timber, the degree of utilization of such timber, and the way in which the industry will adapt itself to a young-growth raw material supply.

Utilization of young-growth timber. The build-up of lumber manufacturing in Mendocino has been based from earliest times on the utilization of its large old-

Fig. 9. Lumber production by species and mill-size class, 1948.

SOURCE: Division of Forest Economics, California Forest and Range Experiment Station.

growth timber resources. It was the magnificent stands of old-growth redwood that originally attracted lumbermen to Mendocino County. The great postwar boom was based largely on the previously untapped stands of old-growth Douglas-fir (table 5).

Today the lumber industry is still largely based on the utilization of old-growth timber, but the use of young-growth in lumber manufacturing is increasing rapidly.

Detailed information tying lumber production to the timber age-class utilized is not available. Small amounts of young-growth appear to have been cut during the early 1950's and by 1956 such cutting was active. Data provided by the County Assessor's office and the California Division of Forestry indicate that the cut of young-growth in 1958 was roughly 100 million b.f. mostly redwood. This represents 12.5 per cent of the total 1958 cut reported by timber operators.

The number of mills operating either entirely or partly on young-growth in 1958 was estimated to be about 23. Most of them were small mills producing less than 10 million b.f. annually.

The market for Mendocino lumber. Mendocino lumber is distributed throughout the United States and exported abroad. Since the county produces about 2 per cent of the national lumber output (in 1956) and 15 per cent of the state total, it shares markets with other producing areas. The ability of the county to compete in these markets has an important bearing on the strength of its lumber industry. In considering market economics, redwood must be distinguished from Douglas-fir and old-growth from young-growth because of the different qualities of each of these classes of lumber.

Markets for *old-growth redwood* are those requiring durability, straightness of grain, availability in large sizes, and pleasing appearance. Such markets stress special manufacturing uses such as tanks, cooling towers, caskets, and furniture. About 75 per cent of the lumber goes into construction, where it is used for special purposes such as sills, siding, and interior work. The special properties of old-growth redwood are the principal basis for redwood sales promotion. As a result, in 1953 about half of the redwood shipments were to markets outside of California (chiefly to the Central, Southern, and Plains States). In these markets Mendocino's primary competition comes from the nine other California redwood counties (see figure 10).

Lumber industry has been based on old-growth timber, but use of young-growth is increasing

Cut of young-growth probably near 12½ per cent of total now

Mendocino lumber amounts to 2 per cent of all U. S. lumber and 15 per cent of the California output

Old-growth redwood has a high-value specialty market, much of it outside California

Fig. 10. California redwood lumber production by counties, 1956.

Old-growth Douglas-fir is sold for general construction uses, mostly in California

Old-growth Douglas-fir markets emphasize general construction uses. Because of its strength, nail-holding ability, and related qualities, Douglas-fir is used for structural members, flooring, and framing. Since California Douglas-fir is in direct competition with producers in the Pacific Northwest and also close to the large California building construction market, out-of-state markets are relatively unimportant.

Young-growth redwood differs substantially from old-growth lumber. Some differences are inherent—young-growth logs are smaller, have considerably wider annual rings, and a much smaller proportion of knot-free material. Other differences reflect the fact that, as a comparatively low-value product, such lumber is

frequently manufactured with less care and thoroughness than old-growth material.

For these reasons, young-growth redwood lumber is not produced in the large sizes characteristic of old-growth, yields a much higher percentage of common grade boards, may include more sapwood with a lower decay resistance, and may be less pleasing in appearance (according to present market preferences) because of coarser grain and lighter color. As a result young-growth redwood lumber has not entered the high-value specialty markets which characterize old-growth. It goes mainly into general construction uses for many of the same purposes as Douglas-fir and directly competes with several other species in these markets.

The effects on log and stumpage value of these quality differences between young-growth and old-growth redwood are quite variable, depending on the nature of the timber itself and on the means which the manufacturer has available for dealing with the special problems of young-growth marketing. Reported differences in log values (f.o.b. mill pond) range from \$1 to \$21.50 per M.b.f. In most cases, however, the value differential between young-growth and camp-run old-growth redwood logs is between \$10 and \$15 per thousand.

Although important market differences are creating a substantial value differential between old-growth and young-growth redwood, some of these underlying marketing problems can be solved with proper programs. Such programs include management of the young-growth to improve its quality by cultural measures; lumber manufacturing techniques to minimize unfavorable characteristics such as shrinking and warping; and market promotion to get the material into uses for which it has natural advantages and to keep it from uses for which it is not well suited. Without a concerted effort to improve the market position of redwood young-growth, existing market preferences for other material will continue and young redwood will remain a relatively poor competitor. In the history of lumber marketing many materials once subject to similar market disadvantages now enjoy strong market positions as a result of the kind of market development program described above. To be effective, such a program requires sustained efforts over many years by a strongly organized marketing group.

Young-growth Douglas-fir lumber also lacks some of the attributes of old-growth. It yields smaller sizes and generally knottier lumber, although for many characteristic uses of this species small, tight knots are pref-

Young-growth redwood goes mostly into general construction, similar to Douglas-fir

but a program of management, manufacturing techniques, and promotion could improve its market potential

Young-growth Douglas-fir can compete with old-growth Douglas-fir in the markets

erable to the larger knots of old-growth. But unlike redwood, these characteristics do not disqualify young-growth Douglas-fir from effective competition in many markets that characterize old-growth. As a result, current value differentials are less, ranging from \$2 to \$10. Experience in the Pacific Northwest indicates that adaptation of the Douglas-fir market to young-growth timber supply is a simpler problem than that of redwood.

The Plywood and Veneer Industry.

*Plywood and veneer
industry is new in
Mendocino*

The manufacturing of plywood and veneer is a comparatively new industry in Mendocino County. The first plywood plant was built at Calpella in 1948, and by 1956 two plywood and four green-veneer plants were in operation. One of the veneer plants has since closed down.

Although its output and raw material needs are small compared to lumber, plywood is Mendocino's second ranking wood-using industry. In 1956, production of veneer logs and bolts was 70 million board feet, or 7 per cent of the total timber output (figure 7). Of this amount, 51 million was received by county plants, the rest was exported to neighboring counties and to Oregon (May, 1957).

The economic importance of the plywood industry is greater than its size, measured in raw materials, suggests. Plywood production requires more labor per unit of wood than does lumber. A given amount of timber supports more workers if utilized for plywood than for lumber.

*Only Douglas-fir is
used*

Only Douglas-fir is used in the county for veneer and plywood, although some redwood, pine, spruce and hardwoods are utilized in other coastal counties.

The plywood industry competes directly with lumber for the supply of high-grade logs, and recent changes in plywood markets and utilization have intensified this competition. When plywood manufacturing began, only sanded plywood with at least one good face was marketable. Knots and similar defects could be included in plywood cores, but face veneers had to be of clear material obtainable only from high-grade logs. Automatic patching equipment has made use of lower-quality material possible. At the same time, unsanded plywood sheathing, in which knot holes on the outside faces are acceptable, has found its use in home construction. These changes in technology and markets meant that plywood manufacturers could use lower-quality logs which previously had gone into lumber.

As a result, the economic base of the plywood industry widened, and competition with the lumber industry for the same type of log increased.

Large, clear logs are still most desirable for rotary-cut veneer. On logs or stumpage of high quality, the plywood plant can generally outbid the sawmill because of the higher realization value of its product per unit of wood used. In effect, the plywood plants absorb a more than proportionate share of high-quality logs, leaving an increased proportion of the lower grades to sawmills.

In contrast to lumber, very little young-growth timber is utilized in plywood manufacture. Most young-growth, because of size and quality limitations, does not meet the log-grade requirements for plywood. In general, specifications require a minimum diameter of 18 inches, providing knots are not larger than two inches. Very little young-growth meets these standards.

Plywood requires high-quality logs, mostly old-growth timber

The Pulp and Hardboard Industry

Pulpwood production began in Mendocino County in 1948 and increased rapidly for a few years, particularly after a masonite hardboard plant began operating in 1950 (table 4). By 1952, production of pulpwood reached a peak of 74 million b.f. Pulp and hardboard mills then shifted to chipped sawmill residues as their principal raw material and pulpwood utilization began a steady decline. In 1957, only 5 million feet of pulpwood was cut.

Pulp production is new and of modest size

As shown on page 35, over-all U. S. demand for pulp is expected to expand. Young-growth timber, thinnings, logging residues and low-quality logs from Mendocino County forests have already been shown to be suitable as raw material for pulping operations. However, little or no increase in this market for timber is to be expected until the potential supply of chipped mill residues available in the area is fully exploited.

In 1952, the estimated volume of unused residues suitable for pulping in Mendocino, Lake, and northern Sonoma counties was 15 times greater than what was used in the pulp and hardboard industries (figure 11). Since 1954, utilization of mill residues has increased greatly while closer utilization in many mills and reduced forest-products output have curtailed somewhat the potential supply. But substantial volumes of unused mill residues are still available in the county. Pulp production could be expanded considerably by using such residues, before additional primary pulpwood production would be needed. Therefore, young-growth

Unused mill residues available to meet potential pulp industry needs

Fig. 11. Use of sawmill residue in Mendocino County area, 1952 (Mendocino, Lake, northern Sonoma counties).

probably will not be used for a number of years even if additional capacity for pulping should be installed.

Other Wood-Using Industries

Other types of forest industries in Mendocino include the manufacturing of poles and piling, shingles and shakes, other split products, and such miscellaneous products as greenery, fuelwood, and Christmas trees.

Poles and piling have been produced in small quantities for many years. Output has varied widely, and increased sharply in 1956 when a pole yard was established in the county. However, the volume—all of it in Douglas-fir—is still less than 1 per cent of the total amount used by all wood-using industries.

Though small, the industry is significant to young-growth forestry because it provides a potential market for thinnings and small-size material which are unsuitable for lumber or veneer.

Shingle and shake manufacturing is an old, established industry in Mendocino. In 1956, the county led all other areas in production—accounting for 62 per cent of the state total. Its 9 plants used only 2.2 million feet of timber. The industry depends entirely on a supply of old-growth redwood which is straight-grained and easily split. Much of its raw material is salvaged from logging operations and dead material. The industry reached a post-war peak in 1947 and its output has been declining since.

Split products, such as grape stakes, fence posts, palings and pickets, fence rails, and split shakes are manufactured in the county by small, independent

Various uses of dead, salvaged, and small-size materials

operators who work primarily with hand tools. In 1956, 37 such operators used 8 million feet of timber. Grape stakes are the leading products (accounting for over half the output), followed by palings and pickets. Most of the small splitters operate on a part-time basis, and output varies considerably from year to year. Old-growth redwood is the only raw material used—with about half of the industry's wood supply coming from dead or salvaged material.

Miscellaneous products include greenery, fuelwood, and Christmas trees.

Prospective Trends in Markets

Output of forest products in Mendocino County reached an all time high between 1954 and 1956 (table 4) and has dropped to about 80 per cent of that peak. This drop does not appear to reflect any permanent change in the outlook for demand for Mendocino forest products. But certain features of prospective demand may modify the county's present position and affect the character of future development.

Aggregate demand for wood. Although the distribution of certain Mendocino products such as Douglas-fir lumber tends to concentrate in California, the markets in which most Mendocino forest products are sold are generally determined by nation-wide influences. Two studies of long-term trends in the U.S. demand for wood products, by the Stanford Research Institute (1954) and by the U.S. Forest Service (1958), largely confirm each other on the broad outlines of the future

Forest-products outlook in Mendocino County depends on nation-wide demands

TABLE 7
U. S. CONSUMPTION OF CERTAIN FOREST PRODUCTS IN 1952 AND
PROJECTED CONSUMPTION IN 1975

Commodity	Consumption		Per cent of total U. S. wood products consumption	
	Estimated	Projected		
	1952	1975	1952	1975
Lumber: (billion b.f.)				
Stanford.....	40.7	44.7	62	51
Forest Service.....	41.5	47.6 to 55.5	62	52 to 54
Pulpwood: (million cords)				
Stanford.....	35.2	62.5	27	36
Forest Service.....	35.4	65.0 to 72.0	27	36 to 35
Plywood: (billion sq. ft.) 3/8"				
Stanford.....	5.4	9.2	4	5
Forest Service.....	5.4	9.6	4	5

SOURCE: Stanford Research Institute, 1954.
U. S. Forest Service Timber Resources for America's Future, 1958.

market. Pertinent details of the two projections are shown in table 7.

Although experience since 1952 suggests some significant revision in the detail of these projections, the major future market trend still seems valid. This is for over-all growth in the demand for forest products with pulpwood and plywood markets showing significantly greater strength than the lumber market.

Greatest increase is seen in pulp production which is weak in Mendocino

The two right-hand columns of table 7 show that much of the expected expansion in the demand for wood will be in the form of pulpwood. Even though both projections anticipate a significant rise in lumber consumption, both expect the *relative* share of lumber in the wood-products market to diminish from 62 per cent of the total in 1952 to only 51 to 54 per cent by 1975. The relative importance of plywood is expected to remain about as it is, while pulpwood may expand its share from 27 per cent in 1952 to over 35 per cent by 1975. Thus, the strongest markets of the future are forecast for the forest product which has been least important in Mendocino County. The development of an expanded pulp industry may be necessary if Mendocino is to maintain its present relative market position in the face of these prospective changes.

The two Mendocino species are little used in pulpwood

It is worth noting that Mendocino's two most important timber species—redwood and Douglas-fir—have never occupied an important place in total pulpwood consumption. Figure 12 shows the relative importance of the several major tree species as suppliers of pulpwood. Both redwood and Douglas-fir are technically usable for pulp, and redwood has been extensively used for hardboard in Mendocino County.

Fig. 12. Douglas-fir and redwood are only minor sources of the U. S. pulp supply (1952 figures).

Source: American Forest Products Industries, 1955.

Douglas-fir is now recognized in the industry as an important and satisfactory source of raw material, but a well organized and sustained development program is needed if Mendocino County is to share broadly in the potential future expansion of the pulp and hardboard market.

Diversification of output. The total economic significance of wood resources to a community depends in part on the kind of forest industries using the resource. Figure 13 shows comparative labor requirements for producing various finished products from a million board feet of logs. Rough lumber, the predominant forest product of Mendocino County, ranks lowest in labor requirements. In other words, conversion of raw material into lumber generates fewer jobs and less income than conversion of the same material into plywood, paper, or hardboard. The discussion of timber supply on pages 38 to 46 suggests that Mendocino is unlikely to experience further growth in its forest economy as a result of expanded timber cut. Thus, the

Needed: a development program to share in the expansion of the pulp market

Source : Marquis, 1948.

Fig. 13. Mendocino County's major wood product, rough lumber, generates fewer jobs and less income than the other products.

future of the economy may depend heavily on the ability of the county to diversify its wood manufactures. Greater employment and income can be sustained without an enlarged rate of wood use if the pulping and plywood industries can be built up and if the manufacture and fabrication of lumber can be expanded. This development will require well-organized marketing activities and substantial capital investments in new manufacturing facilities. To insure the security of such investments a stable supply of raw materials is of course essential.

Needed: diversification of output, well-organized marketing activities, and capital investments based on a stable supply of timber

TIMBER SUPPLY: THE RESOURCE BASE FOR WOOD-USING INDUSTRIES

Analysis of Mendocino timber supply indicates that:

the private timber resource base of the county cannot permanently sustain expansion beyond the 800 million b.f. level of annual cut.

maintenance of present-level cutting will result by 1978 in a serious shortage of private large young-growth stands which by then will be the most important source of merchantable timber in the county.

to maintain the county's forest economy at about the present scale, measures must be taken to secure the fullest and most intensive possible management and utilization of large young-growth stands.

Mendocino's commercial forest comprises 60 per cent of its wildland, most of it in private ownership

Mendocino County contains 2,246,000 acres of land. As shown in figure 14, 3.3 per cent is cultivated, urban, or industrial. The remainder is wildland, of which 60 per cent is classified as commercial forest.

Of the 1,305,000 acres of commercial forest land, 1,056,000 (81 per cent) was in private ownership in 1952. Some 154,000 acres was in National or State forests, Indian Reservations or other types of permanent public reservation. The remaining 95,000 acres was in the public domain, subject to private entry, or had been sold to the state for taxes. Little significant change in the aggregate area of private commercial forest ownership is believed to have occurred since 1952.

Timber Inventory On Private Land

No comprehensive inventory of timber volumes has ever been made in Mendocino County. In 1948 the California Forest and Range Experiment Station made a systematic study of forest areas by ownership and by timber-stand characteristics.³ Using these data, the total timber inventory on private forest land in 1948 was estimated at 29.6 billion board feet (International $\frac{1}{4}$ " rule, including all trees 12" d.b.h. and larger). (Table 8.)

Timber on private forest estimated at 24 billion board feet

During the decade 1948–1958, this inventory was reduced by harvesting and other sources of drain by at least an estimated 9 billion board feet. During the same period, inventory was being augmented by growth, with the net result that timber inventory on private forest

³ A 1945 estimate by the California Forest and Range Experiment Station showed 1,075,000 acres of commercial forest land and 19.7 billion b.f. of timber in Mendocino County, of which 958,000 acres and 17.9 billion b.f. were in private ownership. (Wieslander and Jensen, 1946, tables 20 and 22.)

TABLE 8

ESTIMATED VOLUME OF TIMBER ON
COMMERCIAL FOREST LAND IN
MENDOCINO COUNTY

(All volumes in billion b.f., International
 $\frac{1}{4}$ " rule)

Ownership and age	1948	1958
Private:	29.6*	24.2*
Old-growth areas†.....	22.6	15.1
Young-growth areas.....	7.0	9.1
Public:	6.1	6.0
Old-growth areas†.....	5.2	5.0
Young-growth areas.....	0.9	1.0
Total:	35.7	30.2
Old-growth areas†.....	27.8	20.1
Young-growth areas.....	7.9	10.1

* Redwood accounted for 57 per cent of the total volume in private ownership in 1948 and for 61 per cent in 1958.

† "Old-growth areas" include the following Forest Survey classifications: Old-growth; old-growth—young-growth; and young-growth—old-growth.

*Almost two-thirds of
private forest is
old-growth*

land was reduced to an estimated 24 billion board feet (International $\frac{1}{4}$ " rule) by 1958.

This estimated inventory exceeds, of course, the assessable timber volume (text table, page 56). It includes the volume of all trees 12 inches d.b.h. or larger, many of which are too small to be considered merchantable for assessment purpose. It includes all young-growth volumes exempted from assessment under Section 12 $\frac{3}{4}$

Fig. 14. Land distribution in Mendocino County, 1948.

	KIND OF LAND	% OF TOTAL	AREA, THOUSAND ACRES
	Cultivated, urban, or industrial	3.3	75
Wildland	Grassland and woodland grass	20.5	460
	Woodland and chapparal	16.5	380
	Commercial forest	58.2	1,305
	Other	1.1	26
	TOTAL	100	2,246

Source: Baker and Poli, 1951, table 2.

of the Constitution. Measurement, in terms of International $\frac{1}{4}$ " log rule, gives larger volume estimates than the Spaulding Log Rule employed in most cruises used by the assessor. When these differences between inventory volume and assessable volume are adjusted, the 1958 inventory estimate is consistent with the 1958 assessed volume, within the limits of error of the estimate.

Two-thirds of private forest is redwood, one-third Douglas-fir

About two-thirds of the private inventory is redwood and about one-third Douglas-fir and other species. In 1958 an estimated 62 per cent of the total inventory volume was in old-growth forests and 38 per cent in young-growth forests.

Age Class and Stocking of Timber

Between 1948 and 1958 cutting was concentrated on old-growth areas, reducing them from 64 to 39 per cent of all private lands

The composition of Mendocino's private forest resources has undergone a highly significant change. Between 1948 and 1958 the forest changed from predominantly old-growth to predominantly young-growth.

As shown in figure 15, 64 per cent of the private area in 1948 was in forests containing a significant amount of old-growth timber. Between 1948 and 1958, timber harvesting was heavily concentrated on these old-

Fig. 15. Old-growth and young-growth stands in private forests reversed their balance between 1948 and 1958.

Source: Baker and Poli, 1951; estimate for 1958 projected from 1948 areas as modified by subsequent cutting.

growth areas—an estimated quarter million acres of old-growth land was logged in that period. As a result, the balance between young-growth and old-growth forests in the county has been roughly reversed, and in 1958 young-growth areas accounted for an estimated 61 per cent of all private forest lands.

This change in age class structure is of the greatest importance. Old-growth timber is no longer the key to the county's long-term raw material supply. While harvesting operations will rely heavily on old-growth for another decade or so, the critical element in the long-term timber resource situation is what happens to the young-growth forests. These young-growth forests now dominate the private forest area and their dominance is increasing with each passing year.

In 1948 the privately owned cutover land was stocked with commercial timber as shown in table 9.

A substantial proportion of the area cut during the last decade would now be classified as "unstocked" because there has not yet been enough time for new stocking to develop. On the other hand, young trees have emerged on many areas classified as "unstocked" in 1948, shifting this acreage to other timber density classes. Analysis of the various factors affecting the density of the young-growth stands suggests that, in 1958, the distribution of young stands was not markedly different from that of 1948.

Old-growth timber is no longer the key to the county's raw material supply. Young-growth dominates the private forest area

Timber Growth and Prospective Timber Supplies

Between 1948 and 1958, the private timber inventory of Mendocino County has grown, on an average, an estimated 340 million b.f. (net) annually. Almost 60 per cent of the total growth was on young-growth stands although these stands accounted for only 36 per cent of the productive forest area at the beginning of the period. This reflects the relative low rate of net

Present average annual net growth of private timber inventory: 340 million board feet, 60 per cent of it young-growth

TABLE 9
DENSITY OF TIMBER STOCKING ON PRIVATE YOUNG-GROWTH LAND
IN MENDOCINO COUNTY, 1948

Density of timber	Redwood zone		Other forest type zones		All young-growth	
	Thousand acres	Per cent	Thousand acres	Per cent	Thousand acres	Per cent
Dense.....	21	11	44	40	65	22
Semidense.....	48	26	17	15	65	22
Open.....	58	31	23	21	81	27
Very open.....	59	32	26	24	85	29
Total.....	186	100	110	100	296	100

TABLE 10
AVERAGE RATES OF TIMBER
GROWTH IN THE REDWOOD
DOUGLAS-FIR SUBREGION, BY
STAND CONDITION CLASSES

Stand class	Net Annual Growth per acre, b. f. Int. $\frac{1}{4}$ "
Old growth	negligible*
Young growth	
Well stocked	730
Medium stocked	390
Poorly stocked	250

* Except in well-stocked old growth redwood stands, where annual net growth may reach 400 b. f. per acre.

growth on old-growth stands in comparison with the growth of young stands, even where the latter are openly stocked.

Estimated average rates of growth on various classes of young forest in the redwood-Douglas-fir subregion are shown in table 10. Both site quality and density of stocking strongly influence rates of timber growth. As shown in figure 16, the distribution of site classes in Mendocino County closely parallels that for the redwood-Douglas-fir region as a whole, and the 1948 pattern of stocking was roughly comparable. The growth

Fig. 16. Stocking and site classes in Mendocino County are similar to those in the entire redwood-Douglas fir subregion.

Source: Baker and Poli, 1951; Forest Survey Release No. 19.

rates of table 10 therefore appear applicable to Mendocino County.

These growth data show that conversion of old-growth stands into well-stocked young forests will result in some additional contributions to growth. The extent to which future growth increases above the 340 million b.f. current estimate will depend on (1) on the rate of cutting of old growth stands, (2) the success with which newly cutover areas are restocked, and (3) the efforts made to increase growth on young stands by more intensive management. Assuming that cutting of old-growth stands continues at the average 1948-58 rate (800 million b.f.) and that the rate of restocking will be the same as in the past, county-wide growth would increase to an annual 360 million b.f. by 1968 and an annual 380 million b.f. by 1978.

The combination of cutting old-growth stands and the growth of young ones will continue to cause rapid changes in the character of the timber inventory in the decades ahead. These changes are likely to have important impacts on timber supply. To foresee prospective changes, one must visualize what would happen to the timber inventory under specified assumptions.

*Projected future
annual increase, 360
million board feet by
1968; 380 million
by 1978*

TABLE 11
ESTIMATED PRIVATE TIMBERLAND AREA AND TIMBER VOLUME,
BY AGE CLASSES, 1958

Age class	Thousand acres	Per cent	Billion b.f.	Per cent
Old-growth.....	407.8	38.6	15.1	62.4
Large young-growth.....	244.1	23.1	6.8	28.1
Small young-growth.....	111.7	10.6	1.0	4.1
Unstocked.....	292.8	27.7	1.3	5.4
Total.....	1,056.4	100.0	24.2	100.0

TABLE 12
PROJECTED TREND OF PRIVATE TIMBER VOLUME BY AGE CLASSES,
1958-1978
(Trees 12" d.b.h. and larger; International 1/4" rule)

Age class	Estimated 1958 vol. billion b.f.	Projected volume: 800 million b.f. annual drain		Projected volume: 650 million b.f. annual drain	
		1968	1978	1968	1978
Old-growth.....	15.1	9.1	2.9	9.9	5.5
Large young-growth.....	6.8	6.2	6.6	7.1	7.9
Small young-growth.....	1.0	2.5	3.8	2.7	3.6
Unstocked.....	1.3	1.6	1.7	1.4	1.4
Total.....	24.2	19.4	15.0	21.1	18.4

In 1958 (table 11), 62 per cent of the total inventory volume was on the 39 per cent of the private area remaining in old-growth. If recent levels of growth and drain are used as the basis for projecting the trend of volumes, old-growth will represent less than 50 per cent of the volume by 1968 and only 20 to 30 per cent by 1978. The outlook on this basis may be judged from table 12.

*Assumptions for
future projections*

It should be emphasized that the data in table 12 do not represent a forecast of what will happen to timber inventory. Rather, they show what would happen to inventory if drain from cutting continues at recent levels (about 800 million b.f. per year) and, alternatively, what would happen if the drain were curtailed to about $\frac{4}{5}$ of the present level (about 650 million b.f. per year). On the further assumption that 80 per cent of the drain is from old-growth areas and 20 per cent from large young-growth (the apparent 1960 level), private old-growth timber volumes in the county in 1978 would amount to only 19 per cent of the 1958 level.

The volume of young-growth timber inventory is likely to increase over the next twenty years. It is estimated that it may amount to 12 billion b.f. by 1978 (up 33 per cent from 1958) if intervening drain is at the 800 million foot level. However, most of this increase would be in "small young-growth" stands. These stands are generally smaller in average size of tree than the young-growth areas now being cut. Most "small young-growth" would not present an economical operating chance under utilization standards and forest practice rules similar to those now in effect.

*If present cutting
level is continued,
drastic curtailment of
industry would be
inevitable*

The volume of "large young-growth" (young-growth stands similar in size to those now being cut) projected for 1978 is the same as the present volume in this size class. If such a timber inventory situation actually develops, it would present a critical raw material supply situation. The projected 1978 inventory in old-growth (2.9 billion b.f.) and large young-growth (6.6 billion b.f.) stands would be substantially below that needed to sustain the 800 million foot level of annual cutting (16 billion b.f.). Drastic curtailment of forest products industry output would appear inevitable.

If drain from cutting were reduced to an average of 650 million b.f. between now and 1978 (table 13), prospects for sustaining raw material supply would be substantially improved. The old-growth and large young-growth volumes then available in 1978 would be adequate for perhaps another 15 years of cutting at the

TABLE 13

PROJECTED AREA AND VOLUME OF PRIVATE LARGE YOUNG-GROWTH
IN MENDOCINO COUNTY

(Trees 12" d.b.h. and larger; International ¼" rule)

Year	At 800 million b.f. annual drain		At 650 million b.f. annual drain	
	Area (thousand acres)	Volume (billion b.f.)	Area (thousand acres)	Volume (billion b.f.)
1958.....	244.1	6.8	244.1	6.8
1968.....	227.9	6.2	239.3	7.1
1978.....	259.6	6.6	294.7	7.9

reduced rate, by which time many additional young stands would have reached harvestable size.

As a further aid in visualizing the timber supply outlook, figure 17 projects the probable distribution of timber age classes by 1978, if drain continues at 800 million b.f., with 20 per cent of the annual cut being taken from large young-growth stands.

The bar headed "Normal" indicates the present-age distribution of land among the different age classes which would provide a uniformly sustained flow of timber on a rotation of 55 years. Comparison of this bar with 1958 conditions indicates that there is currently a deficiency of "small young-growth" age classes. By 1978 this will be reflected in a deficiency of "large young-growth," the type of stand that will be urgently needed to supply the timber then required to sustain Mendocino's industries.

If present cutting level is continued, a serious shortage of large young-growth would develop by 1978

Fig. 17. Projected distribution of timber age classes by 1978.

The preceding analyses have dealt with timber inventories on private land and the growth and drain conditions which seem likely to affect private holdings. Public holdings account for 19 per cent of the commercial forest in the county and for about 20 per cent of the estimated 1958 inventory. These lands will continue to provide a resource base for a number of forest industries in the county on a sustained yield basis. Although some expansion of cut from National Forest land may be expected, there is no reason to expect that it will be large enough to modify significantly the general picture of prospective private timber supply.

*Private timber supply
not to be affected
much by increased
cuts on public lands*

The Importance of Young-Growth Stands

If well managed, the growth potential of the county's forest land is sufficient to provide a perpetual wood supply close to present levels of drain. But this fact does not assure the future stability of the county's timber economy. Much more intensive management is needed if growth is to be increased from the present level to one approaching full potential. Sufficient young-growth timber must reach maturity during the decades after 1968 to provide merchantable sized timber in sufficient quantities to meet industry's raw material needs. The way existing young-growth forests are handled during the next decade or two will therefore largely determine whether or not forest industries are faced with a critical raw material shortage by 1970 or 1975.

*Key factor: manage-
ment of large young-
growth stands during
next 15 years*

The key factor in minimizing this potential disruption to the future forest economy is the management given to large young-growth stands during the next fifteen years. If their liquidation continues at the present estimated rate of about 160 million board feet per year (or, as seems probable, at an even higher rate) drastic curtailment of forest products output during the decades following 1975 appears inevitable. On the other hand, timber supply can be maintained by careful management of the young-growth stands, aimed (1) at maintaining the maximum possible volume for harvesting during the period after 1975, (2) salvaging the normal mortality which will occur in such stands during the interim, and (3) increasing the net growth and quality of those stands by judicious thinning operations.

*Three management
aims*

OWNERSHIP OF TIMBERLAND

Although two-thirds of the private forest land is owned either by large forest industries or by the larger ranchers, there are more than 3,000 ownerships of less than 180 acres. These small owner-

ships are thus a major factor in the administration of rural property taxation. The small ownerships also suffer important disadvantages from the standpoint of forest management because larger ownership units are often much better equipped to deal with timber marketing problems, to secure and apply technical forest management advice, and to utilize fully the wood raw material through diversified manufacturing.

In 1957 Mendocino County had an estimated 1,056,000 acres of privately owned forest land. Most of the 3,900 rural landowners in the county (Casamajor, 1958) had some forest land on their holdings. The sizes and kinds of timberland owners were very diverse. As the objectives, size, and other characteristics of forest ownership may often be related to the impact of taxation on forest management practices, attention must be given to the nature of private ownership in evaluating the outlook for the timber-based economy.

Size of Ownership

The large range in size of ownership is shown in table 14. The 3,050 individual ownerships of less than 180 acres average 58 acres each, account for only 10 per cent of the land area, but comprise 78 per cent of all rural land ownerships; thus they are a major factor in the administration of rural property taxation. In contrast, 70 per cent of the rural land area is included in only 212 ownerships of 1,300 acres or more—10 of them exceeding 20,000 acres apiece. Clearly, what happens on these 212 relatively large ownerships is of great importance to the future of the county's natural resources.

Table 14 shows all land area included in the various rural ownerships. The concentration of forest land in

Small ownerships—a major factor in the administration of rural property taxation

TABLE 14
NUMBER OF RURAL PRIVATE LANDOWNERS AND AREA OWNED
BY SIZE OF LAND OWNERSHIP, 1957

Size of ownership	Ownership		Total area owned	
	Number	Per cent	Thousand acres	Per cent
0-179 acres.....	3,050	78	176.2	10
180-1,299 acres.....	655	17	371.3	20
1,300-4,999 acres.....	160	4	436.6	24
5,000-19,999 acres.....	42	1	377.5	21
20,000 acres or more.....	10	..*	455.6	25
Total.....	3,917	100	1,817.2	100

* Less than 1/2 of 1 per cent.
Source: Casamajor, 1958.

TABLE 15
RATIO OF COMMERCIAL FOREST
LAND TO ALL LAND BY SIZE
OF OWNERSHIP

Size of ownership	Per cent of total land area that is com- mercial forest
0-179 acres.....	57
180-4,999 acres.....	52
5,000-49,999 acres.....	61
50,000 acres or more.....	98

SOURCE: Casamajor, 1960.

the larger sized holdings is somewhat greater than that of all land; that is, the larger ownerships tend to have a greater ratio of forest land to all land than do medium and small ownerships, as indicated in table 15. Thus, the 212 ownerships of 1,300 acres or larger (total land area) account for three-fourths of the privately owned forest land in the county.

Type of Ownership

There are also great differences among owners in respect to the kind of owning organization, the purposes of ownership, and related factors such as financial strength, liquidity, access to technical advice on land management problems, and the like. Table 16 indicates the extent of this diversity.

*Timber enterprises
account for 11 per
cent of the owners*

Sixty-one per cent of the ownerships were held in 1957 by persons whose primary objective in ownership was either recreational use or some other goal not related to agriculture or forestry. Farmers and ranchers accounted for 28 per cent of the owners, and timber enterprises for 11 per cent. More than four-fifths of the total land area is owned by ranching or timber enter-

TABLE 16
NUMBER OF RURAL PRIVATE LAND OWNERS AND AREA OWNED,
BY TYPE OF OWNER, 1957

Type of owner	Ownerships		Total area owned	
	Number	Per cent	Thousand acres	Per cent
Timber company.....	85	2	488.6	27
Timber owning individual.....	360	9	214.1	12
Range livestock enterprise.....	541	14	793.6	43
Other farmers.....	541	14	108.4	6
Recreational and other.....	2,390	61	212.5	12
Total.....	3,917	100	1,817.2	100

SOURCE: Casamajor, 1960.

prises. On the basis of area owned, about one-third of these ownerships were controlled by corporations and two-thirds by private individuals.

Approximately 65 per cent of the ownerships and of the privately owned rural area are in the hands of residents⁴ of the county. The remaining ownerships were held principally by people living in northern California outside Mendocino County. About 4 per cent of the owners live in the southern part of the state and only 1 per cent live outside California.

Changes in Ownership

The ownership of rural land in Mendocino County has experienced many changes since World War II. Between 1947 and 1957 only 11 per cent of the rural area remained in unchanged ownerships; two-thirds of the properties, covering 48 per cent of the rural area, changed hands at least once. Other property owners enlarged their holdings so that one-third of the area was in larger ownerships in 1957 than in 1947 (Casamajor, 1958).

The net effects of these changes were: some increase in the amount of land in holdings of 20,000 acres or more (from 22.4 per cent of rural area in 1947 to 25.0 per cent in 1957); a roughly comparable decrease in the area in small holdings of less than 180 acres; and an increase in the numbers of these small holdings and, hence, a decrease in their average size from 88 acres in 1947 to 58 acres in 1957. The decade also saw significant reduction in both the number and acreage of ranching and other farming enterprises and increases in the number and area of timber ownerships. Changes in the type of ownership are presented in table 17.

⁴ A resident is here defined as a party whose address as listed with the County Tax Collector is within Mendocino County. The land is not necessarily occupied.

Almost two-thirds of land owned by residents of the county

Almost half the rural area changed owners during 1947-1957

Timber ownerships increased in number and area

TABLE 17
CHANGES IN OWNERSHIP, 1947-1957

Type of owner	Number of ownerships		Area owned (thousand acres)	
	1947	1957	1947	1957
Timber company.....	55	85	407	489
Timber-owning individual.....	298	360	129	214
Range livestock enterprise.....	548	541	844	794
Other farmers.....	669	541	127	108
Recreation and other.....	1,663	2,390	278	212
Total.....	3,233	3,917	1,785	1,817

Thus, the two major trends in the ownership of rural land in the county were: (1) a tendency for the blocking up of relatively large holdings with the principal goal of timber production, and (2) the breaking down of ownerships into smaller and more numerous holdings used for recreation, rural residence, or other essentially nontimber and nonfarm purposes.

Typical Kinds of Forest Ownership

Four different kinds of timberland ownership can be identified from the data presented above:

- Timber industry holdings of 20,000 acres or more, oriented toward timber growing.
- Timber industry holdings of less than 5,000 acres.
- Range livestock enterprises, 700 acres or larger.
- Small nonindustrial holdings, under 700 acres.

Four main kinds of timberland ownership

All four contain physically similar kinds of forest land. But the economic conditions affecting the management of the different classes of owners are quite different. These economic differences have a bearing both on timber resource utilization and timber taxation.

Table 18 shows the total rural area and the estimated commercial forest area included in such ownerships in 1957. Over 90 per cent of the forest land is in one of the four types of ownership listed above.

In the economics of forest resource use, the four kinds of ownership have different characteristics. A large forest ownership, for example, has several economic advantages over a small one. The more important ones, summarized here, concern marketing, management, and timber utilization.

Marketing advantages. Selling timber is a highly technical business. Standing timber is not standardized to the same degree as most other agricultural and industrial materials. Timber is subject to wide varia-

TABLE 18
DISTRIBUTION OF FOREST LAND BY TYPE OF OWNER

Type of owner	Rural land Owned	Commercial forest owned	
	Thousand acres	Thousand acres	Per cent
Timber industry (over 20,000 acres).....	410.9	385	36
Timber industry (under 5,000 acres).....	184.7	130	13
Range-livestock owner (over 700 acres).....	712.6	320	30
Small nonindustrial (under 700 acres).....	337.5	145	14
All other.....	171.5	76	7
Total.....	1,817.2	1,056	100

tion in quality; location, topography, and other factors affect the extraction cost; accurate estimation or measurement of the timber volume sold is a complex task requiring experience and proper technique; market prices for standing timber and its products have undergone relatively large changes in recent years. These various factors make timber selling a task which demands skilled judgment and close attention to a wide range of technical considerations.

An inexperienced seller who lacks knowledge of marketing is clearly at a disadvantage in securing the full market value for his timber and in protecting values in residual timber, land, and physical improvements. The large land owner is able to sell timber relatively frequently and thereby remains in contact with buyers and market conditions. Through repeated sales, he is able to develop marketing experience and skills. The size of sale may warrant employment of professional assistance in legal and technical fields. Most small-forest owners (those with less than 5,000 acres), experience marketing disadvantages because their sales are infrequent and the volumes offered relatively small. A recent study of timber sales from small ownerships in Mendocino County showed that a majority of small owners had had no previous experience with selling standing timber. Most of the owners lacked knowledge essential to careful planning and administration of a timber sale. Although the average price in 41 such sales was \$9,300, only one seller in six had sought sales advice from a consulting or service forester.

Management advantages. The small-forest owner also is at a disadvantage with respect to securing and applying the technical forest management information needed for the most effective use of his land. In a recently examined sample of Mendocino County owners, all owners of 20,000 acres or more of forest land employed one or more trained foresters. Owners of 5,000 to 20,000 acres sometimes employed forestry consultants, but usually managed without technical assistance. Small owners (less than 5,000 acres) very rarely secured technical forest management counsel from any source. Small owners thus cannot plan the management of their properties in the light of the best available information and technique.

Additional evidence of the land management advantages of larger ownerships is provided by an analysis of cutting practices.

Among a sample of owners of 20,000 acres or more, owners of more than 39 per cent of the acreage mark

Advantages of large forest ownership:

1. More experience and knowledge of marketing

2. More technical management information

the timber for cutting on the basis of some sort of silvicultural guides. Owners of an additional 52 per cent of the acreage harvest on the basis of diameter limits significantly above those provided by law. In contrast, on 57 sales from small ownerships, timber was marked in only 3 per cent of the cases and minimum diameter limits were used in only 26 per cent. In almost half the sales, timber was harvested on the basis of the buyer's choice of merchantable timber. Either the marking of timber or the establishment of a minimum diameter limit will normally result in more productive cutover land than will cutting in accordance with the buyer's choice.

3. *Better utilization of the whole tree*

Utilization advantages. Full utilization of the standing tree is a major goal of both good forest management and good industrial practice. Before 1950, only about 50 per cent of the cubic content of timber removed from growing stock in the Mendocino County area was actually converted into usable products. Since then considerable progress has been made in fuller wood use, such as the development of chipped mill residues as a raw material for pulp and hardboard. Broadening of the end product base to include not only lumber but also veneer, plywood, hardboard, and other products is helping to achieve fuller utilization.

Such diversified utilization is much more difficult to achieve where the manufacturer must rely for his wood supply on a large number of small tracts. Because it is difficult to insure several years' supply from such sources, operators dependent on them may not be able to risk the capital investment needed for diversified wood use. Evidence of this is shown below.

	Six owners of of over 20,000 acres each	All other owners and plants
Assessed value of manufacturing plant per thousand forest acres.	\$17,000	\$6,910
Assessed value of manufacturing plant per dollar of assessed timber value. . .	\$ 2.04	\$ 1.44
Assessed value of manufacturing plant per million b.f. of logs used per year. .	\$26,200	\$8,580

Using assessed value as a measure of the investment in plant and utilization facilities, the larger forest ownerships have significantly heavier plant investments per acre of forest owned, per dollar of timber investment, and per million board feet of raw material used than do conversion operations based on smaller land ownerships.

Another factor related to size of ownership concerns the use to which the owner desires to put his land. In

a study of 126 owners of tracts smaller than 5,000 acres it was found that only about half had sold any timber for cutting between 1950 and 1957 (Casamajor, 1960). Of those who had not harvested any timber, almost two-thirds gave as their reason the belief that timber harvesting would conflict with other uses of the land (usually recreation or residence) which were more important to them than timber harvesting or the income therefrom. In 1957 there was an estimated 150,000 acres of commercial forest land in this kind of ownership, much of it in parcels of less than 180 acres. Thus, 15 per cent of the privately owned timber growing land of the county is in a kind of ownership which at present effectively removes the land from the economic timber supply. Evidence suggests that the proportion of forest land in these small recreational and residential-type ownerships will increase as time goes on. Such shifts may not always work to the over-all economic advantage of the county. They may serve to reduce the effective future supply of timber. To the extent that they result in an increased rural population, costs of the services rendered by local government may go up by more than the amount of increased tax revenue accompanying the changed land use. In addition, recreational and residential use of an area may sometimes provide less employment and income than the harvesting and utilizing of the timber produced on the same area.

Owners of 15 per cent of timber land do not wish to cut their timber

Part II: The Taxation of Young-Growth Timber

FORESTS IN MENDOCINO COUNTY'S TAX BASE

Timber, and the plants and equipment dependent on timber for their value, accounted for about 25 per cent of the total assessed valuation in the county in 1959. But timber and timberland alone comprised only 10 per cent of total assessment. This reflects a major decline in the importance of timber in the tax base, as timber and timberland assessments accounted for 35 per cent of the value of all real estate in 1932. The total taxable timber volume appears likely to decline by a further 70 per cent during the next 20 years. Thus, the importance of timber to the tax base is likely to be increasingly in terms of the value of the plant and equipment which the timber resource can support. Already assessments on such timber-dependent property exceed those on timber itself by 70 per cent.

Taxes and assessments have declined as a source of county revenue

Current revenue to finance local government in Mendocino County is derived from taxes and assessments levied locally, from subventions and grants made by other units of government and from a variety of miscellaneous sources such as receipts from licenses, fines, permits, and trust funds. In 1956-57 35 per cent of the county's current receipts came from local taxes and assessments; almost half came from federal and state subventions or grants; and about 15 per cent was from miscellaneous sources. Since the end of World War II, federal and state grants have tended to increase more rapidly than revenues derived from local sources. Thus, as shown in figure 18, the relative importance of taxes and assessments as a source of county revenue has declined somewhat. But they remain by far the most important single source of revenue subject to local government's control.

Trends in Taxes Levied

The history of annual tax levies in the county from 1920 to 1959 is shown in figure 19. Over this forty-year period, the levy has increased almost eight-fold. In terms of purchasing power (based on wholesale price levels), the 1959 levy was $4\frac{1}{3}$ times that of 1921. Between 1940 and 1953 the levy increased a little less than four-fold; during the same period estimated personal incomes increased a little over five-fold. The average total tax levy for the three-year period 1955-57 was 4.9 times its 1940 level; over the same period, estimated personal income in the county had risen 6.3 times.

Fig. 18. Sources of Mendocino County revenue.

Source: Annual financial statements, receipts, disbursements, and statistics, Mendocino County, compiled under supervision of the county auditor.

Figure 20 shows comparative trends of the tax levy, total assessed valuation, and the county tax rate outside urban areas for 1940–58, the period of greatest tax increase. Over these years, the general county tax rate rose less than 15 per cent. Up to 1947 the increase in assessed value was slow and well below the rate of increase in tax levies. Since 1947, the rise in assessed

Fig. 19. Trend of tax levies in general and special county taxes levied in Mendocino County, 1920–1959.

Fig. 20. Trends of tax levy, assessed valuations, and county tax rates outside urban areas, Mendocino County, 1940–1958.

values has been much more rapid. The average assessed value for the years 1955-57 was almost three times the comparable average for 1940-42.

Sources of Assessed Value

In 1958, total assessed valuation of all property in Mendocino County was \$79,953,760. During recent years, property in urban communities has accounted for about one fourth of this total assessed value. Property assessed by the State Board of Equalization consisting mainly of railroads and public utilities has accounted for about 15 per cent of the total. Timber, plus the plants and equipment dependent on timber supply for their operation, accounted for another one fourth of the total. Obviously, the trend in assessed valuation of timber and associated plants is of great significance to the maintenance of the present tax base and to the level of tax burden on the various other classes of property in the county.

Total assessments against timber and timberland have experienced a relatively small net change over the past 25 years as shown below.

	1932	1958
Total assessed value, all real estate	\$16,342,383	\$64,395,750
Assessed value of timber and timberlands	5,767,609	6,299,115
Timber assessment as per cent of total	35.3	9.8
Assessed timber volume (Million b.f.)	8,928	4,657

Source: Schofield, 1932; Office of the Assessor, 1958.

Between 1932 and 1958, the dollar value of such assessments increased by about 10 per cent. During these same 26 years, aggregate output of the forest products industries of the county has exceeded an estimated 8 billion board feet. The raw material required for this output is approximately equal in volume to the total assessed timber inventory in 1932. Thus, timber assessments between 1932 and 1958 are higher partly because in 1958 a large volume of timber was included which had been of no value in 1932, and partly because of the increase in the value per thousand b.f. at which timber is assessed.

The most important feature of the tabulation above is the decline over the 26 year period in both assessed timber volume and in timber assessment as a percentage of all assessed real estate. The assessed timber volume in 1958 was only 52 per cent of what it had been in 1932. Timber assessments as a per cent of all real estate assessments in the county had fallen from more than a

The assessed timber volume was cut in half within 26 years

third to less than one tenth of the total. These trends emerged despite vigorous efforts to extend assessment to all old-growth as it acquired an economic value, and despite several significant increases in the assessed value per thousand b.f. applied to old-growth timber.

Also of great importance is the substantial increase over the years in plants and equipment dependent on timber as a source of assessed value. Table 19 shows that in recent years the assessed value of such timber-dependent plants and equipment has exceeded the assessed value of the timber itself. This is in sharp contrast to earlier conditions. Although comparable data are not available in detail, it is estimated that in 1932 the assessed value of all wood-using plants and equipment in Mendocino County was considerably less than \$1 million. Using this as a measure of the situation in 1932, there was about \$110 of timber-dependent plant value on the assessment rolls per million b.f. of assessed timber. By 1958, the value of dependent plants had risen to over \$2,460 per million b.f. of assessed timber.

Thus the indirect contribution which the timber inventory makes to the county's tax base is now many times more important than in the past. As table 19 shows, this indirect contribution is now a more important source of county revenue than the taxes paid directly on the timber. For the three year period 1957-59, timber-dependent plant and equipment assessments averaged 1.7 times the assessment against timber itself. Thus, in considering timber tax problems, the relationship of direct timber taxation to timber supply and hence to the value of timber-dependent plants has become a major consideration in the economics of Mendocino County.

Plants and equipment dependent on timber increased substantially

TABLE 19
ASSESSED VALUE OF TIMBER AND WOOD USING PLANTS AND EQUIPMENT
IN RELATION TO TOTAL ASSESSED VALUE: MENDOCINO COUNTY, 1957-1959

Kind of property	1959		1958		1957	
	Thousand dollars	Per cent	Thousand dollars	Per cent	Thousand dollars	Per cent
All assessed property.....	85,665	100	79,954	100	79,298	100
All timber and timberland.....	8,905	10.4	6,299	7.9	6,608	8.4
Logging equipment.....	1,439	1.7	1,986	2.5	2,035	2.5
Wood using plants.....	10,831	12.6	9,569	12.0	11,509	14.5
Total timber-based property.....	21,175	24.7	17,854	22.4	20,152	25.4
Property assessed by State Board of Equalization.....	13,074	15.3	12,217	15.2	10,488	13.2
All other assessed property.....	51,416	60.0	49,883	62.4	48,658	61.4

SOURCE: Office of the Assessor.

The Outlook for Timber in the Tax Base

The preceding analysis, coupled with the projections of future timber inventory made in Part I, provide a basis for outlining the future role of timber in the tax base. As noted, during the past 15 years the aggregate assessed value of timber in the county has been maintained in part by the addition to the rolls of old-growth timber which previously had little or no economic value. Changed economic circumstances have left little or no submarginal private old-growth timber in Mendocino County. Thus, further accretions of old-growth to the tax roll from this source are likely to be negligible. The second factor which has prevented a decline in the dollar value of timber assessments has been the increase in assessed value per thousand. This increase accompanied and reflected the rise in market values of timber in the county. Although some further increase of stumpage prices may be expected over the years, the dramatic price rises of the decade following World War II are unlikely to be experienced again.

*Future trend of
timber in the tax
base: a sharp decline*

*By 1978 taxable old-
growth will be 20
per cent of the 1959
level*

*Second-growth timber
will not offset the
declines in old-growth*

Thus, both factors that have helped maintain the absolute value of timber assessments over the past 25 years seem to have largely run their course. In their absence, the future trend of timber assessed valuation in Mendocino County seems likely to decline sharply. If assessed values per thousand remain at present levels, if there are no further additions to assessed old-growth inventory, and if output of forest products requires 800 million b.f. per year, the total value of assessed old-growth in the county would be expected to decline at the rate of 4 per cent annually over the next two decades. By 1978 old-growth assessments would be reduced to \$1.7 million, compared with the \$8.6 million of 1959, or 20 per cent of the 1959 level.

When similar assumptions are used to project trends of young-growth timber volumes from 1958 to 1978, it is apparent that increases in taxable second-growth timber will not offset the declines in old-growth. Timberland classified as small young-growth and unstocked supports timber that is generally less than 40 years old and therefore not subject to tax. The total increase in volume to be expected in such stands between 1958 and 1978 is only about one fourth of the volume of depletion to be expected in old-growth.

Much of the timber in large young-growth stands is over 40 years old. Its taxability depends on the question of its legal maturity. The 1958-59 tax roll included 275 million b.f. of second-growth timber on an estimated 22,100 acres of young-growth land. Analysis of acreages

classified as taxable and of the relationship between inventory volumes and assessable volumes indicates that about 12 per cent of the large young-growth area was considered legally mature for tax purposes in 1958. The total area and volume of large young-growth are likely to decline somewhat during the next decade and to increase again by 1978 as shown in table 13. But the net change in volume of large young-growth between now and 1978 will be relatively small. Thus, there is no prospect during the next 20 years that a great amount of young-growth will grow into the large young-growth class which, to a significant extent, would offset the dwindling old-growth tax base.

On the other hand, the proportion of timber in the large young-growth category which exceeds 40 years of age is likely to increase somewhat in future years. As a result, the ratio of mature second-growth to all large young-growth will rise from its 1958 level of 12 per cent perhaps to as high as 20 per cent.

In summary, the outlook for timber inventory between now and 1978 suggests that the old-growth inventory, now the principal element in the timber tax base, will dwindle to relatively insignificant proportions. This decrease will be partly offset by comparatively small increases in taxable young-growth. But an over-all decline of over 70 per cent in total taxable timber by 1978 is to be expected.

YOUNG-GROWTH TAXATION AND ASSESSMENT

Ninety-six ownerships including 56,000 acres of young-growth forest were declared mature for purposes of taxation between 1957 and 1960. In general such property has been declared mature in accordance with a "guideline" adopted by the State Board of Forestry which proposes that young timber be mature for assessment purposes when an owner initiates cutting thereon except for stand improvement or sanitation purposes. Assessment practices were revised in 1959. Determination of fair market value is based on recognition of the kind of management unit of which the young-growth timber is a part. Some 478 million b.f. of young-growth had been reclassified by 1960, amounting in the latter year to 7½ per cent of all timber on the roll. Young-growth timber assessments have never exceeded 1 per cent of the tax base. Prospective trends of timber growth and value suggest that the total assessed value of young-growth is unlikely to exceed \$1 million in the future.

Section 12¾, Article XIII of the California Constitution, as amended in 1926, (see Appendix), exempts

Bases of the projections

Legal basis for taxation

from taxation all immature forest trees planted or growing naturally on lands from which the original merchantable growth has been removed to the extent of 70 per cent of all trees over 16 inches in diameter. The amendment further provides that timber shall be considered mature at such time after 40 years from planting or removal of the original timber as a maturity board shall determine.

The intent of the measure is indicated in published arguments favoring the constitutional amendment. The argument of Senator A. B. Johnson stated: "... The young, growing timber, like wheat, corn, hay, and fruit, will be exempt from taxation..." That of Senator Fred C. Handy stated: "... The California Constitution now exempts growing crops from taxation... This amendment places the taxation of crops of timber on the same basis with taxation of other crops... It places no taxation upon the trees until they are mature."

For more than 25 years following adoption of this amendment, lands from which 70 per cent or more of the old-growth had been removed were carried on assessors' roles as young-growth areas, and timber on these lands was not assessed. During this period, the physical character of the young timber was for the most part such that it was unacceptable in the log markets of the time. Consequently, little or no cutting of young-growth took place on such areas prior to 1950.

By 1952, however, as a result of increasing average size of the timber in young stands, changed standards of merchantability, and keen competition for logs, some young-growth timber had acquired economic value for current utilization. Cutting of such stands was under way and tax officials were faced with the necessity of administering the phase of Section 12 $\frac{3}{4}$, Article XIII, concerned with the determination of timber maturity.

Actions of the Timber Maturity Board

In Mendocino County, the Timber Maturity Board, consisting of the county assessor, a representative of the State Board of Equalization, and a representative of the State Board of Forestry, first met on May 8, 1957. By mid-1960 four more Maturity Board meetings had been held in the county. At each meeting additional young-growth timber was declared mature for taxation purposes. The results of these actions in terms of acreage and timber volumes declared mature are shown in table 20.

State Board of Forestry guidelines

These actions of the Mendocino Maturity Board were taken in accordance with certain "guide lines" adopted by the State Board of Forestry on May 14,

TABLE 20
SUMMARY OF MATURITY BOARD
ACTIONS ON TIMBER IN MENDOCINO
COUNTY, 1957 TO JULY 1, 1960

Year of action	Property declared mature		
	Number of owner-ships	Gross area	Area of young-growth
		Acres	
1957.....	23	43,226	19,232
1958.....	40	27,439	20,095
1959.....	13	7,879	6,377
1960.....	20	16,779	10,243
Total.....	96	95,323	55,947

1953, for the interpretation of Section 12 $\frac{3}{4}$, Article XIII. These guide lines were restated by the Board of Forestry in a policy resolution adopted December 7, 1954. They provide that timber which has been exempted from taxation for 40 or more years shall be mature for assessment purposes (a) when "an owner initiates cutting thereon except for stand improvement or sanitation purposes," or (b) when "70 per cent by volume of the trees 16 inches d.b.h. and larger on the land is of a class which is generally and substantially dealt in and sold or operated within the County as commercial saw timber." (See Appendix.)

Assessment Practice

Under present practice, young-growth timber which has been declared mature is assessed in accordance with the principles which are applied to old-growth timber in the county. Assessment practice recognizes three general cases:

(1) Properties (usually of limited acreage) which are managed as units by themselves and where the assessable young-growth timber will ordinarily be cut in its entirety within a few years.

(2) Properties which are part of a larger operating unit such as a ranch or forest management unit and where young-growth timber cutting extends over several years or is being deferred.

(3) Properties being cut under a plan for sustained-yield and which will therefore retain assessable young-growth values indefinitely.

The basis for assessing short-term liquidation properties is the current market value for stumpage of comparable quality. The basis for long-term liquidation

Principles used in assessment practice

Basis for assessing

properties is the market value for the timber at the anticipated time of cutting, discounted for the interest foregone and the taxes paid during the period until income is received, and for the risk involved in holding some of the timber over a period of years. The basis for assessing properties on sustained yield is the present worth of a perpetual series of annual incomes equal to the current market value of the estimated net annual timber growth from the land and discounted for risk.

Assessment practices revised in 1959

Prior to 1959-60, the practice was to assess second-growth properties on the basis of estimated volumes, valued at \$1.55/M for redwood and \$1.25/M for other species.

Tax rolls on second-growth timber for 1958-59 and 1959-60 are summarized below.

Tax rolls on second- growth timber for 1958-59 and 1959-60

	1958-59	1959-60
Number of owners assessed.....	65	66
Acres assessed	38,741	47,246
Average assessed value of land (per acre) \$	4.25	\$ 4.67*
Reported timber volume assessed (million b.f.).....	274.6	164.9†
Average assessed value of timber (per M)	\$ 1.31	\$ 1.87†
Total assessment, land and timber.....	\$525,235	\$647,830

In the interval between the two rolls, 12 properties had been removed from the second-growth roll by logging and 13 had been added by Maturity Board action. The total area on the tax rolls increased by 22 per cent and the total assessment against young-growth timber and the land on which it stood rose by 23 per cent.

Of the 66 second-growth properties on the 1959-60 tax roll, 49 had been listed under the same ownership on the 1958-59 roll. Of these 27, (55 per cent) carried the same assessment in 1959-60 as they had a year earlier; 15 properties had been reassessed on the basis of their operating status and discounted market values of timber; and assessments on 7 properties had been changed because of changes in the estimated volume owned or in other appraisal factors. The principal reasons for changes between the 1958-59 and 1959-60 rolls were as follows:

Reasons for changes

* Does not include land assessed on a flat per M rate in 1958-59 but assessed as part of sustained yield operating units in 1959-60.

† Does not include 133.7 million board feet assessed at a flat per M rate in 1958-59, but assessed as part of sustained yield operating units in 1959-60.

Source: Office of County Assessor.

Total assessed value, 1958-59 roll.....	\$525,235
Value added:	
By property declared mature.....	\$94,270
By reappraisal	56,560
By all other changes.....	8,565
	<hr/>
	\$684,630
Value removed:	
By cutting of timber.....	36,800
	<hr/>
Total assessed value, 1959-60 roll.....	\$647,830

The average assessed value of all second-growth property on the 1959-60 roll was \$15.80 per acre. Average value of the land was \$4.67 per acre, or 29.6 per cent of the total. The range of assessment for land and timber was from \$5.19 per acre to \$33.31 per acre. The distribution of assessments within this range is shown below.

Assessed value dollars per acre	Number of properties
Less than \$8	4
\$8-\$12	17
\$12-\$16	17
\$16-\$20	11
\$20-\$24	8
Over \$24	7
	<hr/>
Total	64

Present appraisal practice does not recognize annual carrying charges other than taxes on properties where cutting of some or all of the young-growth is to be deferred. In the case of a sustained-yield property, existing appraisal procedures involve capitalizing estimated annual growth in value of the timber at an interest rate chosen to make an allowance for the property tax. No allowance is made for other costs of carrying the property. If costs such as annual administration, protection, and management charges are in fact incurred, the appraisal under this practice would be too high.

Present appraisal practice

For example, assume a young-growth property where growth is estimated to be 500 b.f. per acre per year and stumpage market value is \$6 per thousand b.f. At a 5 per cent interest rate (which includes the tax rate), such a property would have net annual income of \$3 per acre, an appraised value of \$60 per acre, and an assessed value of \$15 (using a 25 per cent assessment ratio),⁵ if no annual costs other than taxes were involved. But if significant annual carrying charges other than taxes do exist, and if they are ignored in appraisal

⁵ For convenience, risk allowance is ignored but this does not affect the analysis.

practice, serious inequities in assessment may arise. If in our example annual carrying charges of \$1 per acre were actually incurred but were ignored in the appraisal, the indicated \$60 valuation would be 50 per cent above the true value. Analogous errors would occur if carrying charges are ignored on deferred-income properties other than those on sustained yield.

There is evidence that carrying charges of the order of \$1 per acre may be incurred in the operation of certain properties in Mendocino County. Therefore, this aspect of appraisal practice is important. The matter is seriously complicated by the difficulties of determining levels of annual carrying costs appropriate for appraisal purposes. These difficulties include the fact (discussed below) that the level of carrying costs may be influenced by the kind of ownership, and the accounting problem of determining for an integrated management unit what share of certain types of cost may properly be attributed to particular units of the property.

Ignoring management costs in appraisals discourages needed management practices

An additional consideration with respect to this practice is its possible effect on the management programs of owners. More intensive management of second-growth stands is needed (and needed *now*) if these stands are to make their maximum contribution to the future economy of Mendocino County. Such intensive management will require additional annual outlays by the owners for protection, stand improvement, salvage of mortality and the like. If expenditures of this kind are ignored in arriving at taxable value, it tends to discourage the owner from making expenditures of the needed kinds.

Young-Growth in the Tax Base

478 million board feet of young-growth reclassified by 1960

In the three-year period from the initial reclassification of young-growth in Mendocino County to July 1, 1960, 478 million b.f. of young timber was designated as mature by Maturity Board action.⁶ Of the 320 million b.f. so reclassified in 1957, 1958, and 1959, there were 126 million b.f. (39 per cent) remaining on the roll in 1960. The relative importance of these young-growth volumes in the total timber tax base may be judged from figure 21. In 1959-60 young-growth accounted for 7.3 per cent of the total volume of timber on the rolls and for 7.3 per cent of the total value assessed against timber and timberland. After allowing for land assess-

⁶ Of this, some 158 million b.f. reclassified in 1960 will not be placed on the roll until 1961, by action of the County Board of Equalization.

Fig. 21. The place of young-growth timber in the total timber tax base, Mendocino County.

ments on the basis of the \$4.67/acre average, the apparent average valuation of young-growth timber on the 1959-60 roll was \$1.46 per thousand.

In table 13 (page 45) the area of “large young-growth” in private ownership was estimated at about 245,000 acres. Although the “large young-growth” classification is not based directly on age of stand, it includes those stands in which more than 20 per cent of the immature trees are larger than 11 inches d.b.h. (Baker and Poli, 1951). The proportion of trees in a young-growth stand which are larger than 11 inches varies with the age of the stand and also with site quality, stand density, and species. Under representative Mendocino County conditions “large young-growth” appears to correspond to

amounting to about 7½ per cent of all timber on the roll

a minimum age of stand ranging from 35 to 45 years. The 35,947 acres of young-growth declared mature to date is equal to 23 per cent of the estimated total "large young-growth" acreage in the county in 1958.

*Young-growth timber
never exceeded 1 per
cent of the tax base*

*Assessed value of
young-growth
unlikely to exceed
\$1 million*

Under the reclassification and assessment practices which have been followed to date, the aggregate assessments on young-growth timber have increased from year to year but have never exceeded 1 per cent of the total tax base of Mendocino County. Unless the rate of cutting of second-growth timber accelerates substantially, the amount of young-growth annually subject to reclassification and assessment under present practices appears unlikely to increase greatly above the levels already experienced. A normal future expectation under such conditions (and assuming stable stumpage values in the future) might thus be aggregate annual assessments on young-growth timber of the order of \$750,000 to \$1 million.

ECONOMIC EFFECTS OF YOUNG-GROWTH TAXATION

Taxation of young-growth timber appears to have had little effect on the management of small tracts. Such tracts are ordinarily not declared mature until after the owner has decided to cut them and, on the average, the timber on small tracts remains on the tax rolls for only a year or two. On larger tracts, some of the timber remains subject to tax for considerably longer periods. It is probable that uncertainty as to the effect of stand improvement cutting on taxability of timber is deterring the adoption of this essential management practice on large holdings. In addition, young-growth taxation encourages liquidation cutting in preference to sustained yield management wherever financial factors other than taxation are not strongly in favor of sustained yield.

Full evaluation of the effects of the taxation of young-growth timber is an exceedingly complex task. Some of the questions raised by such an evaluation, (for example those dealing with the legal meaning of maturity or with the responsibilities of assessors with respect to timber) involve questions of law or of public policy beyond the scope of this study. Emphasis here will be placed on three important questions:

What effects, if any, does young-growth taxation have on the management of young-growth stands and, hence, on the raw material supply for wood-using industries?

Does young-growth taxation involve inequities in taxation, as between different forest owners?

What effects does young-growth taxation have on the tax base of the county?

Effects of Taxation on Young-Growth Management

The importance of young-growth stands and the economic reasons for much more intensive management of such stands have been outlined earlier in this bulletin. In view of these circumstances, it is important to ask: Does the taxation of young-growth have a significant effect on such key questions as the time when an owner will cut his timber, whether or not he will undertake stand improvement measures, or whether he will acquire property for sustained yield management?

The cutting history of young-growth timber subject to taxation in Mendocino County is summarized in table 21. Ninety-three per cent of the reclassified young-growth area is in tracts which had been subject to some kind of timber harvesting by mid-1960. Ten per cent of the tracts, accounting for 34 per cent of the reclassified acreage, were under sustained-yield type harvesting. Only four of these tracts were under 2,000 acres in size and of these only two were under 600 acres. For tracts smaller than 600 acres, sustained-yield harvesting was a negligible factor, being applied to only 0.4 per cent of the area.

On 70 of the 96 reclassified parcels (59 per cent of the reclassified acreage), liquidation cutting took place. On small tracts of 100 acres or less the young-growth area had been logged off by 1960 in 22 out of 23 cases. As figure 22 indicates, on larger tracts more of the reclassified timber remained uncut as of 1960. Of 70 reclassified tracts subject to liquidation cutting, 53 tracts

Key questions of management: time of cutting, sustained yield management, improvement measures

TABLE 21

NUMBER OF PROPERTIES AND AREA OF YOUNG-GROWTH CLASSIFIED AS MATURE, AND 1960 STATUS OF CUTTING ON SUCH AREAS

Cutting status	1957	1958	1959	1960*	Total
<i>Young-growth declared mature</i>					
Number of ownerships.....	23	40	13	20	96
Area (acres).....	19,232	20,095	6,377	10,243	55,947
<i>1960 status:</i>					
<i>No cutting:</i>					
Number of ownerships.....	2	9	3	2	16
Area owned (acres).....	1,242	1,466	1,194	80	3,982
<i>Liquidation cutting:</i>					
Number of ownerships.....	17	30	10	13	70
Area owned (acres).....	6,044	18,552	5,183	3,689	32,868
Area cut (acres).....	4,198	10,043	1,806	1,206	17,253
<i>Sustained-yield cutting:</i>					
Number of ownerships.....	4	1	0	5	10
Area owned (acres).....	11,946	77	0	7,074	19,097

* The County Board of Equalization has ruled that certain timber declared mature in 1960 is not taxable until 1961.
SOURCE: Office of the Assessor.

(accounting for more than half the reclassified acreage) had had all taxable young-growth timber removed by 1960.

The average length of time during which reclassified timber was left standing may be judged from table 22. Most tracts under 250 acres were logged off during, or before, the year of classification. On most larger tracts, logging began during the year of classification, but in many of these only a fraction of the reclassified timber was removed during the first year. Thus, on medium-sized tracts reclassified in 1957, one-third of the reclassified acreage had not been logged three years later.

To simplify understanding the relationships between reclassification, size of tract, date of logging and rate of timber removal, the average experience over the period 1957-1960 with lands reclassified in Mendocino County may be used to develop figure 23. This shows the area of unlogged young-growth which would remain, year by year, following the reclassification of 10,000 acres.

Fig. 22. More reclassified timber remains on larger tracts.

TABLE 22

RECLASSIFIED LAND UNDER
LIQUIDATION BUT UNCUT IN 1960,
BY DATE OF RECLASSIFICATION
(Includes lands reclassified 1957
through 1959 only)

Size acres	Number of tracts	Per cent of area which re- mained uncut in June 1960. Lands reclassified in:		
		1957	1958	1959
0-250	31	13	4	15
251-2,000	23	33	40	66
Over 2,000 ...	3	..*	65	86
Total	57			
Average ...		29	44	64

* No tracts reclassified in 1957 were over 2,000 acres and under liquidation.

The bars indicate the differences in "life expectancy" of the reclassified timber depending on size of ownership.

Under these conditions, 8 per cent of the acreage in small tracts, 20 per cent of the medium tracts, and 40 per cent of the larger tracts would remain unlogged (or be on "sustained yield") five years after the date of reclassification. On the average, only 29 per cent of the reclassified area would remain unlogged at the end of five years. Except for the sustained-yield parcels, all the reclassified young-growth would be logged off during the seventh year following reclassification. Thus, under Mendocino County conditions of 1957-1960, the average expectancy was that reclassified young-growth would remain on the tax roll for about three years before being removed from taxation by cutting.

Effect of Tax on Time of Cutting—Small Holdings

It has been the usual practice of the assessor to request classification of young-growth as mature on those tracts where logging has begun or where there is contractual or other evidence that logging is contemplated. Wherever this policy is applied and is clearly understood by landowners, reclassification of timber under Section 12¾ can hardly determine directly the time of logging of young-growth timber—such timber is taxed only after the decision to log at least a portion of the tract has already been made. However, if owners are not aware of the policy or if they believe it may be changed, the fear of reclassification may stimulate early logging.

A study of "life expectancy" for reclassified young-growth in Mendocino County

Under present conditions, young-growth would remain on the tax rolls for three years before being cut

Decision for small tracts: When to cut young-growth

Fig. 23. Effect of taxation on young-growth management: reclassification of timber as mature would reduce the "life expectancy" of the timber most in small, least in large tracts.

Of 71 ownerships classified as mature during 1957-59, 40 ownerships were subjected to logging either before or during the year of reclassification and, as of 1960, an additional 14 were unlogged. Thus, for more than three-fourths of the reclassified ownerships, the time of cutting has clearly been independent of the reclassification action and there is no evidence to indicate that it was important in the other cases. In a study of timber sales made from small holdings between 1950 and 1958 (Casamajor, 1960) no seller gave the tax burden as a reason for the sale of his timber. Among the small owners sampled in the present study, none cited tax considerations as important in determining how he handled his timber.

Taxation of young-growth has little effect on the management of small tracts

Analysis of the financial aspects of managing young-growth timber suggests the further conclusion that, for small ownerships, even the prospect of reclassification, at the time that logging begins, of young-growth and subsequent imposition of general property taxes on the timber is not an important factor in speeding up the logging date of such timber. The financial details vary widely with individual cases, but here is a representative situation for a 120-acre tract of Douglas-fir young growth (for Site II land, 80 per cent stocked).

Even the prospect of reclassification need not speed up logging time

If the stumpage price expected 5 years hence shows	Then the most profitable cutting age			
	With rate of return 4½ per cent		With rate of return 6 per cent	
	No tax	Tax	No tax	Tax
No increase	56 yrs.	56 yrs.	50 yrs.	50 yrs.
\$1/M increase.....	61 yrs.	61 yrs.	55 yrs.	55 yrs.

It is assumed that the owner may either sell the timber this year or hold it and sell at the end of five more years. In accordance with the situation on most small properties, annual carrying charges other than interest and taxes are assumed to be nominal. The comparative financial advantage of the two alternatives will depend mainly on (1) the expected rate of growth of the timber, (2) the rate of return the owner wishes to receive on his timber investment, and (3) his expectations as to future stumpage price trends. The values above show the maximum age at which it would pay the owner to hold the tract for another five years, rather than selling the timber now. For example, if he wishes 4½ per cent return on his investment and expects no increase in stumpage prices, it will pay him to hold his timber for another five years at all ages up to age 56. But beyond that age, he would be better off to cut the timber immediately rather than to hold it another five years.

As the text table above indicates, both the rate of return required by the owner and his expectations as to future stumpage price trends have a substantial effect on the most profitable cutting age. A shift in required rate of return from 4½ per cent to 6 per cent reduces the most profitable age by roughly five years, and a change in price expectations of \$1 per thousand b.f. has a similar effect.

In the left column of each pair, the analysis has assumed no tax on the timber. In the right column it is assumed that the timber will be classified as mature in the year of cutting and that (in accordance with aver-

age Mendocino County experience with small tracts) property taxes will be assessed against the timber for two years following the date of reclassification. Comparison of the "No tax" column with the "Taxed" column shows that imposition of the tax has no significant effect on the most profitable date of cutting.⁷

Liquidation Versus Sustained Yield—Larger Holdings

Decision for large holdings: liquidation or sustained yield

For larger ownerships the most important decision affecting time of cutting is whether the young-growth will be liquidated or managed on a sustained-yield basis. The choice made by owners between these two alternatives has an important effect on the tax base, and the taxation of young-growth may have an important effect on the choice the owners make.

The effect of the choice on the tax base results from the fact that young-growth managed for liquidation remains in the tax base for a variable period which in the past has averaged three years, while young-growth handled on a sustained yield basis yields a tax revenue over an indefinitely long period of years. The importance of this may be judged from the following example.

⁷ In theory, imposition of the tax lowers the age of most profitable cutting by a fraction of a year, but the practical effect of this is not significant.

Fig. 24. Assessed value benefits from sustained yield over liquidation cutting.

In figure 24 it is assumed that 10,000 acres of average Mendocino County young-growth is declared mature in 1960 and that it is assessed in accordance with practices and rates which prevailed in the county in 1959. If the entire acreage is managed on sustained yield, it would be assessed in 1960 at \$127,000 and an equal assessment would remain in effect each subsequent year (assuming no change in stumpage values). In contrast, if the entire acreage is to be liquidated, it would be assessed at \$149,300 in 1960 but the total assessment in subsequent years would decline as the taxable timber was removed. On the basis of the average conditions of liquidation which have been experienced in Mendocino County, assessments would decline as shown in figure 24 (broken line).

In the first year of assessment the young-growth will contribute more to the tax base if managed for liquidation. This reflects the fact that the average deferral of income is less under liquidation than under sustained yield, and a smaller discount factor is therefore appropriate. But in the second year this effect is more than offset by liquidation of taxable timber. As a result, for that year the young-growth will contribute more to assessed value if managed for sustained yield than if managed for liquidation. This advantage from the standpoint of the tax base gets larger with each succeeding year. For the initial five-year period, the aggregate contribution to the tax base if the timber is handled on sustained yield will be 25 per cent greater than if it is handled on a liquidation basis. Thus, even in the short run, there would be substantial benefits to the tax base if owners choose sustained-yield management rather than liquidation.

By 1965, under existing liquidation practices, all assessable young-growth would have been removed and the contribution of the property to the tax base would drop to \$54,500 and remain there. Thus, from that date on, the property would contribute 2.33 times as much taxes to the county if managed on sustained yield as it would if liquidated.

Innumerable factors may influence the choice of the landowner between liquidating his young-growth and managing it for a perpetual yield. For many, economic factors will exercise a predominant influence; for some, extra-economic considerations such as compatibility with recreation use may be involved. Among the most important economic factors are:

- Rate of growth of the forest
- Expectations as to future stumpage price trends

Even in the short run, sustained-yield management would bring substantial benefits to the tax base

In the long run, benefits to the tax base are even greater

*Factors that will
influence manage-
ment decision
of owner*

- Comparative costs of management, other than taxes
- Whether or not the owner holds conversion plants whose raw material supply must be assured
- Comparative risks of loss
- Financial liquidity of the ownership
- Income tax aspects
- Comparative burden of property taxes

*Growth rates and
stumpage price favor
sustained yield*

Prospective growth rates on much Mendocino County forest land are high when compared to other timber-producing areas. Except on the poorer sites or in inadequately stocked stands, growth rates are sufficient to support satisfactory earnings on the capital invested, provided factors other than growth are not adverse. As noted, there may be some future moderate increase in stumpage values, and to the extent that land owners concur in this judgment the long-term price trend favors sustained yield rather than liquidation.

The costs, other than taxes, of managing young-growth for sustained yield are higher than those for liquidation management. The various parts of the property must be kept continuously accessible, year after year, for both protection and utilization. Greater expenditures for protection of the growing stock against fire, insects, and disease are needed. Technical supervision and forest management become more costly. But the magnitude of these additional costs will vary greatly among owners, depending on the intensity of management, the size of the property, and the methods of accounting used.

In a survey of representative Mendocino County owners, reported costs of forest management varied all the way from nothing to more than \$1.50 per acre per year. Certain costs vary with different types of owners. The resident ranch owner, for example, may be able to provide fire protection (in addition to State protection) for his property without any significant additional cash outlay, while the nonresident owner would incur substantial out-of-pocket expense to accomplish the same thing. The large owner can ordinarily secure technical forest counsel needed for sustained-yield planning at less cost per acre than the small owner. Thus, the magnitude of additional costs of sustained-yield management varies with the particular property and cannot be generalized. A group of large Mendocino owners who are cutting in accordance with plans for permanent production reported forest-management costs which averaged about \$1.00 per acre per year higher than those reported by a comparable group of

owners who are liquidating. In the light of the costs of sustained-yield management in areas such as the Pacific Northwest this appears to be close to the minimum extra cost to be expected. If the intensity of sustained-yield forest management in Mendocino County is to increase, it will require additional cast outlays for forestry expenses above the apparent present \$1.00 acre average.

Sustained-yield operation exposes the timber investment to risk of destruction by fire or other physical dangers for a longer period than does liquidation. This is particularly true for small ownerships, since large forest holdings are in part "self-insuring" against physical loss. This aspect of increased risk may be offset in part by greater accessibility of the timber and by more intensive protection efforts, but the net result suggests a somewhat higher rate of risk to the investment in sustained yield for small or medium-sized ownerships.

The factors already mentioned suggest that strong financing is usually essential for sustained-yield operations. The ownership must maintain its investment in growing stock indefinitely and, to meet out-of-pocket costs for forestry, taxes, and related outlays, has a considerably higher ratio of annual expenses to gross receipts than has liquidation. Ownerships which are not well financed often regard the timber holding as a source of cash to meet emergency needs. For example, 14 per cent of a sample of recent timber sales in Mendocino County were made to meet emergency cash needs of the owner.

With growth rates and stumpage price trends favorable to sustained yield, and with lower costs of management, comparative risks, and financial liquidity favoring liquidation, the property tax may often be a very substantial factor influencing the owner's choice between sustained yield and liquidation. If all other circumstances are the same, any annual tax on standing timber takes a bigger proportion of the before-tax value of the property if the property is on sustained yield than if it is on liquidation. Thus, if after analyzing all factors except property taxes an owner concludes his property is of equal value for either liquidation or sustained yield, the existence of the property tax will shift the financial advantage in favor of liquidation.

The operation of this principle under Section 12 $\frac{3}{4}$ is shown in table 23. The tax ratios shown indicate the proportion of the present worth of the property before taxes which would be taken by the general property tax under current practices. Thus, in the case shown,

Risks and costs of sustained-yield operations favor liquidation

With most factors balanced, property tax may be a deciding factor

TABLE 23
TAX RATIOS FOR A
REPRESENTATIVE YOUNG-GROWTH
STAND IN MENDOCINO COUNTY
FOR ALTERNATIVE LENGTHS
OF CUTTING PERIOD

Length of cutting period	Present volume per acre	Assessed timber value acre	Tax ratio
	Thousand b. f.	Dollars	Per cent
1 year.....	8.5	14.90*	1.25
5 years.....	8.5	9.40†	3.46
Sustained yield.....	8.5	9.70‡	16.70

* Assessed on basis of immediate cutting.

† Assessed on basis of discounted income from future cutting.

‡ Timber and land assessed on basis of 500 b.f. sustained annual growth; \$3.10 per acre is attributed to land value and the remainder to timber.

taxes take 16.7 per cent of the value before taxes if the property is managed on sustained yield, but only 1.25 per cent of the value before taxes if it is liquidated in one year. This illustrates the fact that, wherever the value of a timber tract is about the same for either sustained yield or liquidation, the existence of a general property tax on the timber makes liquidation the more attractive financial alternative.

*In any case,
young-growth
taxation encourages
liquidation*

Whether or not the property tax is the *determining* factor in the choice of management alternatives in any particular case will depend on the relative strength of the other economic factors discussed above. But in any case, a general property tax such as that imposed under Section 12¾ *tends* to favor liquidation cutting.

Assessment practices may also be a factor in determining how heavily the tax on young-growth favors liquidation. Assessment of liquidation properties is currently based on the merchantable timber volume present at the expected time of cutting. Assessment of property on sustained yield is based on an estimate of expected average annual growth. Due to this difference in basis of appraisal, an error of equal magnitude in basic appraisal data will have more effect on the tax ratio under sustained-yield management than on that under liquidation. For example, in the case shown in table 22, an error of 20 per cent in the timber-volume estimate will change the tax ratio under liquidation by 24 per cent. An error of 20 per cent in the timber growth estimate will change the tax ratio under sustained yield by 32 per cent. As a result, great care must

be used in securing the growth information on which assessment of sustained yield properties is based. Assessments based on an overestimate of the growth may serve to encourage liquidation in circumstances where sustained yield would otherwise be the more attractive financial alternative.

Similarly, the practice of ignoring in appraisals any annual carrying charges other than taxes (discussed on page 74) bears more heavily against sustained-yield properties than against liquidation properties. Under sustained yield the costs which are ignored are likely to be higher than on liquidation properties, and they may well continue indefinitely. Thus, the present worth of the unrecognized costs is likely to be much larger for a tract on sustained yield than for one on liquidation, and the owner who analyzes the financial aspects of the sustained-yield versus liquidation alternatives for his property will find the tax burden significantly heavier under sustained yield.

Impact on Stand Improvement Cutting

Under intensive forest management, carefully planned partial cutting of young-growth stands is often undertaken as a stand-improvement measure. Stand-improvement cutting includes all cuttings, not a part of a final harvest operation, made during the life of a forest stand. The advantages sought from stand-improvement cutting usually fall in one of the following categories:

- Harvest of trees that would die from suppression if natural development of the stand were allowed to continue. In effect, this means use of trees that, without stand-improvement cutting, would not persist to become part of the final crop.
- Removal of low-quality, or poor-species trees so that future growth will be of higher ultimate value than growth in the unimproved stand.
- Acceleration of the growth per acre on the residual stand as a result of the reduction in competition among individual trees.

Advantages of improvement cutting

There is presently no conclusive evidence that the redwood and Douglas-fir stands characteristic of private land in Mendocino County will show accelerated growth per acre as a result of stand-improvement cutting. But research in Europe and the Pacific Northwest indicates that within certain limits the same amount of annual growth per acre can be expected on both heavily and moderately stocked stands. Thus, even if growth

per acre is not increased, thinning may permit a reduction in the growing stock needed to produce a given level of growth.

Although these advantages can be secured by properly applied improvement cuts in young-growth stands, the financial aspects of improvement cutting are complicated. These aspects become even more complex and uncertain as a result of the existing uncertain outlook with respect to young-growth taxation.

*Disadvantage of
improvement cutting:
extra costs*

Stand-improvement cutting involves extra costs to the owner. Trees must be marked for cutting by a qualified man, and logging costs are generally higher than for ordinary logging because the volume of timber cut per acre is relatively small. The range of such additional costs is normally from \$2 to \$4.50 per thousand b.f. cut.

*Experiments with
stand improvement*

Experimental stand-improvement cuttings have been undertaken by some Mendocino owners and some others are attempting to employ stand-improvement principles in the course of regular young-growth operations. There is evidence, however, that some owners have been deterred from initiating stand-improvement cutting through fear of the tax consequences. The problem arises because of uncertainty as to the effect of initiating stand improvement cutting on the taxability of young-growth stands. If a maturity board, acting in accordance with existing guide lines, should interpret a stand-improvement cutting as evidence of maturity for tax purposes, an owner might have all his young-growth of the same class placed on the tax rolls for the entire period between initiation of improvement cutting and the year of final harvest. He would then be subject to a much heavier tax burden directly as a result of undertaking the improvement cutting. The prospect of this additional burden may more than offset any economic gains which the improvement cutting offers, and thus result in discouraging a desirable practice. Some examples will illustrate these considerations.

*Summary of effect on
tax burden of
improvement cutting
in a heavily stocked
40-year old
Douglas-fir stand*

Summarized below is an analysis (Staebler, 1955) of the effect on the tax burden of improvement cutting to remove expected mortality in the case of a heavily stocked 40-year-old Douglas-fir stand on a small property. The interest rate is 3 per cent, the tax rate 5 per cent. Compared are present values of yields from an acre of timber under three different assumptions as to management and taxation; and the differences in optimum-harvest age and in tax ratio are shown.

	Present net worth of yields Dollars	Optimum harvest age Years	Tax ratio Per cent
Case 1: No improvement cutting and no tax until year of final harvest....	317.50	50	1.25
Case 2: Improvement cutting at age 40, no tax until year of final harvest....	348.00	70	1.25
Case 3: Improvement cutting at age 40, annual tax from year of improvement cut	309.50	50	9.20

Case 1 assumes no improvement cutting, and taxation of the stand only in the year of final harvest. Under these conditions it will pay the owner to hold the timber to age 50, and the tax imposed at that time will take 1.25 per cent of the tax-free value of the property. Case 2 assumes that an improvement cut is made at age 40 and at 10 year intervals thereafter, and that the timber is not declared mature for tax purposes until the year of harvest cutting. Under these conditions, it will pay the owner to hold the timber until age 70 (rather than to age 50 as in case 1) because the improvement cut has improved the rate of earnings on the stand. Case 3 assumes that improvement cuts are made as in case 2, and that this results in declaration of maturity for the entire property which is then taxed annually until final harvest. Under these circumstances the property is worth less than if no improvement cutting had taken place (case 1) because the increased tax burden more than offsets the increases in yield obtainable in case 2.

The total harvest from the property under case 2 exceeds that obtainable without improvement cutting by 11 per cent. Thus, the policy of taxing when improvement cutting begins reduces the potential timber supply which the property could provide by the 11 per cent derived from thinning yields. In addition, the policy would discourage the owner from deferring the harvest until age 70, a management practice that would be advantageous to the county in the light of the projected timber-supply situation 20 years from now.

In the cases just considered, improvement cuttings were confined to salvage of expected mortality. Where young stands are heavily stocked, stand-improvement cutting can be made more practical by judicious re-

Taxing at the beginning of the improvement cut reduces timber supply, and discourages owner from deferring harvest

moval of some of the timber growing stock. As noted earlier, where stocking is heavy such cutting can often improve timber quality without impairing the volume of final yield. The situation is illustrated by the case presented here for a 320-acre tract of 45-year-old redwood, heavily stocked. Interest rate is 3 per cent, tax rate is 5 per cent. The present value of yields, at age 45, is shown for two alternatives as to management and taxation.

	Present worth of yields per acre		
	No thinning	10 per cent thinning	25 per cent thinning
Case 1: No improvement cutting; no tax until year of harvest.	\$218.40	....	....
Case 2: Improvement cuttings; no tax until year of harvest...	....	\$235.70	\$257.70
Case 3: Improvement cutting; an- nual tax from date of ini- tial cut .....	....	\$209.50	\$230.50

Note: Yield of 52 M b.f. per acre at age 55; annual mortality estimated at 150 b.f. per acre. Final yields valued at \$6 per M; intermediate yields at \$3.50 per M.

Effects of stand improvement on timber taxability are too uncertain to encourage owners of large holdings to try this essential management practice

By removing a portion of the growing stock in addition to the expected mortality, the intermediate yields may be sufficient to offset the increased tax burden arising from classification of the young-growth as mature. This is shown by case 3, where the present worth of the property, thinned by 25 per cent and placed under annual taxation, is greater than the present worth if all cutting and taxation is deferred until final harvest 10 years from now.

However, as case 3 shows, taxation of the thinned stands tends to discourage light thinnings as compared with heavy ones. The 10 per cent thinning is of less value than no improvement cutting at all, if the timber is taxed annually, even though the 25 per cent thinning showed a profit. This is of importance for two reasons. In the present state of knowledge, heavier thinnings bring greater silvicultural risks than light ones, and the heavier the thinning the greater the chance of reducing current growth and final yield. Neither of these factors is recognized in the figures above.

A further aspect of the stand-improvement problem arises because neither harvesting techniques nor markets for products have been developed for thinnings

on much more than an experimental scale. Until more has been learned about harvesting techniques, and until markets for the class of products harvested have been developed, initiation of a stand improvement program should be started on a relatively small scale without committing the entire young-growth acreage in the ownership to such a program. If initiation of the stand-improvement cutting on a part of the ownership results in declaration of maturity on all other timber of like class held by the owner, it may well raise tax costs to the point where the stand-improvement program is uneconomic.

For example in the case of the 320 acre redwood tract of the text table on page 80, the owner contemplates starting his stand improvement program on an 80-acre portion of the tract so as to learn more about his silvicultural, logging, and marketing problems before committing the whole property to this plan of management. This may result in classification of the entire 320 acres as mature for tax purposes. If this happens, the present worth of his prospective yields from a 25 per cent thinning program on the property will be only \$201 per acre—considerably less than if no improvement cutting at all were undertaken.

Tax Instability

Forest-tax problems and the impact of taxation on timber management are more severe during a period when taxes are unstable than during a period when they are relatively constant or even rising at a fairly uniform but moderate rate. A principal reason is that, unlike certain other kinds of costs of holding timber investments, annual taxes are an out-of-pocket expense.

As noted, in most timber investments interest costs are likely to represent a much larger proportion of total cost than do taxes. But this may be more than offset in its effect on owners' decisions by the fact that property taxes are an out-of-pocket expense while interest on investment in most cases is not.

The need to provide cash each year to meet taxes on standing timber may create special problems. If the timber property is not being cut and therefore is yielding no current income, the owner may be in a position to finance his timber taxes out of net income from some nontimber investment. But if he has no such source of cash, he may have to cut his timber to raise the cash needed to meet timber-tax obligations. Such problems are likely to arise more frequently if tax levies against the timber are increased sharply at a particular time,

More experiments are needed to explore this field

Periods of tax instability affect timber management

with a consequent increase in the owner's need for cash. Tax increases may be due either to an increase in the tax rate or to an increase in assessed value. In Mendocino County the latter factor has been more important than the former as a cause of tax instability.

The apparent average tax rate⁸ in Mendocino County rose by 76 per cent between 1940 and 1958, or at the rate of 4.2 per cent per year. Between 1945 and 1946 the apparent rate rose by 35 per cent and an annual increase of 10 to 13 per cent has been experienced in several years since the war. But except for the 1945-46 rise, annual changes in tax rates on timber properties do not appear to have been large enough to cause financial problems to most owners.

Analysis of apparent tax rates on 12 sample forest properties for the period 1950 to 1958 showed that the maximum increase in tax rate on any of the properties in any year was 18 per cent. Over the eight-year period the largest average annual increase on any of the sample properties was 3.5 per cent and the average annual increase in rate for all the properties in the sample was 2.1 per cent per year. These data reinforce the conclusion that *tax rate* instability is not a major problem affecting owners of Mendocino young-growth.

*Tax rate instability
is not a major
problem affecting
owners of Mendocino
young-growth*

Because young-growth timber has been taxed in Mendocino County only since 1957, a comparatively small number of young-growth properties have been reappraised. The 1959-60 roll showed 13 young-growth properties which had been reappraised by discount methods. In two of these cases, the volume or land area assessed was sufficiently different from that carried on the 1958-59 roll as to make comparison meaningless. The changes in valuation resulting from reassessment of the remaining 11 properties are shown in table 24.

The impact on an owner of an increase of 50 per cent or more in timber taxes in a single year obviously may be severe. The foregoing data on reappraisals occurred in a transition period in the appraisal of young-growth, and therefore may not be representative of what is to be expected from future reappraisal practice. But the magnitude of the changes in taxes accompanying these reappraisals suggests that careful attention should be given to maintaining continuity of appraisal practice, to a frequency of reappraisal sufficient to keep assessments continually in line with market values, and of other measures helpful in avoiding large percentage increases in valuation between any two successive tax years.

⁸ Total tax levy divided by total assessed value.

TABLE 24

PERCENTAGE CHANGE IN
ASSESSMENT ACCOMPANYING
REAPPRAISAL OF 11 YOUNG-GROWTH
TIMBER PROPERTIES ON THE
1959-60 MENDOCINO COUNTY
TAX ROLL

Percentage change from 1958-59 assessment	Number of properties
Over 100 per cent increase.....	2
50-100 per cent increase.....	2
0-50 per cent increase.....	2
0-50 per cent decrease.....	4
Over 50 per cent decrease.....	1
Total number of properties.....	11
Average increase (per cent).....	23

Tax Uncertainty

Uncertainty as to future taxes is also a factor influencing the relative financial attractiveness of sustained yield versus liquidation cutting. The more uncertain the outlook, the more desirable is a relatively short-term timber investment which automatically limits the uncertainty. From this standpoint, clarification of the guidelines governing young-growth timber taxation so as to remove existing uncertainties as to tax questions would help to favor long-term timber-management programs. There is evidence to indicate that the current uncertainties in this respect have discouraged some acquisitions of young-growth timber which would have placed the timber on a sustained-yield basis. In other cases, uncertainty over the young-growth tax outlook appears to have discouraged adoption of more intensive management of young-growth stands already being handled on a long term production basis.

*Tax uncertainties
discourage long-term
management
programs*

Equity Aspects

Many of the aspects of young-growth timber taxes which were discussed in the preceding pages from the standpoint of their impact on owners' management decisions are equally important from the standpoint of equalization of taxes among different taxpayers. The lower ratios of taxes to tax free value provided by short-term cutting programs as compared with long-term ones mean (other things being equal) relatively lighter tax burdens on owners who liquidate timber rapidly than on those who adopt longer term management plans. The situation reflects a serious defect in the na-

*Inequities under the
present tax system?*

ture of the general property tax when it is applied to standing timber.

Property tax problems. For most types of real property subject to the general property tax, the tax tends to prompt owners to keep the property in productive use. The only other alternatives are either to let it lie idle, and lose potential income, or to liquidate it physically, thereby taking it off the tax roll and realizing a salvage value.⁹ But so long as such property is not completely obsolete, the owner can gain nothing (and would usually lose) by tearing the property down. The spread between the value of the property for future income production and the salvage value if the property is dismantled is great enough to more than offset any tax saving that might result from physical liquidation of the property.

*Differences between
timber and non-
timber properties*

But timber owners are in a different position. As soon as timber reaches marketable size, such owners can choose between (1) keeping it as a productive asset and (2) cutting it for current products and thereby destroying its capital value. Unlike the case of salvage of an obsolescent building, the value of the timber for current products is usually not too different from that of the timber as productive capital. Moreover, liquidation of the timber serves to relieve the owner of taxes on the timber. The significant point here is that the timber owner can influence the extent of the tax burden he has to bear by the management decision he makes about his property. Thus, because of the nature of timber as an economic good, the timber owner can influence his tax burden through management decisions to a far greater degree than can owners of non-timber property.

This may result in inequities in tax burden between different timber owners and between timber owning and nontimber owning taxpayers. Even theoretically perfect tax administration and assessment practice cannot avoid the difficulty which is illustrated by the tax ratios presented on page 76 in table 23. As a result, assessors face an unusual equity problem in appraising timber for general property tax purposes; the means for resolving it do not appear to be available to tax officials.

The recent change in appraisal practice which shifted the basis of appraisal from present physical volume to a basis which recognizes the relationship of a particular tract of timber to the operating unit of which it is a

⁹ This second alternative is of course not available in the case of land.

part has removed one of the potential causes of inequity. The new basis in effect permits the assessor to recognize that the alternative of immediate sale for cutting may not represent the "highest use" of the timber and to take into account in the appraisal some of the factors which influence the owners' management decisions. But so long as different owners have different viewpoints on satisfactory rates of earnings, different requirements as to their cash position, and different approaches to annual expenses for forest management, ample room for variation in tax ratios on second-growth timber properties will remain.

Maturity problems. Equity problems peculiar to operations under Section 12 $\frac{3}{4}$ arise from the nature of the existing maturity guidelines. They are connected with the criterion that timber (40 years or more after removal of the old growth) shall be considered mature when "70 per cent by volume of the trees 16 inch d.b.h. and larger on the land is of a class which is generally and substantially dealt in and sold or operated within the county as commercial saw timber." The difficulty of obtaining at reasonable cost the detailed inventory information on second-growth stands needed for accurate application of this guideline is apparent. A cruise showing some classification of volumes by tree diameter would be required and such cruises are ordinarily made only for the most intensively managed young-growth properties. Thus, uniformly accurate application of this guideline to all taxpayers would appear to be impractical at present.

A further difficulty involves the meaning of the term "class (of timber) which is generally and substantially dealt in." If this phrase is interpreted in strictly physical terms, say as timber which meets certain requirements as to minimum size and maximum defect, literal application of the guideline would often result in declaring mature some timber which is currently inaccessible, or which is so related to the rest of the operating ownership that cutting is almost certain to be deferred for a number of years. Classification of such inaccessible or deferred cutting timber as mature subjects it to taxation for a number of years with a tax burden perhaps several times heavier than that on timber of the same *physical* class located on a road and operated without reference to other units.

On the other hand, the term "class" might be interpreted in economic rather than physical terms, allowing the maturity boards to take account of accessibility, relation to the operating unit and possibly other factors

New appraisal guides removed one cause of inequity but still left room for variations

Existing maturity guidelines difficult to apply equitably

in applying the guideline. This interpretation could result in one tract of timber being declared mature at the same time that an adjacent tract exactly similar in *physical* appearance was considered not mature.

Under either interpretation of the guide-line, the taxpayers receiving the heavier tax burden would be likely to contend that there is inequity, in effect arguing for application of the alternative definition of the term "class." Revision of the guide-line in order to make clear whether "class" refers only to physical characteristics or whether it includes economic ones as well would resolve the administrative aspects of the problem. But to determine whether the physical or economic definition of "class" is the appropriate, one probably requires that the same issues of legal interpretation that are involved in the concept of "maturity" be definitively settled.

Needed: legal interpretation of "class" of timber

Administrative cost. A further problem bearing on equity is the cost of getting the information needed to determine maturity. Timber is a highly variable commodity. Like its value, its maturity is determined by a considerable range of factors. To estimate and apply each of these factors to a large number of individual properties is an administrative task of the same order of complexity as the appraisal of timber. If administrative costs of determining maturity are to be reasonable in relation to the tax revenues involved—the average tax on the 1958–59 Mendocino County roll was about \$0.55 per acre of young-growth timber—simple procedures which can be quickly applied with a minimum amount of field work are required. In the face of the kinds of variability inherent in the large areas of young-growth timber in Mendocino County, procedures which are simple enough to be economically justified seem unlikely to eliminate problems of equalization.

Administrative cost a third major source of inequity

Appendix

Constitutional Provision and Policy Guide Lines

A. Section 12¾, Article XIII, California Constitution

(As Revised, November 1926)

Exemption of Certain Trees and Vines

Fruit and nut-bearing trees under the age of four years from the time of planting in orchard form, and grapevines under the age of three years from the time of planting in vineyard form, and all immature forest trees which have been planted on lands not previously bearing merchantable timber or planted or of natural growth, upon lands from which the merchantable original growth timber stand to the extent of 70 percent of all trees over 16 inches in diameter has been removed, shall be exempt from taxation, and nothing in this article shall be construed as subjecting such trees and grapevines and forest trees to taxation; provided, that forest trees or timber shall be considered mature for the purpose of this act at such time, after 40 years from the time of planting or removal of the original timber as above provided, as a board consisting of a representative from the State Board of Forestry, a representative from the State Board of Equalization and the County assessor of the county in which the timber is located, shall by a majority thereof so determine.

B. California Board of Forestry Policy on Timber Taxation

(Adopted December 7, 1954)

Section 12¾, Article XIII of the State Constitution was adopted in 1926 by the people of California as a forest conservation measure for the purpose of encouraging perpetual regeneration of the forest resource in California by providing tax relief for immature and growing crops of timber.

This Section of the Constitution provides that "all immature forest trees which have been planted on lands not previously bearing merchantable timber, or planted or of natural growth, upon lands from which the merchantable original growth timber stand to the extent of 70 percent of all trees over 16 inches in diameter has been removed, shall be exempt from taxation, and nothing in this article shall be construed as subjecting such trees . . . and forest trees to taxation; provided, that forest trees or timber shall be considered mature for the purpose of this act at such time, after 40 years from the time of planting or removal of the original timber as above provided, as a board consisting of a representative from the State Board of Forestry, a representative from the State Board of Equalization and the County Assessor of the county in which the timber is located, shall by majority thereof so determine."

In order to establish guide lines for uniform application of this Section of the Constitution, and to discharge its interests and

responsibilities thereunder, the State Board of Forestry conducted public hearings, appointed, and received the recommendations of, a Timber Taxation Study Committee composed of two representatives each from the State Board of Equalization, County Assessors Association, County Supervisors Association, Board of Forestry, and four representatives of the forest industry, and one representative of the University of California School of Forestry, and conducted other studies in regard to timber taxation.

NOW, THEREFORE, BE IT RESOLVED, that the Board of Forestry hereby declares in the public interest and concern for the future economy of the State of California and in accordance with the established forest conservation policy of the Board of Forestry and the State of California that:

1. Timber which has been exempted from county taxes under the provisions of Section 12 $\frac{3}{4}$, Article XIII of the California State Constitution for 40 or more years may be returned to the tax rolls whenever the board consisting of a representative from the Board of Forestry, a representative from the Board of Equalization, and the County Assessor of the county in which the timber is located declare that:

a. Timber shall be mature for assessment purposes after the 40 years when an owner initiates cutting thereon except for stand improvement or sanitation purposes, or

b. Timber shall be mature for assessment purposes after the 40 years when 70% by volume of the trees 16" d.b.h. and larger on the land is of a class which is generally and substantially dealt in and sold or operated within the county as commercial saw timber, and

2. In its judgment, the provisions of Section 12 $\frac{3}{4}$, of the Constitution should be administered under the interpretation that:

a. The statement "70% of all trees over 16 inches in diameter" is a collective term meaning 70% of the volume of merchantable timber in trees over 16 inches in diameter, and

b. It was the legislative intent that the 30% or less of timber remaining on a logged off area was to be exempt from taxation for a period of 40 years, as a seed source, from the time of removal of the 70% by volume of the stand, and thereafter, until the Constitutional board had declared the timber reestablished and growing on the area to be mature for taxation purposes, and

3. In presenting the above recommendations, the Board of Forestry also goes on record in urging the Constitutional board and taxing authorities to bear in mind at all times that the future economy of the timbered counties and the timber industry shall be dependent upon maintaining a

large and vigorous stand of second growth timber; and that the growing of a crop of timber involves many years of high risks against fire, insects and disease. The Board of Forestry further points out that Section 12 $\frac{3}{4}$, Article XIII of the Constitution was passed by the people of California in recognition of these and other factors peculiar to growing timber as a crop. Therefore, the Board of Forestry emphasizes that every consideration be given to the retention of timber during its years of maximum growth by conservatively applying the provisions of the law and thereby not forcing premature cutting because of high or premature assessment, and

BE IT FURTHER RESOLVED, that this restatement of policy by the Board of Forestry revokes all previous resolutions adopted by the Board in regard to timber taxation, and

BE IT FURTHER RESOLVED, that copies of this Resolution be sent to the Board of Equalization, to County Assessors of the State, and to other interested persons or organizations.

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CALIFORNIA WILDLANDS...

- 65 million acres of mountains, foothills, canyons, rivers, lakes, and sea coasts.
- a giant "farm" for timber and forage.
- a vital source of California's water supply.
- an "outdoor playground" for millions of vacationers.

THE THREAT: the onslaught of...

- population growth.
- urban and industrial expansion.
- increasing demand for water, lumber, forage.
- wildfires.
- insects and plant and animal diseases.
- waste.

THE SOLUTION: coordinated research on using wildland resources to realize their full potential...

- present rate of timber growth could be doubled.
- usefulness of timber cut could be doubled by new products made from current waste.
- forage production for livestock and game could be tripled.
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- tens of millions of dollars lost to fire, insects, diseases could be saved.
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- integrates studies of complex wildland problems.
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- promotes the exchange of information between research workers and wildland managers and policy makers.
- collects and disseminates scientific data on wildland studies.

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