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FOREST SURVEY RESULTS FOR HIGHER GRADE HARDWOOD SAWTIMBER

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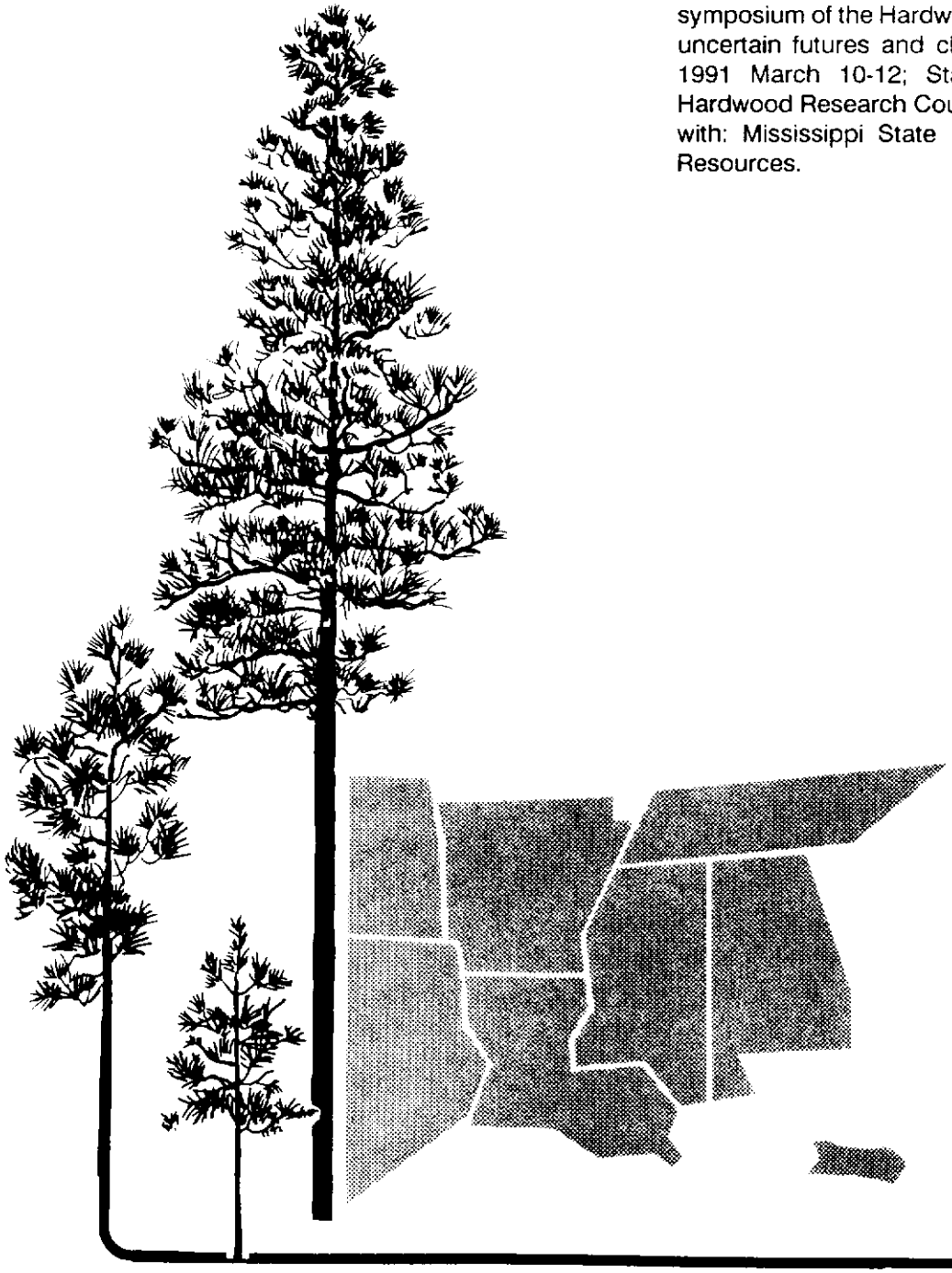

Southern Forest Experiment Station

FOREST SURVEY RESULTS FOR HIGHER GRADE HARDWOOD SAWTIMBER

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ABSTRACT

The 1987 Forest Survey of Mississippi shows a slight increase in forest area and a substantial gain in hardwood inventory. Hardwood gains, appearing in all diameter classes, suggest an increase in quality but hardwood users generally believe quality is declining. By our analysis, volume of top quality hardwood declined while volume in other grades increased. Forest Survey grading is conservative when compared with grades assigned by a hardwood specialist. User constraints applied to the survey data base severely limit the amount of "available" quality hardwood. Forest Survey data are available so users can conduct their own analyses.

Recent surveys of forest resources in the Southern United States indicate stable or declining softwood (primarily southern pine) inventories while hardwood supplies continue to increase. The hardwood increases appear across a wide range of diameter classes and suggest an increase in hardwood quality. Hardwood users, however, generally feel that hardwood quality is declining and that higher grade hardwood is becoming more and more difficult to obtain. An objective assessment of hardwood quality is clouded by subjectivity, a change in grading procedures, and a generally imprecise concept of what actually constitutes "higher grade" or quality hardwoods.

To accurately assess quality of the hardwood resource, one must examine the Forest Inventory and Analysis (FIA) procedures carefully. Surveys are conducted throughout the United States by six FIA units. A concerted effort has been underway for some time to produce compatible results from these surveys in the East. All Eastern FIA units, for example, use permanent plots and apply hardwood tree grading rules consistently. The results are reported in standard units, and a set of "core" tables have been adopted for standard output across the East.

Because survey cycles are 8-10 years in the South Central region, there can be differences among successive surveys due to changes in procedures. In the last cycle, we used standard factory and shop log grades (USDA Forest Service 1966), and in the current cycle, we adopted tree grading procedures (Hanks 1976). Now, we are consistent among FIA units but inconsistent within our own region. Since we are aware of this change in procedures and the original data are preserved and accessible in a data base, the survey information can be reprocessed to determine true trends.

Our case study (Beltz et al. 1990) was conducted in Mississippi where hardwood sawtimber volume increased by 31% and affected a wide range of diameters (Figure 1). Since larger trees are generally of better quality, and the grading rules require certain minimum diameters for the upper grades, it is reasonable to expect an increase in quality. If Grade 1 hardwood volume in the 1977 Mississippi survey report (Murphy 1978) is compared directly to the 1987 survey results (Kelly and Sims 1989), a 30% increase will be apparent. Kelly and Sims, however, point out in the text of the 1987 report that there was actually a decline in Grade 1 volume. This is the effect of the change in grading procedure. In the 1977 survey, we graded the butt logs and predicted grades of the upper-stem logs. Now, all the sawtimber volume in the stem is tabulated according to grade of the butt log.

Even though we are able to recompute old volumes according to new standards and make valid trend analyses, who is to say that our grading reflects the industry standards for hardwood quality? At the urging of E. C. Burkhardt, consulting forester and hardwood specialist, we tested our field grading. On several sample plots in the Vicksburg, Mississippi area, Burkhardt graded the butt logs of 192 sample trees previously graded by Forest Survey crews. The results of this comparison show FIA crews were generally tougher on the trees than Burkhardt was (Figure 2). Part of the difference was due to Burkhardt's knowledge of local species and quality, plus there was provision in the published grades for allowing 10-ft. logs in all grades. We require at least a 12-ft. minimum butt log. The bottom line is, Forest Survey grading is reasonably comparable to that of a knowledgeable hardwood specialist and is probably conservative.

I think we can reasonably assume that our measurements of diameter on permanent plots are fairly accurate and we can believe the reported increase in hardwood volumes in the larger diameter classes. If we believe the results from the hardwood grading exercise, then Forest Survey grades should reflect quality as well. Where then, is the cause of the disparity in user expectations and FIA results?

We pursued this question by examining the reporting standards versus the expectations or norms of a typical user. With Burkhardt as the "user," we set up arbitrary constraints on "quality" hardwoods. We set out to reprocess the original forest survey data

into sawtimber estimates expressed in Doyle and limited to a 12-in. minimum dob. Both of these are nonstandard items in the Forest Survey. To be included in the new estimates, stands (plots) had to contain at least 1500 bf/acre and be bottomland sites or good upland hardwood sites. Pine sites were excluded.

To the extent that these constraints represent actual requirements, we can demonstrate the restricting effect on the "quality" hardwood resource. We had to use a taper function to determine where 12-in. dob occurred since our field measurements were taken to a 9-in. minimum dob for hardwoods. Since such an equation (Matney et al. 1985) was available for cherrybark oak in Mississippi, that is what we used.

Based on cherrybark oak supplies after applications of the constraints, Doyle values amount only to 71% of International values. The 12-in. minimum diameter reduced supplies by 16%. Site constraints eliminated another 40% of the resource. Volume/acre requirements, at 1500 bf/acre, had little effect. By the time all were applied, Doyle estimates were only 1/3 of the original International estimates. If an additional constraint, such as "trees must be graded at least 1 or 2", were added, the remaining resource would be quite small indeed!

In a southwide analysis (USDA Forest Service 1988), about 1/3 of the timberland was oak-hickory forest type and only 17% bottomland hardwoods (Figure 3). In general, 70 to 80% of the bottomland and oak-hickory forest types are privately owned by individuals not in the timber business. The implication is that these individuals are motivated not by the need for quality hardwood but by financial and aesthetic considerations.

If certain species are requisites for higher quality hardwood, then these species had better be oaks. Southwide, oaks account for nearly half of all hardwood sawtimber volume (Figure 4). Scarcer species, such as cherry, black walnut, etc., while prized for their wood, represent a very small proportion of the total resource. Within the oaks, the category "other red oaks" predominate (Figure 5). These are generally of lesser quality than the "select red oak" category which is comprised of cherrybark oak, Northern red oak, and shumard oak. Select white oaks are comprised of white, swamp white, chestnut, chinkapin, Durand, and Bur oaks. The "other white" category includes all the rest.

McWilliams (1988) examined the quality hardwood issue in the upland south (the Ozarks, the Ouachitas, North Mississippi, and Tennessee) and added tree grade restrictions to a set of constraints including volume/acre, percent slope, tract size, and distance to road. At the outset, only 13% of the initial inventory was still "available" as quality hardwood (Table 1).

In summary, Forest Survey resource statistics can provide insight into the quality hardwood supply issue. However, a thorough

understanding of current and past procedures used to assess quality is necessary to accurately interpret trends. Hardwood sawtimber volume has been steadily increasing but volume in Grade 1 trees declined slightly in Mississippi. Clearly, the amount of resource material available to a hardwood user is a function of the size requirements imposed upon the raw material. In addition, economic considerations such as minimum volumes per acre, distance to a road, tract size, species preference, and ultimately, the willingness of the private individual to sell at a given price, can severely limit the availability of quality hardwoods.

Forest Survey data are available and users can reprocess to their own specifications. The original measurements, including many not used in these examples, are preserved in the Forest Survey data base. We cannot report according to each user's criteria because the users have highly diverse requirements. Access to the data base is provided at reasonable cost so users can conduct their own analyses and interpretations. Contact the Southern FIA unit at (601) 324-1611 for information on training seminars, fees, and other details.

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Table 1. Quality hardwood sawtimber.

	Billion Board Feet	Percent
Initial Inventory:	63.7	100
Constraints:		
>3000 bf/acre	40.5	64
Slopes<34%	32.6	51
Tracts>50 acres	25.6	40
<1/2 mile to road	18.6	29
Tree Grades 1 & 2	8.0	13

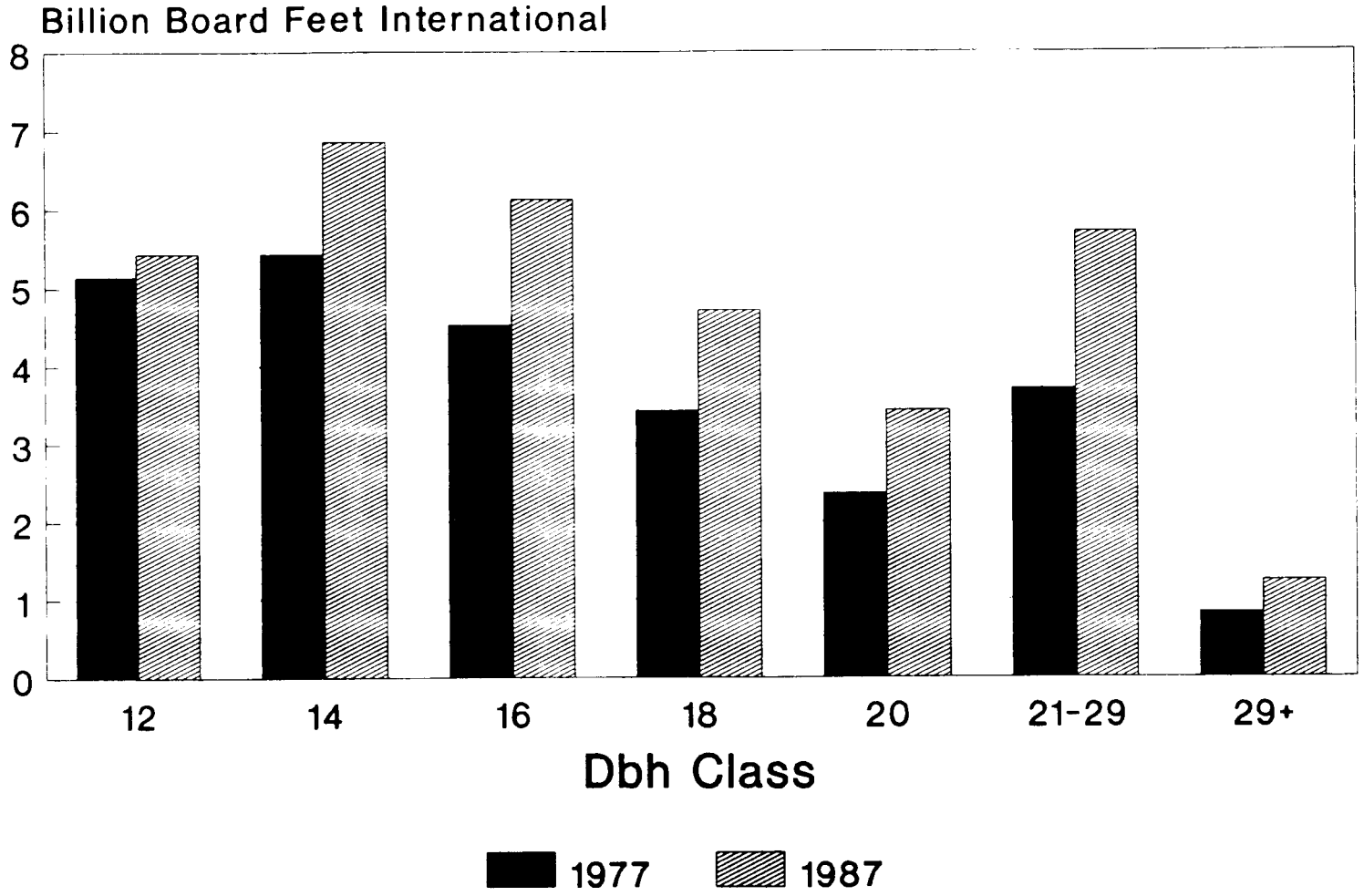

Figure 1. Hardwood Sawtimber Volume by Diameter Class.

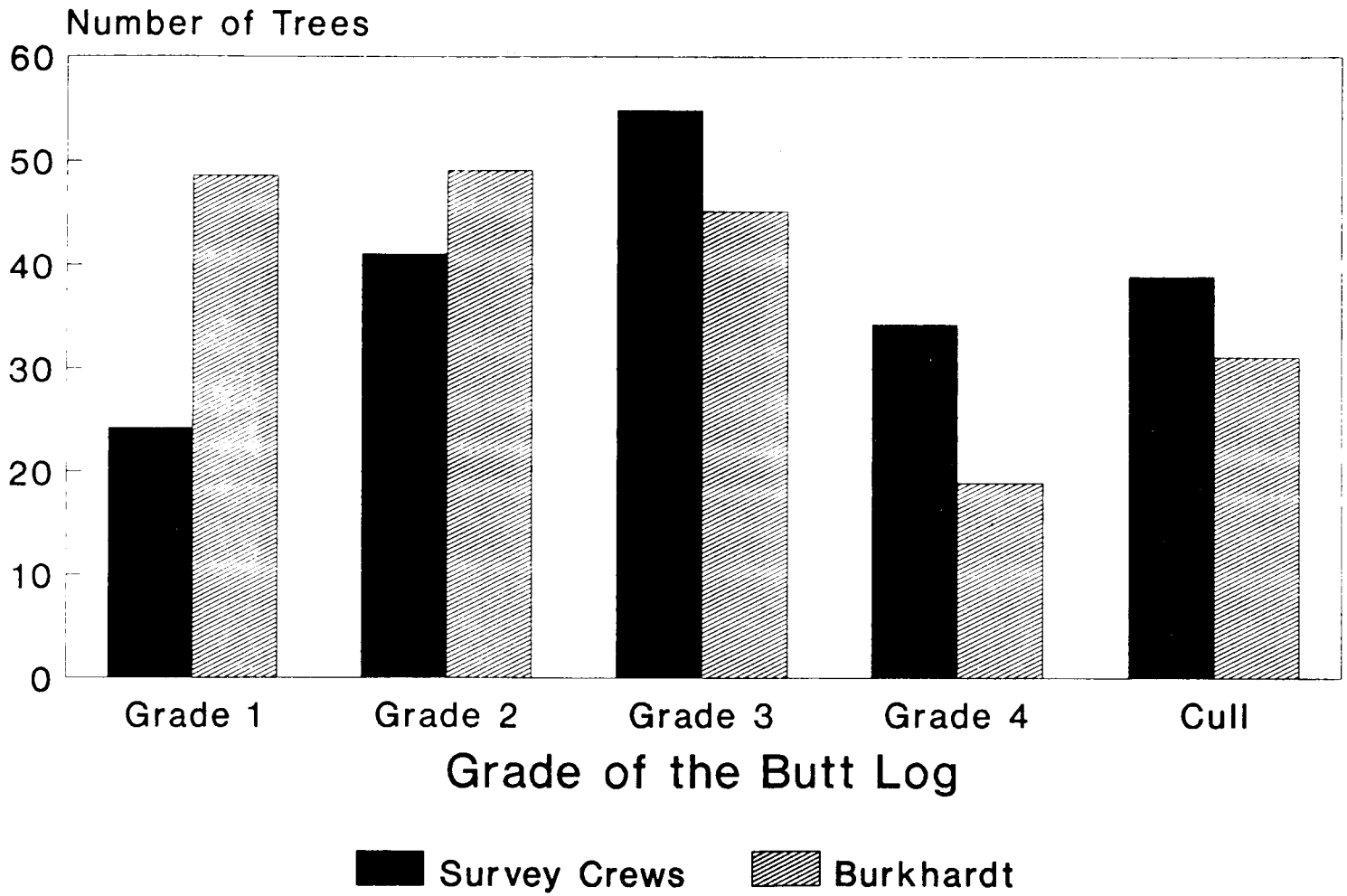

Figure 2. Grading Comparison.

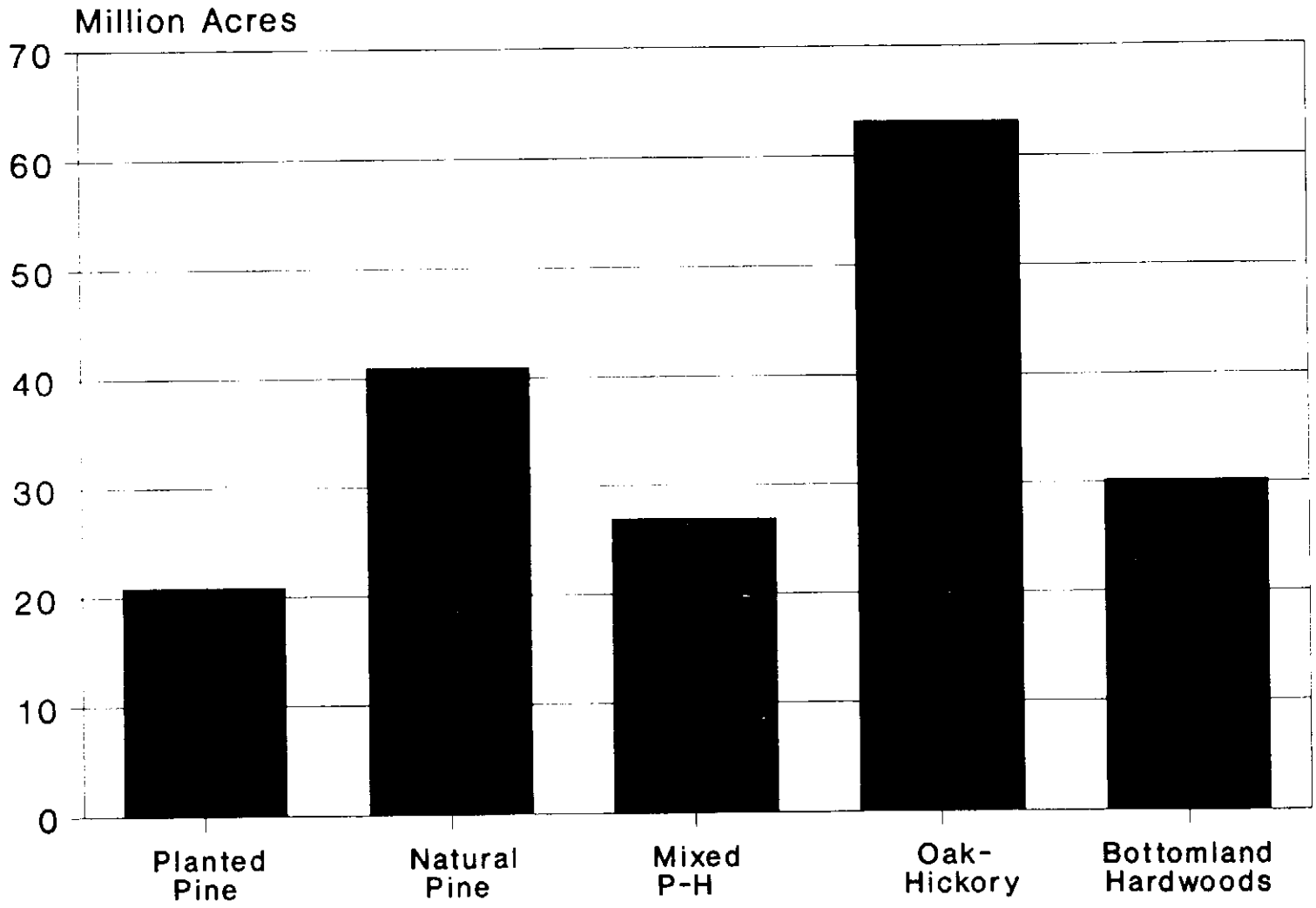

Figure 3. South's Timberland by Forest Type.

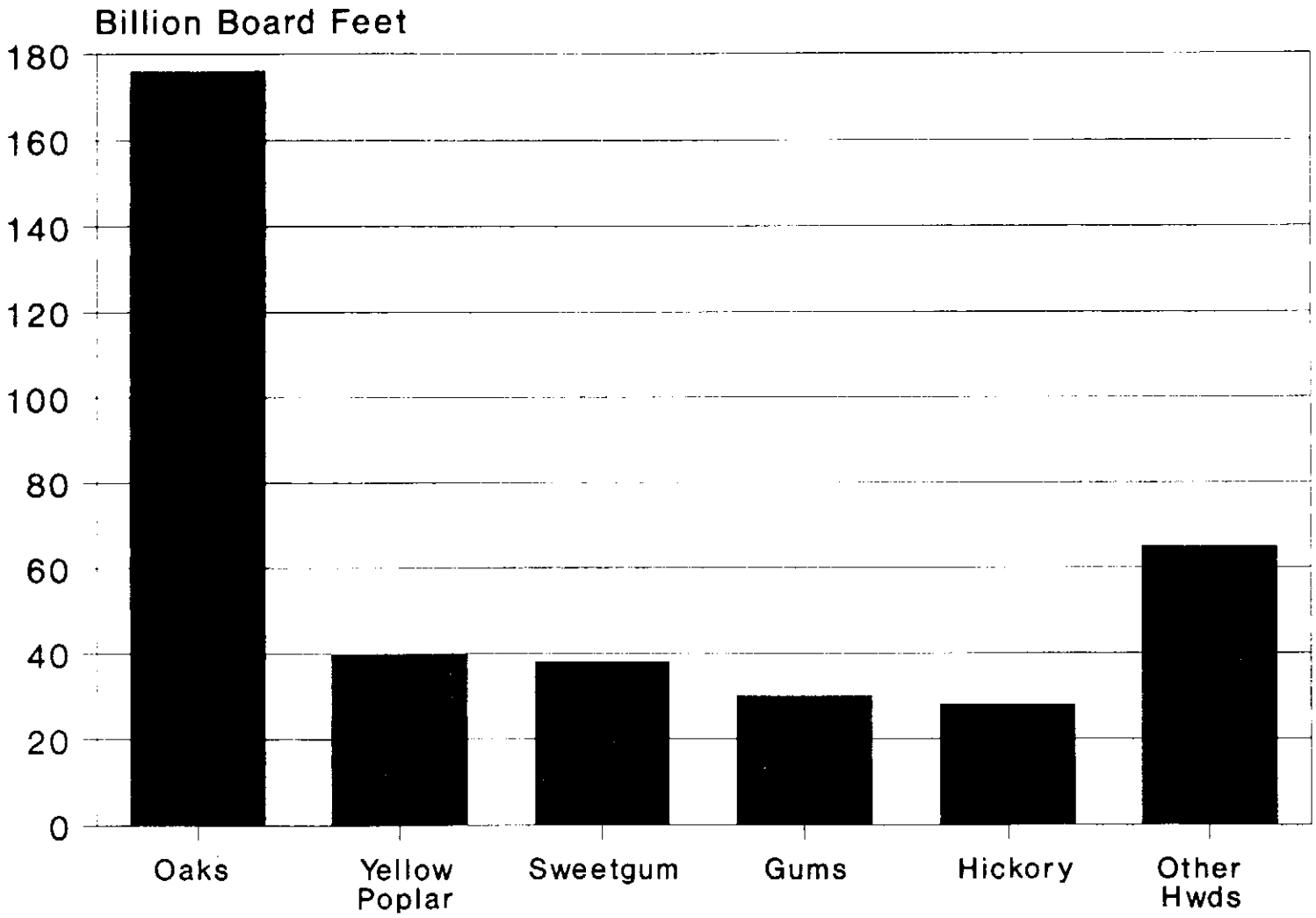

Figure 4. Hardwood Sawtimber Volume by Species.

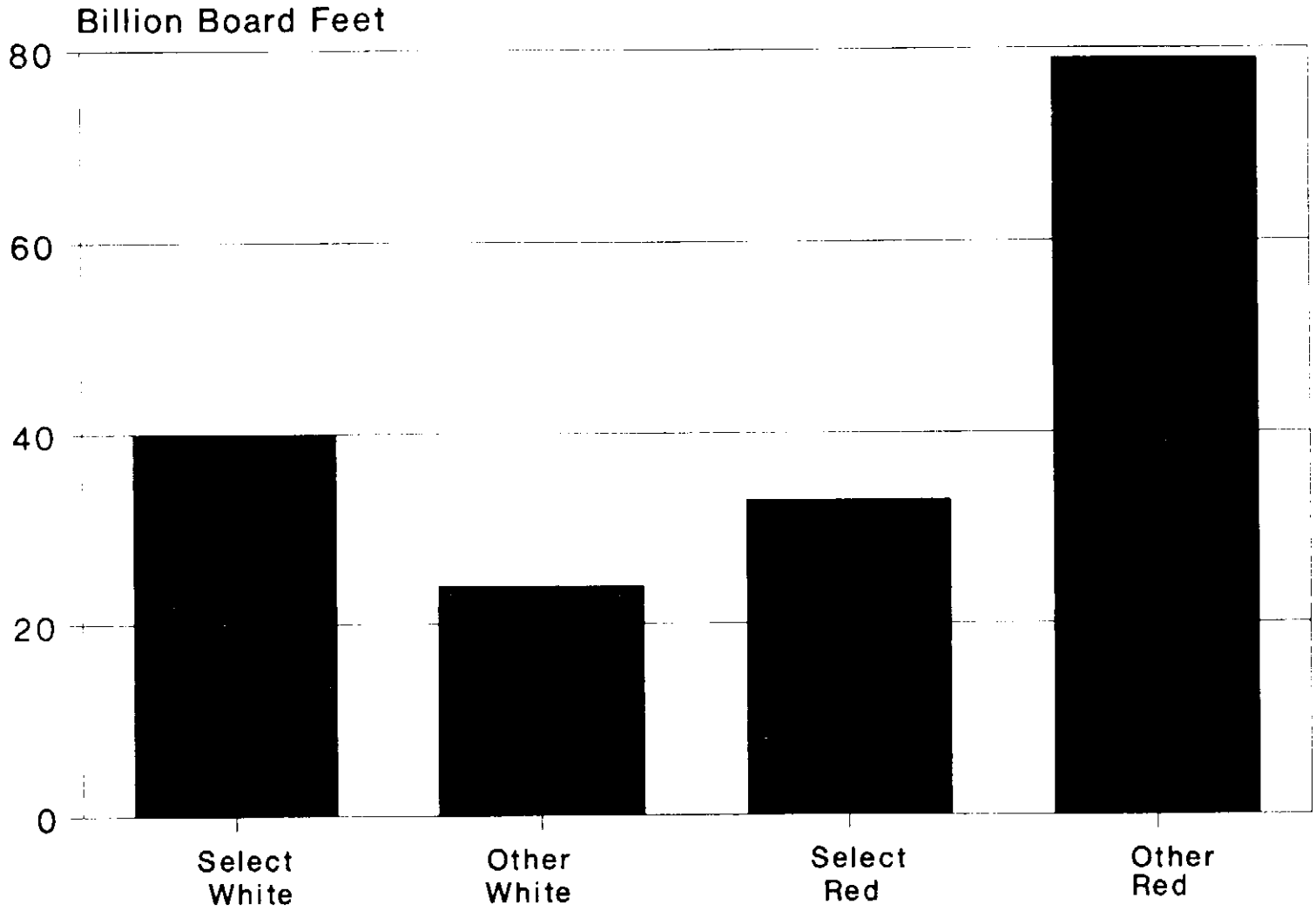

Figure 5. Oak Sawtimber Volume by Species.