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Impact of Alternative Timber Management Policies on Availability of Forest Land in the Northeast



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ABSTRACT

Gaging the ability of the forest resource to satisfy future timber requirements is central to solving many problems arising from competition for use of forest land. In this study, production potentials of forest acreage in the Northeastern United States under management alternatives that range from extensive to intensive are weighed against several estimates of timber requirements for the year 2000. The different capabilities for fulfilling timber requirements in different parts of the region indicate areas likely to be affected most by further shifts toward nontimber use of forest land.

The intermediate option for forest management combines forest management at the present level with emphasis on harvesting the best timber-growing sites first. This option could meet timber requirements for year 2000 with roughly half the region's commercial forest area. Moreover, it could accommodate both intensive management and multiple-use objectives where they are most applicable by allowing flexibility in forest land use decisions.

COMPETITION for use of forest land, already very evident in parts of the Northeast, will become especially keen in the future—keener, on the whole, than the competition for the wood that the forests can produce. Yet, as others (Clawson 1974, Zivnуска 1974) have suggested, the way to resolve the land use conflicts may be to increase wood production—simply because increased wood production could satisfy the demand for timber with less commercial forest area. And this would provide greater flexibility in the use of forest land for purposes other than timber production.

PROJECTING WOOD FIBER NEEDS

If there were general agreement on a long-run program for growing timber, many problems arising from timber harvesting and from competition for forest land would be easier to solve. Thus it seems desirable to take a look at alternative long-run timber-growing programs, and then work backward to the actions indicated on today's forests. Recent projections of national

Figure 1.—Sample subregions

timber products consumption in terms of roundwood volume. Another projection, which recognized the likelihood of future price increases, had relative prices rising from 1970 levels by 1.5 percent per year for lumber; 1.0 percent per year for plywood, miscellaneous products, and fuelwood; and 0.5 percent per year for paper and board. These prices resulted in lower levels of consumption than in the first projection. A third projection is based on recent trends in U.S. per capita consumption of timber. Consumption of wood increased more rapidly than population until shortly after the turn of the century; then the increase slowed until it now approximates population growth. Per capita consumption has remained about the same for 2 decades (Radcliffe 1976).

To estimate future timber demands for each State and forest survey subregion, the average annual timber removals in 1970 were multiplied by an index of the projected national increase in demand (Fig. 2). This generates a set of demand projections for the subregions consistent with the two "assessment" assumptions. To derive the third demand projection, the medium projection of U.S. population growth (U.S. Bureau of the

Census 1975) was converted to an index (1970 = 1.00) and applied to the recent average annual timber removals. This projection assumes a continuation of current removals per capita and an increasing U.S. population.

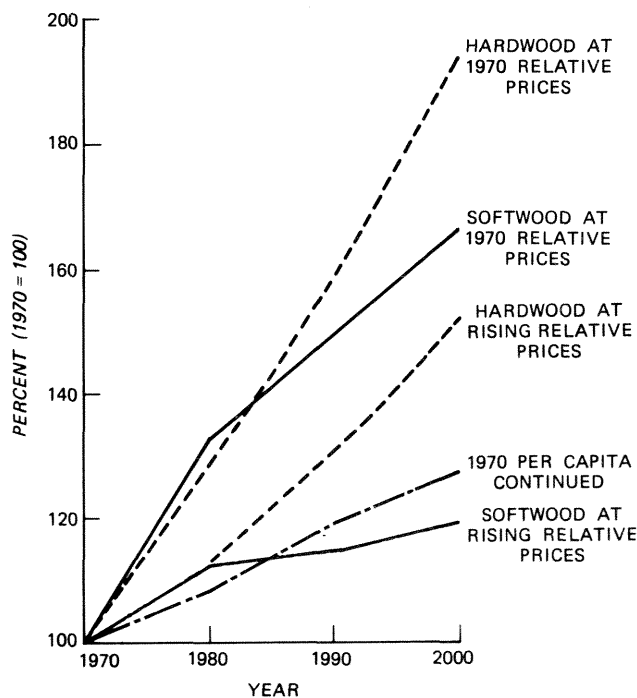
These estimates of future demands for timber, based on proportionate changes in local timber removals, in some sense acknowledge the economic factors underlying productive capacities that have emerged from past demands for wood. Insofar as this represents the region's comparative advantage in producing wood, the assumption of proportionate response, while not totally satisfactory, is the best at hand.

MANAGEMENT ALTERNATIVES

Three broad classes of alternatives for forest land management and timber production seem possible for the coming decades:

- Extensive: low-intensity management with high acreage harvested
- Intensive: high-intensity management with low acreage harvested
- Intermediate: some action in between.

Figure 2.—Projected change in timber removal, 1970-2000 (Northern U.S.).



The "extensive" alternative reflects what is now happening in Northeastern forests. Average growth of wood is less than half (42 percent) of the potential of fully-stocked natural stands. Controversy continues over how much forest should be harvested, methods of timber harvest, withdrawal of additional area for non-harvest forest uses, and similar matters. Nevertheless, commercial forest is potentially available for timber harvest and most of it will be harvested at one time or another. A forest management policy based on this "extensive" option would be to continue current management levels and cutting practices, maintaining the cut per acre at its present level.

In contrast to the "extensive" alternative is one that would include some actions to insure nearly complete natural stands of trees: several intermediate cuttings between harvests and the application of special techniques to get rapid stand regeneration. But this is intensive management in a relative sense only: it is not meant to attain the ultimate biological potential for timber production that might be achieved under extremely intensive forest culture.

COMMERCIAL FOREST LAND REQUIREMENTS

Rather, this more feasible management policy is designed to promote timber management and harvest on the most productive forest land. Accordingly, it concentrates timber management and cutting practices on the best sites first.

The Forest Service categorizes sites by the mean annual growth in cubic feet per acre attainable in fully stocked natural stands at the culmination of their mean annual increment. Biological potential of the forest is simply an expression of the average growth of wood per unit area of forest land devoted to timber growing. A calculation for the Northeast indicates that the region has a potential productive capability of about 7.03 billion cubic feet per year, if all of the commercial forest area were used to its natural timber-growing capacity (Table 1). A similar calculation using each State and subarea's potential acreage distribution among the site classes provides a gage of its productive capability under intensive management.

Our intermediate alternative for forest land management and timber production would concentrate timber harvest activity on the best sites first, while continuing forest management at present levels. Site classes also provide the basis for gaging productive capability under the intermediate alternative; but based on the area's present, rather than potential, acreage distribution of mean annual growth classes. On this basis the region could grow 3.81 billion cubic feet per year; slightly over half the 7.03 billion cubic feet of *potential* timber-growing capacity.

The growth figures above contrast with recent levels of timber growth and removal, which are about 2.93 and 1.28 billion cubic feet, respectively. Overall, these data indicate that the Northeast has much unused timber-growing capability. But we must also take account of both the increasing wood fiber requirements that have been projected and the spatial variation in ability to satisfy them throughout the Northeast.

High-level demand

Extensive management. If current practices were continued, the timber resources in some northeastern states would be insufficient to fulfill the higher estimates of roundwood consumption projected (at 1970 relative prices) for the year 2000 (Fig. 3). Hardwood forest management at this extensive level would not sustain enough annual wood production to prevent deficits in Ohio, New York, Maine, Vermont and Maryland. Likewise, the extensive level of management would fail to meet high-level projected requirements for softwood timber in Ohio, New Jersey, Maryland and Delaware. In fact, softwood timber removals have already exceeded growth in the last three of these states.

Deficits between estimated roundwood demand and the amount of wood production that these states could sustain with current cutting practices could be met elsewhere in the region. To do so would require that about 90 percent of the region's hardwood production area and 75 percent of the softwood production area be committed to growing wood.

Intensive management. In sharp contrast, most of the high-level projected demand for wood fiber could be satisfied from a fraction of the commercial forest area if the intensive management alternative were adopted. Only one-fourth of the region's hardwood production area would be needed for timber growing under intensive management. Similarly, softwood requirements could be met with one-fifth of the region's softwood production area. In Delaware and Maryland, however, even intensive management would not prevent a softwood deficit. Other states in the region would have to make

Table 1.—Potential timber productivity of commercial forest land in the Northeast

Site class ¹	Commercial forest area	Potential annual growth per acre ²	Total potential annual growth
	<i>M acres</i>	<i>ft³</i>	<i>Million ft³</i>
120 to 165 ft ³ /acre	8621.0	142.5	1228.5
85 to 120 ft ³ /acre	22034.4	102.5	2258.5
50 to 85 ft ³ /acre	37298.1	67.5	2517.6
20 to 50 ft ³ /acre	29209.3	35.0	1022.3
All classes	97162.8	72.3	7026.9

¹Site classes indicate potential growth of fully stocked natural stands.

²Midpoint of the site class.

Figure 3.—Proportion of State's commercial forest area needed to meet timber demands projected at 1970 relative prices, for year 2000.

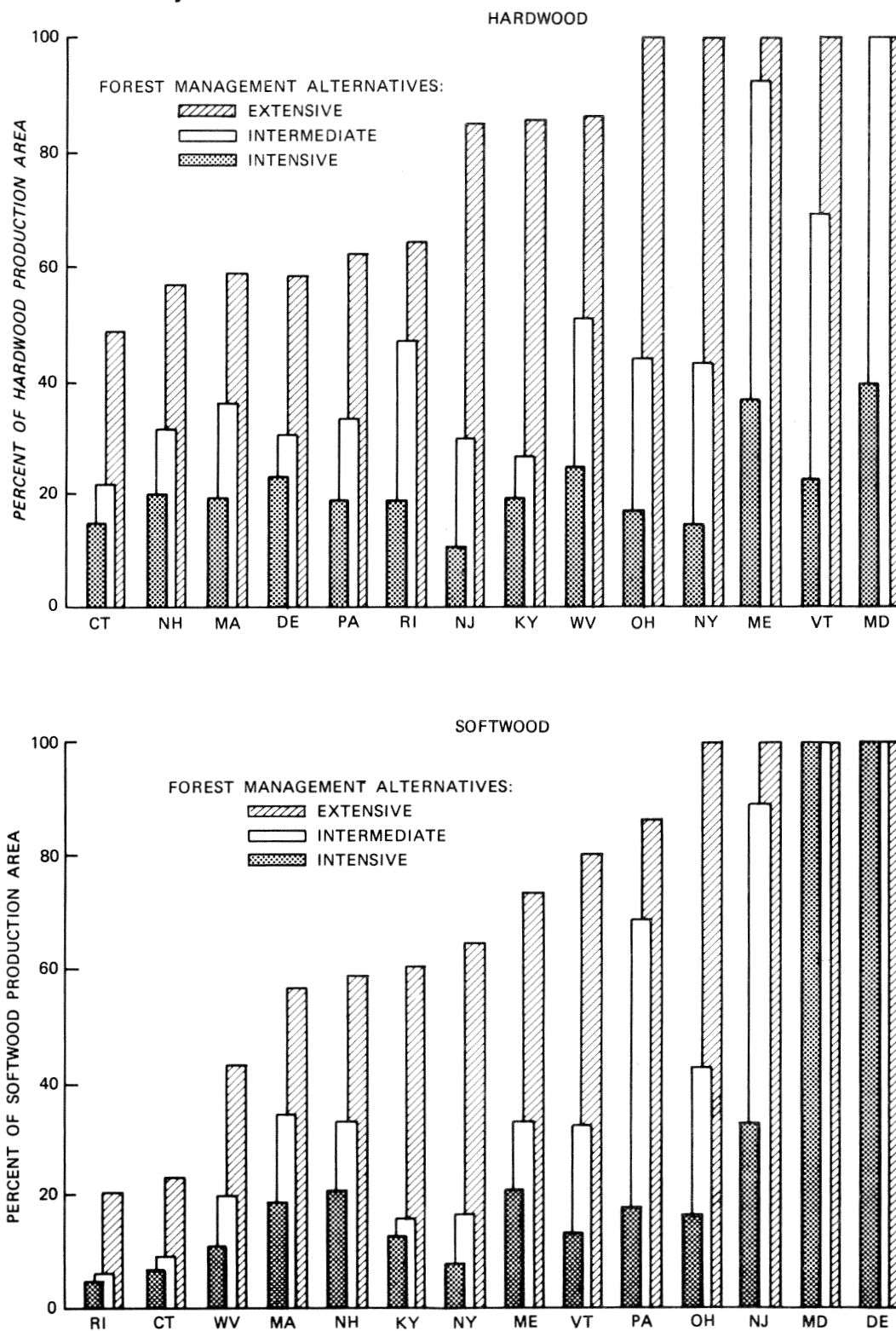


Figure 4.—Proportion of State's commercial forest area needed to meet timber demands projected at current consumption per capita, for year 2000.

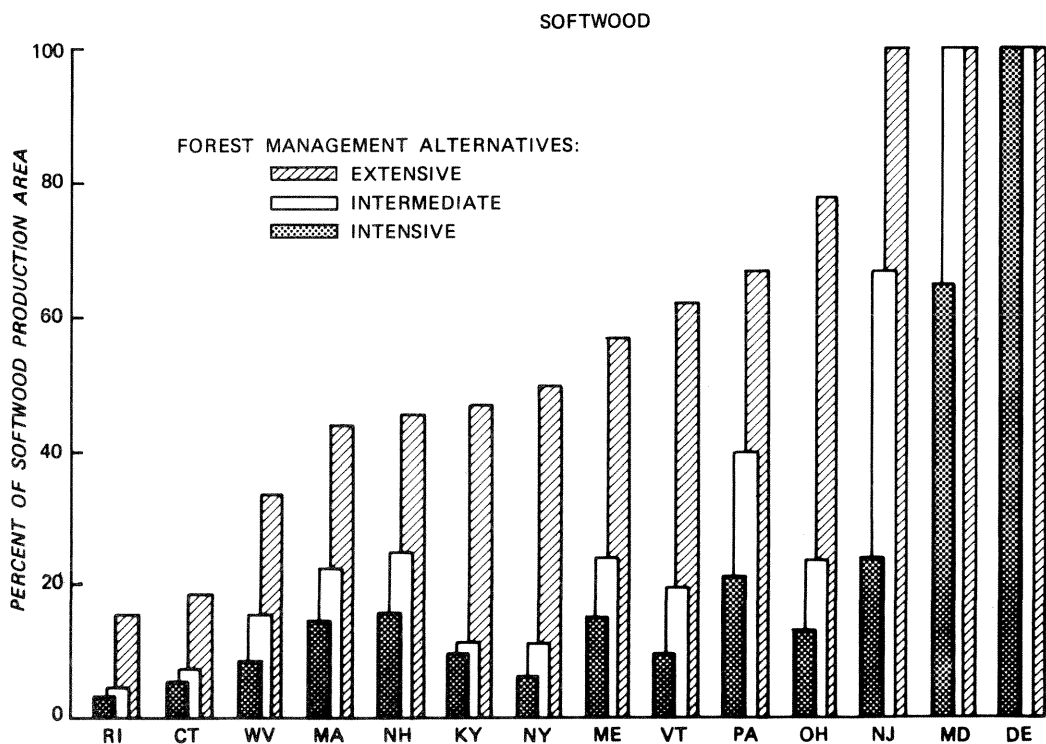
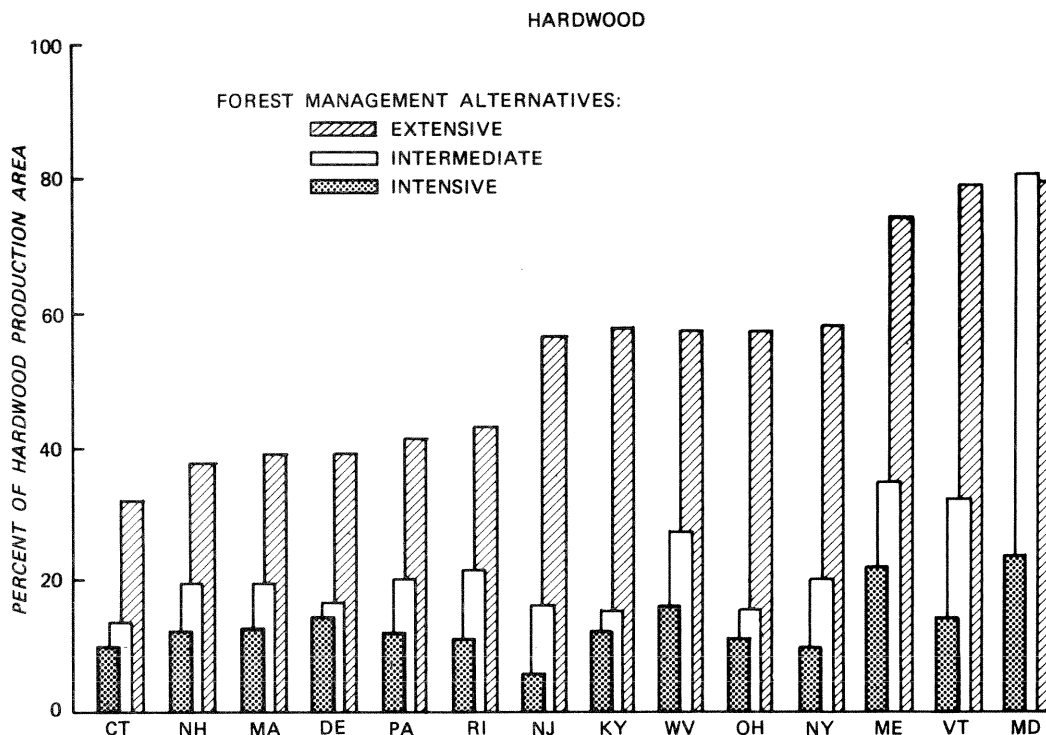
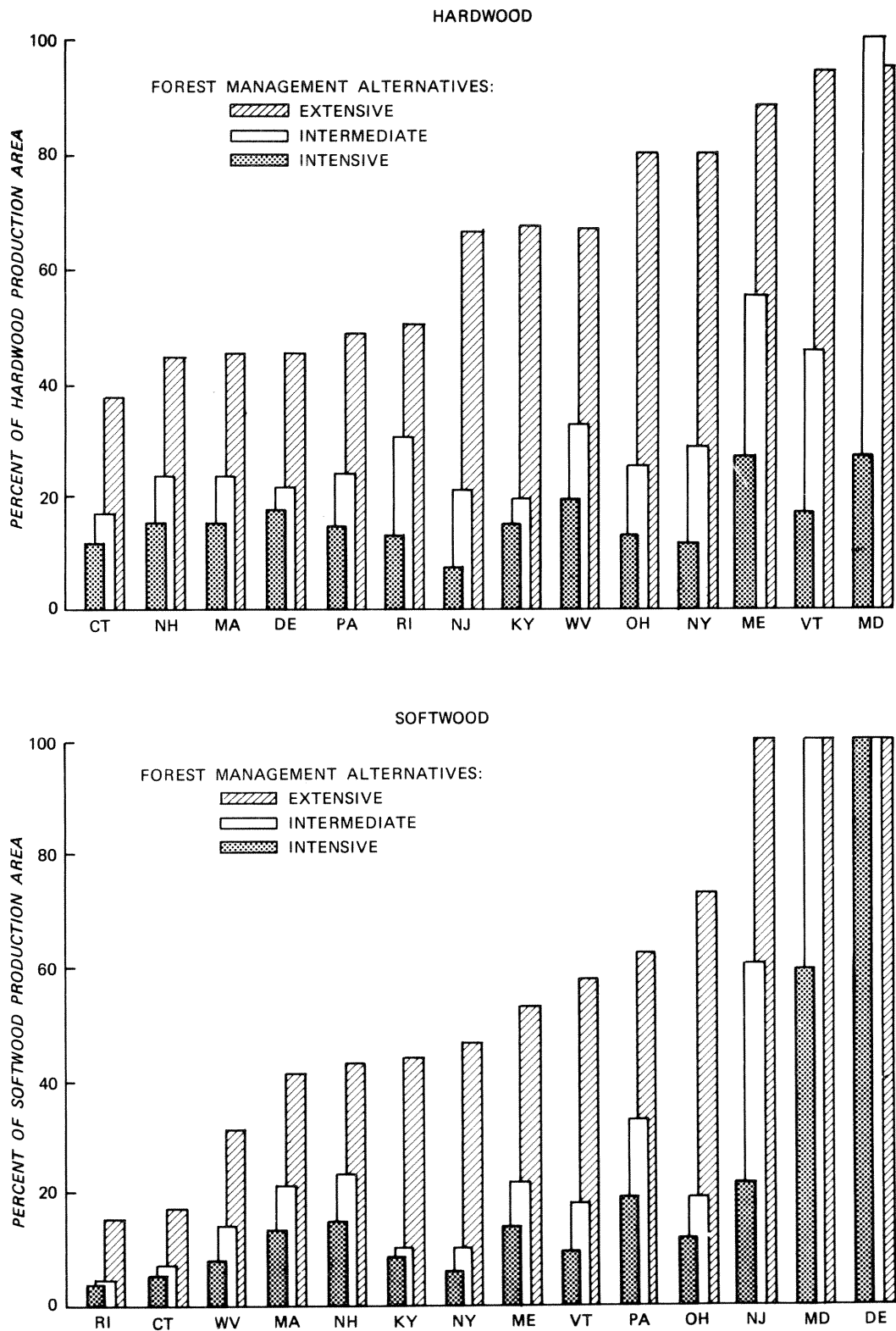


Figure 5.—Proportion of State's commercial forest area needed to meet timber demands projected at rising relative prices, for year 2000.



up the softwood deficit to prevent depletion of forest resources in those two states.

Intermediate management. The intermediate alternative for forest management and harvest also would satisfy most of the high-level projected demand for wood fiber in the year 2000. However, because it maintains the present acreage distribution among mean annual growth classes, intermediate management would require nearly twice as much forest area as intensive management. The gaps between sustainable timber production and projected demand for softwood in Delaware and Maryland and for hardwood in Maryland would have to be filled elsewhere in the region.

Low-level demand

At the opposite extreme of future timber requirements are the low-level projections of demand based on a continuation of recent timber removals per capita.

Extensive management. If current cutting practices continued, most northeastern states would have no trouble meeting these low-level estimates of roundwood consumption for the year 2000 (Fig. 4). Of course, since recent softwood timber removal has exceeded growth in Delaware, Maryland, and New Jersey, a continuation of current cutting practices would further deplete their softwood forest resources. In the rest of the region, low-level softwood demands could be met with slightly over half of the softwood commercial forest area. Thus depletion pressures on these three coastal states could be relieved elsewhere in the region.

Intensive management. With low demand and intensive management, the region's timber requirements in the year 2000 could be met with less than 15 percent of the hardwood area and 15 percent of the softwood production area. The only excess demand in the region would be for softwood in Delaware.

Intermediate-level demand

Between projections based on continued 1970 relative prices and those based on continued per capita consumption are the intermediate projections of roundwood requirements. These interact with the management alternatives in much the same way as the low-level (1970 per capita) projections (Fig. 5), but would require 20

to 30 percent more hardwood acreage and about 5 percent less softwood acreage to satisfy the projected roundwood consumption in the year 2000. The reduction in softwood acreage reflects underlying assumptions that cause lower estimates of softwood demand with rising relative prices than with stable per capita consumption of wood (see Figure 2).

INTRA-REGIONAL CAPABILITIES

Certain combinations of timber demand and management intensity, such as low demand and intensive management, may not be very plausible. However, they help form a range of baseline projections or best estimates of maximal and minimal area requirements for wood production across the Northeast. Insofar as these baseline projections portray future conditions, they can serve as indicators of potential problems in an area and provide bases for corrective policies.

Further subdivision, from region to state to forest survey unit, accents the relatively less flexible nature of the smaller areas. Within the region as a whole there is plenty of leeway for adjusting to pressures that demands for wood fiber place upon the forest resource. But potential problem areas within the regional timber supply system become more apparent as we focus on smaller areas. Even states that will have no difficulty fulfilling estimated future requirements for wood fiber may contain sub-areas that do. For example, despite adequate capacity statewide, high-estimate wood fiber requirements will encounter tight supply situations in several of Pennsylvania's forest survey units. The different capabilities for fulfilling timber requirements across the region have been summarized as maps depicting the commercial forest area allotted to timber growing under the various assumptions about timber demand and management intensity (Figs. 6-8).

There are few areas in the Northeast where potential shortages in timber production persist through all alternatives considered here. For hardwoods, southern Maryland, New York's eastern Adirondack area, central Maine, and sections of western Ohio and Kentucky are most sensitive to timber production pressures. The greatest pressure on softwood resources occurs in Delaware, Maryland, southern West Virginia, and south-central Pennsylvania. New Jersey,

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Figure 6a.—Proportion of softwood production area needed to meet high softwood timber demands (projected at 1970 relative prices) in year 2000.

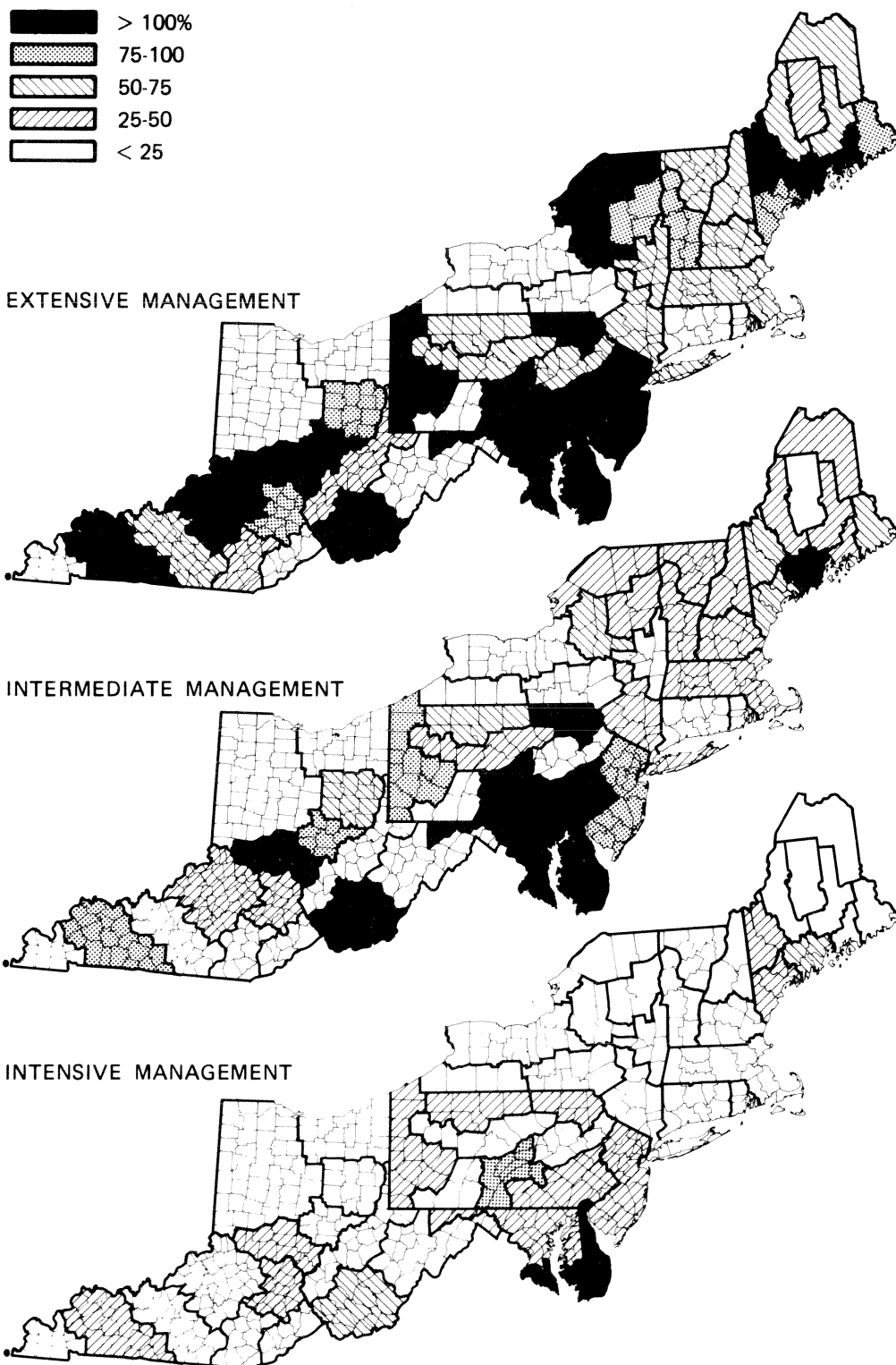


Figure 6b.—Proportion of hardwood production area needed to meet high hardwood timber demands (projected at 1970 relative prices in year 2000).

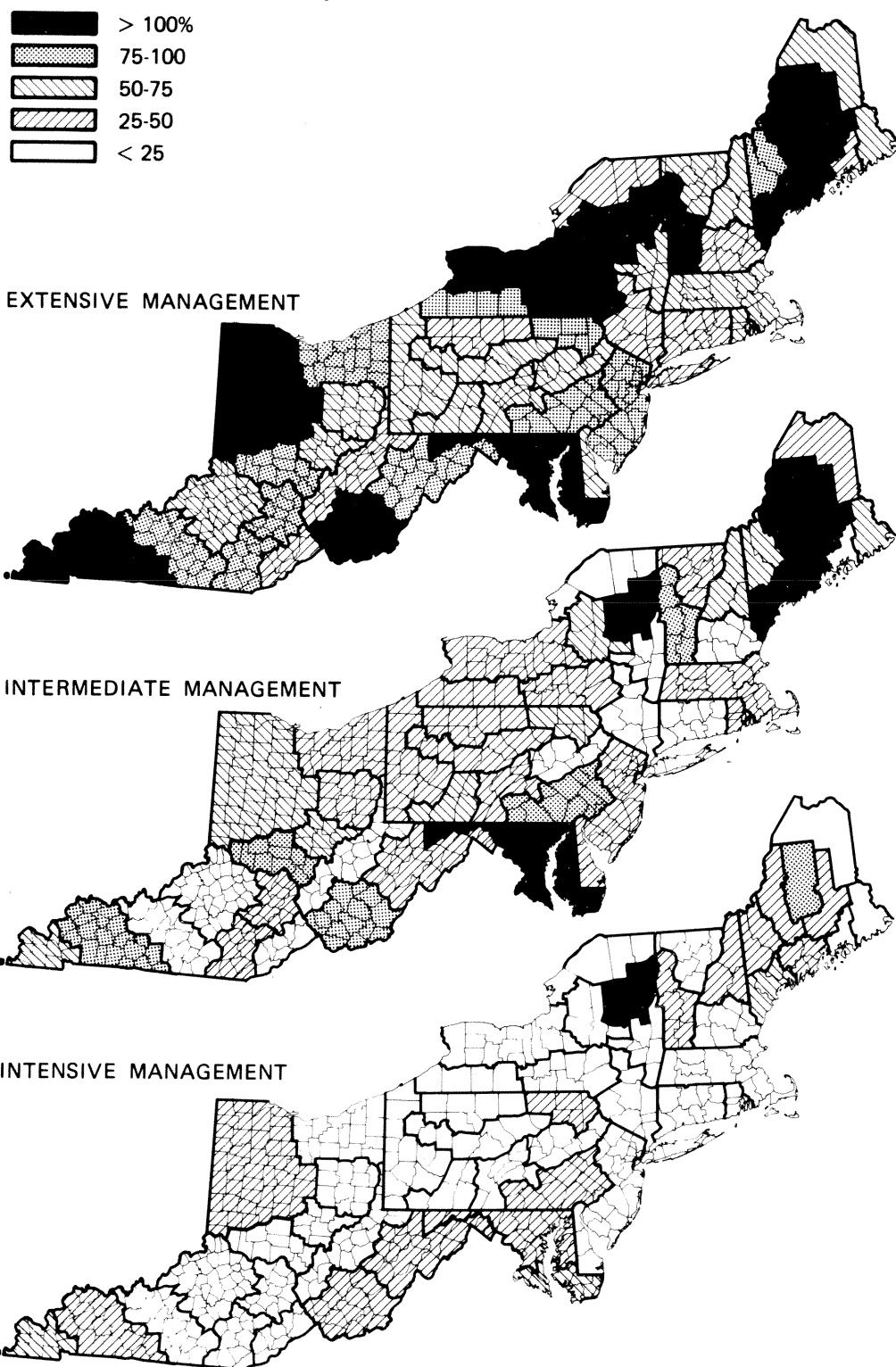


Figure 7a.—Proportion of softwood production area needed to meet intermediate softwood timber demands (projected at rising relative prices) in year 2000.

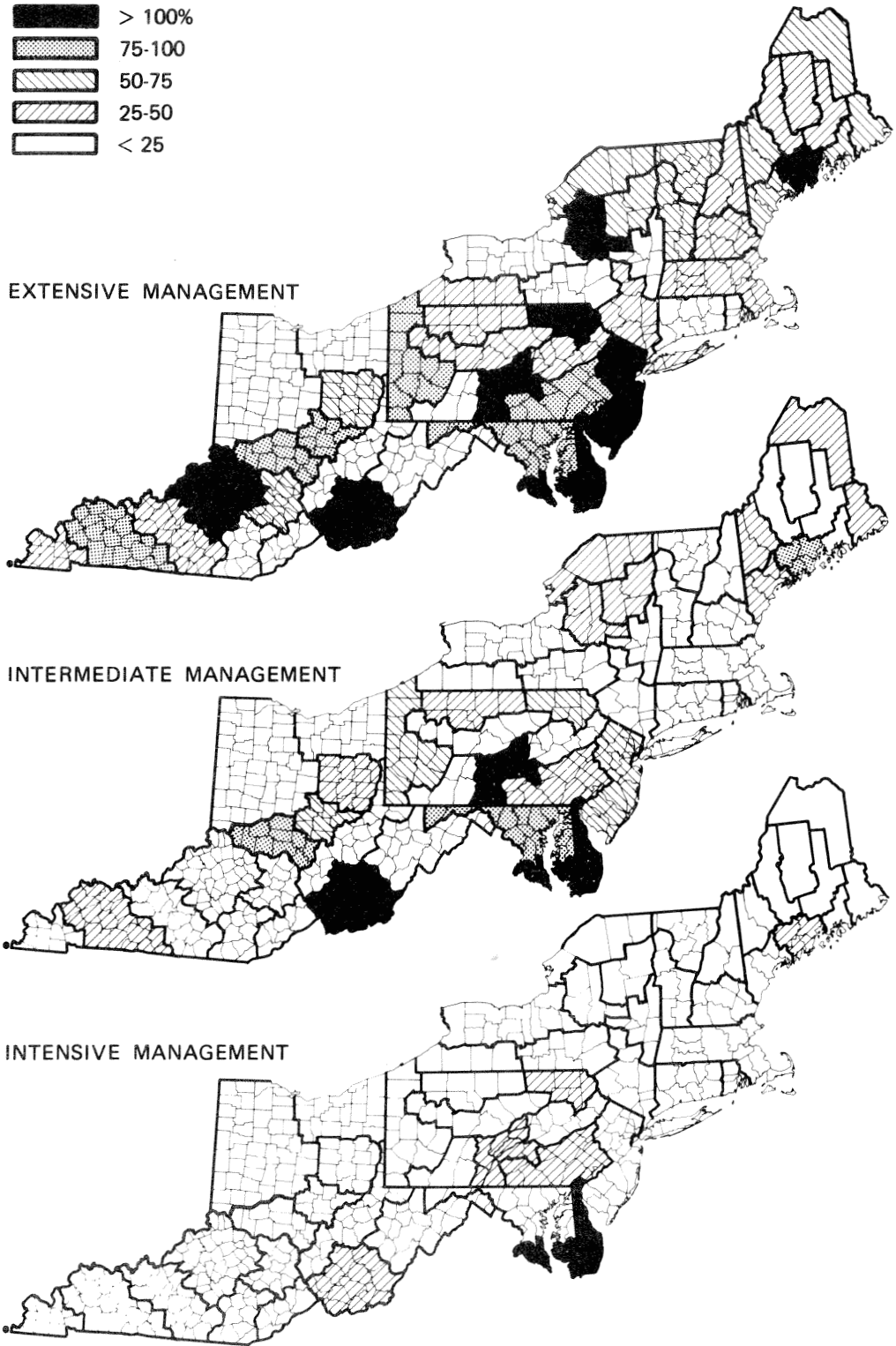


Figure 7b.—Proportion of hardwood production area needed to meet intermediate hardwood timber demands (projected at rising relative prices) in year 2000.

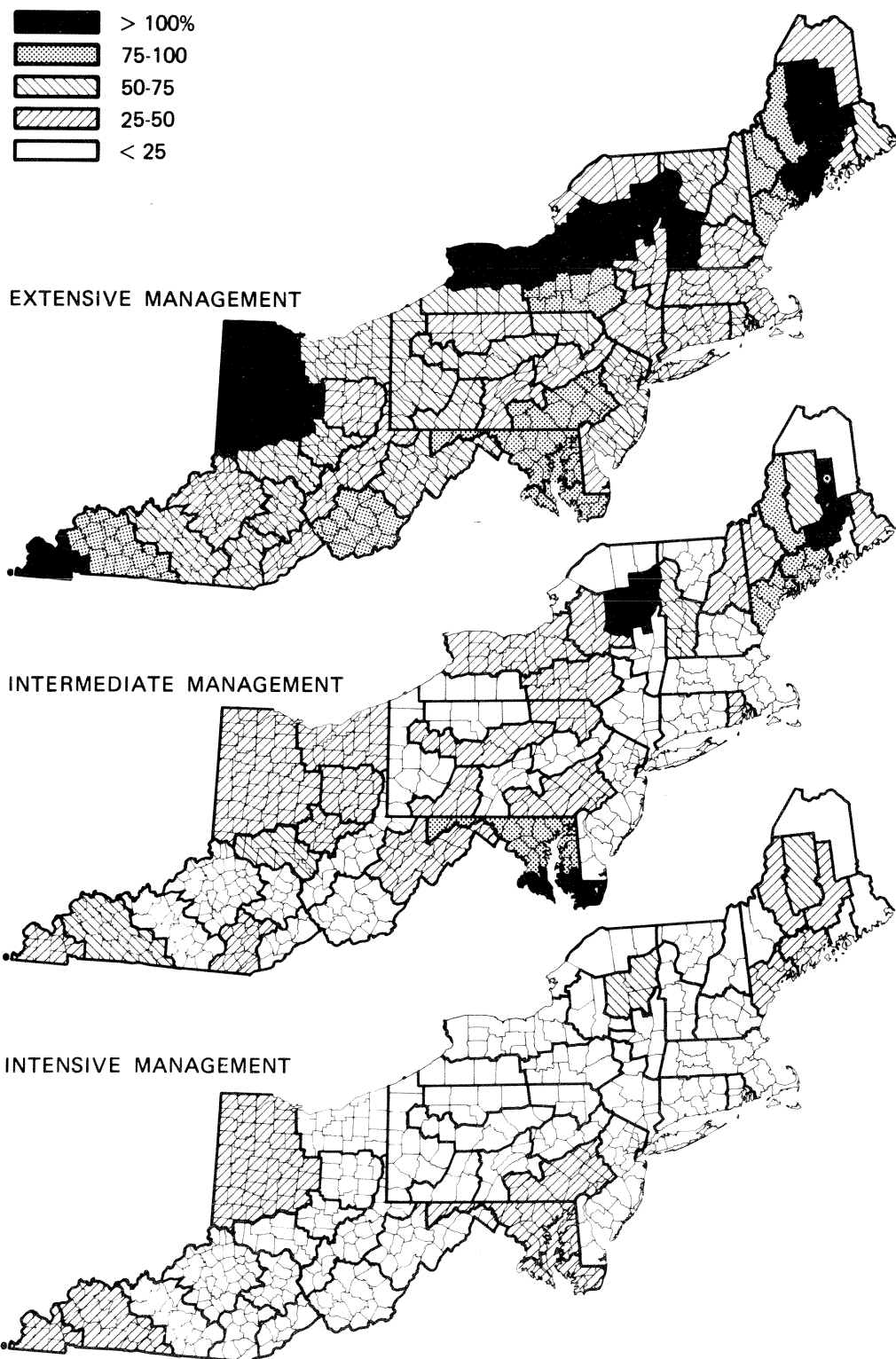
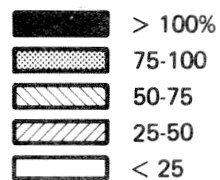
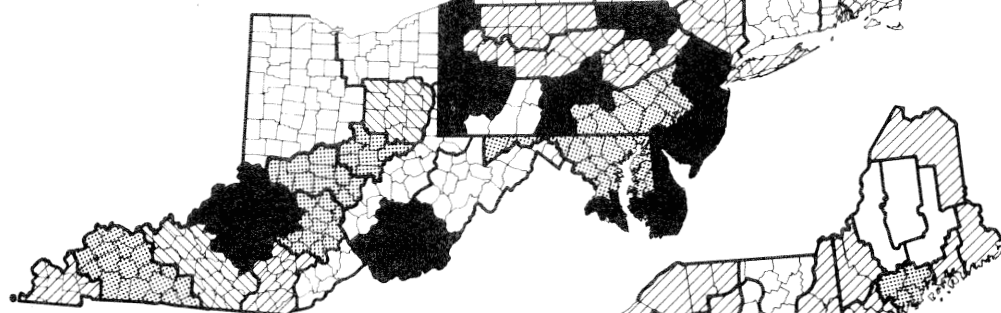


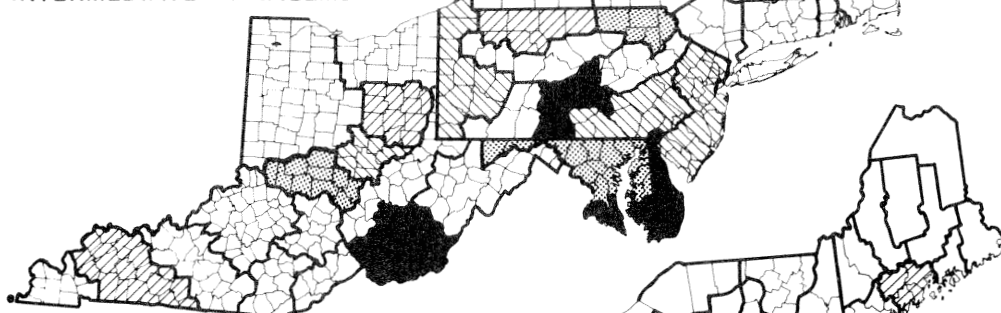
Figure 8a.—Proportion of softwood production area needed to meet low softwood timber demands (projected at current consumption per capita) in year 2000.



EXTENSIVE MANAGEMENT



INTERMEDIATE MANAGEMENT



INTENSIVE MANAGEMENT

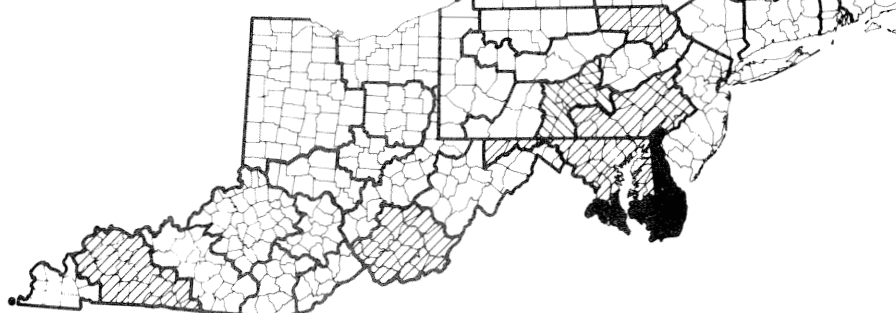
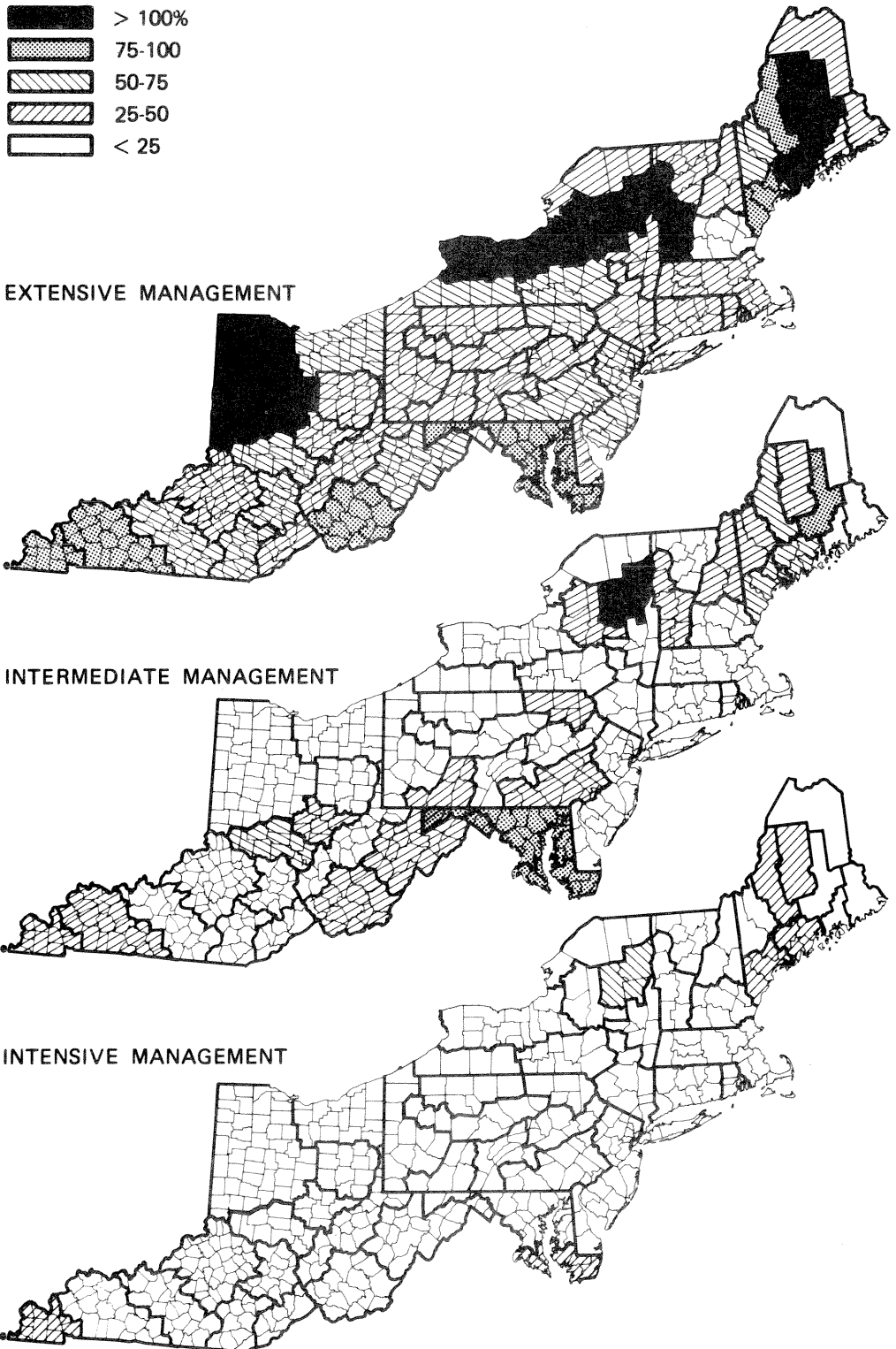


Figure 8b.—Proportion of hardwood production area needed to meet low hardwood timber demands (projected at current consumption per capita) in year 2000.



northeast and western Pennsylvania, New York's western Adirondack area, south-central Maine, and north-central Kentucky will face deficit softwood resource problems if current practices continue as in the extensive management option. Within the Northeastern U.S., these areas are likely to be impacted most by further shifts toward the use of forest land for purposes other than timber growing.

CONCLUDING CONSIDERATIONS

Projections of the forest area needed for timber production that are based on a continuation of extensive forest land management assume that 1970 levels of emphasis on multiple-use, environmental, and economic objectives will continue. Projections based on intensive levels of forest land management assume that timber production will get primary emphasis on all commercial forest area needed to meet timber requirements.

A comparison of projected area needs (Figs. 3, 4, or 5) indicates the tradeoffs in commitment of forest area associated with esthetic, watershed, other multiple-use, and environmental management objectives. Management of commercial forest land exclusively for timber production is limited by these objectives. Thus, on one hand, it may not be possible to reach the minimum forest area commitment indicated by the intensive management option. It becomes attainable only where owners manage their land exclusively for timber production.

On the other hand, the extensive management option reflects the commercial forest land base and the social, economic, and environmental management levels of 1970. Changes in the emphasis placed on these objectives would result in more restrictive timber management practices.

The implication is that any change in emphasis from the 1970 mix of objectives guiding forest land use would require the concentration of timber production on fewer acres than those shown for the extensive solution for the year 2000. But many of the pressures that create change also create opposition to exclusive use. Consequently, it appears that projected timber requirements could best be met by encouraging timber growing and timber harvest in forest areas that have the greatest comparative

advantage for this use. In addition to improved efficiency, a move in this direction would create greater flexibility in the framework for forest land use decisions.

Perhaps our intermediate management option is not far off the mark in suggesting the forest area needed to meet projected timber requirements. This middle ground would seem to provide the flexibility for some owners to practice intensive timber management while others stress multiple-use objectives. Overall, this would produce less timber volume per acre than intensive management. Thus it would require more forest acreage to meet the projected timber requirements for the year 2000.

The important point is that by spreading the burden of timber growing over a larger forest acreage it is possible to accommodate both intensive management and multiple-use objectives where each is most applicable. Under intermediate-level forest management, projected timber requirements for the year 2000 could be met from roughly half the existing commercial forest area. Thus there is a comfortable margin for adjusting to perhaps even less intensive management, as well as to uses of forest land that are incompatible with timber growing and timber harvest.

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