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# The Future of the Douglas-fir Region Forest Economy: Potential Development Under Changing Public Policies and Private Resources

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## The Future of the Douglas-fir Region Forest Economy:
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Over the next two decades, the Douglas-fir region faces an array of changes in timber supply structure that will markedly effect the future development potential of its forest products economy.[1] In the private sector, supplies from industrial and nonindustrial lands will follow divergent paths. Industrial timber inventory, which has declined steadily since the inception of harvesting, will reach its nadir, and the concentration of both inventory and cut will shift from older stands of natural origin to younger, smaller, managed stands. This transition will likely entail a reduction in harvest. In contrast, nonindustrial inventories have been stable to rising over the past four decades and harvest is nearing peak post-WWII levels. The key concerns for this owner group are its willingness and, to a lesser extent, its ability to sustain these higher harvest levels. On public lands, the growing significance of non-commodity values and preservation of biological diversity in management objectives will almost certainly lead to some harvest reduction. The ultimate extent and exact timing are not at all clear, but the effect will be to amplify the impacts of reductions in industrial cut. In the longer term, public harvest policies remain a critical factor but the industrial outlook is essentially reversed. With the maturation of large areas of managed timber, growth and merchantable inventory on industrial lands will expand, setting the stage for a resurgence in harvest.

This paper examines the development prospects of the Douglas-fir region forest sector over the next fifty years. The analysis highlights the age class and management transition on industrial timberlands, harvest potentials on nonindustrial ownerships, and levels of public harvest as prime sources of uncertainty in both the near and longer term outlook for the region. The next sections give an overview of the regional forest industry, current resource conditions, and potential sources of variation in future public harvest levels. Subsequent sections present specific projections of the region's future and a discussion of the results.

### Developments in the Processing Industries

Like most western regions, output of the solidwood products industries (lumber and plywood) in the Douglas-fir region has fluctuated with periodic construction cycles but has shown essentially no trend since the mid-1960's (see the left portion of Figure 1). Growth in U.S. consumption over the past two decades has been met by the South in the case of plywood and by the South and

Canadian imports in the case of softwood lumber.[2] The region's share of aggregate national and virtually all regional markets has fallen steadily, even in the West. These trends are a reflection of the region's high production costs relative to its key North American competitors. As a result of increases in both delivered wood and non-wood costs, the region emerged as high cost lumber and plywood producer in North America in the early 1970's. The recession of 1980-82 brought a sharp drop in delivered wood costs due both to declining stumpage prices and reduction in log and haul costs. This helped to narrow the cost differential with the South but did little to overcome the strong wood cost advantage of interior British Columbia in the case of lumber. Reductions in work force and improvements in recovery efficiency have acted to lower non-wood costs as well, but the region remains the high cost producer in both lumber and plywood.

Historical trends in fiber products output are illustrated in Figure 2. Over the past three decades paper and board production has risen steadily, due in part to the expanded integration of paper and board facilities with pulping operations. The fraction of pulp shipped as market pulp has fallen as a result, averaging 600,000 tons per year or roughly 10 percent of regional output in the 1980's. Growth in paper and board output slowed somewhat during the 1970's but rose again significantly in the 1980's. Major increases have come in newsprint and unbleached kraft (linerboard and packaging) grades, with stable to declining output in fine and other papers.

The sharp increase in regional pulp output and capacity during the 1960's was based on exploitation of a large pool of unused residues from solidwood production. With utilization nearing practical upper limits by the early 1970's, and with strong demand for chips in the export market, producers turned to alternative fiber sources. Wastepaper consumption has increased substantially, approaching 900,000 tons per year. Firms have also sharply expanded use of roundwood, chipped in the woods or other remote locations and shipped to the mill. In the late 1960's, roundwood received and chipped at the mill comprised roughly 27 percent of wood fiber input and mill residues the remainder. By the late 1980's, roundwood processed at the mill had fallen to 10 percent, residues to 70 percent, and roundwood chipped off-site had grown to 21 percent of wood consumption. The bulk of this material is cull old-growth or other logs derived from sawlog harvesting operations. While the wood volumes involved are substantial, perhaps 175 million cubic feet SWE per year, these removals are not reflected in published reports of timber harvest since they are cull or non-sawlog quality.

Log exports have comprised the most significant growth sector of the Douglas-fir region forest economy since the mid-1960's, consuming some 20 percent of total regional harvest by 1980. After the peak levels of the late 1970's, log exports from the Douglas-fir region fell in the 1980-82 recession and subsequently recovered to all time high levels in 1988 (see Figure 3). Despite the sharp drop in volumes in the early 1980's, export prices did not fall as rapidly as domestic prices and exports remained a key revenue source for some regional firms during the recession. In the recovery, the export market has changed in several important ways. The People's Republic of China has emerged as the second largest importer, taking in excess of 30 percent of volumes shipped in the late 1980's. The PRC generally purchases a lower quality log assortment than the Japanese. In recent years, the quality structure of the C-sort may be a rough approximation of the quality range of logs used in domestic mills. The quality difference is reflected in the prices of C-sort logs which averaged 10-20 percent below the J-sort during the early 1980's, falling to some 40-50 percent below since 1985. This relative price shift is in part a reflection of the increasing scarcity of higher quality logs for the J-sort. Old-growth logs, which accounted for as much as 70 percent of exports during the 1970's, today may comprise as little as 10 percent of export volumes. Japanese purchasers have paid a growing premium for the remaining higher quality grades despite the overall drop in average log quality.

## Resource Conditions and Harvest Trends

With the exception of the Depression years, harvest in the Douglas-fir region has expanded steadily since the early days of settlement, reaching its all time peak in the building boom period of the early 1970's (see Figure 4). Growth after 1950, however, was due almost entirely to increasing cut on public lands. The following sections provide detail on harvest trends and inventory conditions on both private and public ownerships.

### Private Lands

Timber harvest from private land in the Douglas-fir region has shown considerable historical variation between industrial and nonindustrial ownerships. After a sharp rise and peak in the late 1920's, and a further peak in the early 1950's, industrial cut has been stable to declining with much cyclical variation. Nonindustrial harvest shared the same early behavior but by 1980-85 had declined

to roughly half of its level in the 1950's. Harvest detail by owner group is shown in Figure 5 for the period since 1950.

Past harvest behavior is clearly reflected in the age class structure of both private inventories and harvests in the early 1980's (see Table 1). Industrial cut has remained relatively stable since the mid-1960's. Old-growth stands have been almost entirely harvested, more than three-quarters of the inventory is less than 50 years of age, and natural origin second-growth (from harvests prior to World War II) provides the bulk of the current cut. Nonindustrial lands also have little remaining old-growth, but declining cut over the past three decades has left a larger portion of the land base in second-growth and a smaller portion in stands less than 50 years. Cut is about evenly split between the two oldest classes.

As harvest has proceeded on private lands, aggregate timber growth has expanded. The trend in net stock or inventory position varies with the growth/drain balance of the specific owner group. This is illustrated by the inventory data in the left portion of Table 2. For industrial inventories, growth is rapidly approaching cut and the annual rate of inventory reduction has steadily declined. On nonindustrial lands, inventory trends are strongly influenced by changes in the land base. The bulk of private forest lands shifting to agricultural, urban or other non-forest uses in the region comes from the nonindustrial category. Losses from this ownership have occurred continuously, with some cyclical variation in rate, over the time span shown in Table 2. Adjusting for area shifts, i.e., expressing inventory on a per unit area basis, nonindustrial inventories have increased steadily since the early 1950's.

These observations suggest a conservative view of future timber supply prospects for private lands in the Douglas-fir region, at least in the near-term. With insignificant volumes of residual old-growth and an highly imbalanced distribution of inventory between submerchantable and young-growth age groups, industrial ownerships may be unable to sustain recent rates of harvest. At the same time, the potential for substitution from nonindustrial lands must be viewed as uncertain. The decline in nonindustrial harvest in the three decades prior to 1980 (depicted in Figure 5) occurred despite rising real timber prices and per acre inventories. Though the exact causes are not known, the growing diversity of objectives for holding timberland among nonindustrial owners and their declining dependence on timber harvest as a source of income may have contributed to this trend. In

contrast, data since 1985 show nonindustrial harvest rising well above trend levels. This shift may reflect a rather sudden change in owner attitudes toward timber sales and/or expanded stumpage acquisition efforts by mills, as industrial and public supplies grow increasingly limited. It is not clear, however, if this upswing in harvest will continue.

In the longer term, the large areas of immature timber on industrial lands should provide a basis for sustaining harvest as they grow to merchantable sizes. Harvest potential will also depend on changes in the forest land base and the rate and form of investment in timber management. Table 3 gives historical and projected areas of softwood types in private ownership together with a detailed breakdown of the management status of these lands. It is estimated that the aggregate private timberland base in the region will fall by some 75,000 acres during the decade of the 1980's. Roughly one-third of the loss from nonindustrial holdings will be acquired by industrial owners.

The limited data available indicate that a substantial portion of natural origin stands on industrial lands will have been converted to some form of intensive management by 1990. The impact of these changes on future harvestable volumes can be substantial. For example, in the yield relations employed in our analysis the cumulative yield difference at age 50 between mid-site Douglas-fir stands receiving the most intensive form of management and those which are planted but not subsequently treated is nearly 25 percent. Of equal importance, the intensively managed stand contains a sufficiently large number of trees of merchantable size to be eligible for harvest at age 45 in contrast to age 55 for the "planted only" stand. On nonindustrial lands, investments have been smaller and the management shift in the last decade far less marked (Table 3).

**Public Lands**

Historical harvest by broad classes of public ownership is shown in Figure 5. Following World War II, strong demand for forest products and declining private harvests brought expanded markets for public timber. On the national forests, management policies shifted from the custodial posture of the inter-war years toward an active program of timber sales. National forest harvest grew rapidly as a result, more than doubling in the 15 years after 1950. By the late 1960's, harvest was approaching maximum levels under existing management plans, and Forest Service timber supply policies began to change markedly. Computation of allowable cut levels was shifted to a non-declining even-flow basis. Wilderness legislation and the expansion of undeveloped reserves removed large areas from

the harvestable base. In unreserved areas, harvest practices were modified to reduce environmental and non-commodity use impacts. Harvest has gradually declined over the past twenty years as a result.

Within the "other government" group, the Bureau of Land Management and Washington Department of Natural Resources represent the largest sources of harvest in recent years. Timber management policies on these lands are similar in many ways to those of the Forest Service, but their harvest history is highly varied. The large harvest increase seen in Figure 5 during the 1960's resulted from the expansion of timber sales activities on the O&C lands managed by the BLM in western Oregon and on Washington DNR lands. During the same period, cut on Oregon Department of Forestry lands was falling, as salvage harvesting in the Tillamook area of northwest Oregon was largely complete.

Allowable cut levels for the national forests are determined, to a first approximation, through a periodic planning process authorized by the Renewable Resources Planning Act (as amended by the National Forest Management Act). After nearly a decade in preparation, most of the plans for the forests in the Douglas-fir region are still in draft form.[3] In the aggregate, the "preferred alternatives" in these plans call for an annual sale volume of some 2.9 billion board feet.[4] Average 1977-1988 actual sale volume was 3.4 billion board feet.

Beyond the plans, the future course of national forest harvest in the region remains highly uncertain. Environmental and recreation advocates continue to pressure the Forest Service to expand its consideration of non-commodity benefits in planning and management activities. Many of the management changes proposed by these groups would act to reduce national forest harvest. Three issues merit specific attention:

(1) As a result of recent litigation, the U. S. Fish and Wildlife Service is presently reconsidering its classification of the northern spotted owl under the 1978 Endangered Species Act. Should the owl be listed as threatened, management activities will be restricted presumably through reservation of additional old-growth habitat beyond that contained in the draft plans. In place of, or in addition to, such legal developments, efforts might also be made to reserve habitat for spotted owls and an array of other old-growth dependent species either through the annual budgetary process of the agency, by

restricting roading authorization or the areas in which sales can be planned, or by direct legislation establishing reserves.

(2) Efforts will almost certainly continue to establish many of the remaining roadless areas on the national forests in the region as wilderness under the 1964 Wilderness Act, their disposition in the draft plans notwithstanding.

(3) There is growing recognition that achievement of broad environmental protection objectives for public lands may not be attainable solely through preservation. Maintenance of biological diversity and long-term site productivity will require basic modifications in methods of management even on lands designated for commercial timber production. Appropriate practices are as yet unclear, but the general effect will be to reduce harvestable volumes over the course of the rotation. In the context of even-flow harvest scheduling this will lower overall allowable harvest.

Some of the largest other government agencies face pressures similar to those confronting the Forest Service. The outcome of the current spotted owl issue, for example, will have important impacts on harvest from Bureau of Land Management lands in western Oregon. At the state level as well, agencies such as the Washington Department of Natural Resources are reassessing their old-growth and wildlife habitat policies.

## Alternative Scenarios

Projections of future trends in the Douglas-fir region industry and resource base were derived from an updated and expanded version of the Timber Assessment Market Model (Adams and Haynes, 1980; Haynes and Adams, 1985; U. S. Forest Service, 1989). We examine three scenarios derived from concerns/issues raised in the preceding discussion.

1) **High public harvest [HINF]**: assumes harvest on all public lands continues at average levels observed during the 1970's, with no reduction for old-growth habitat preservation. In light of current policy debate, this would be an optimistic view of future harvest levels. Projected harvest levels are shown in Figure 5. Assuming a stable sales program, harvest volumes gradually converge to sales levels over the next five years. The sawtimber portion of harvest, depicted in Figure 5, continues to decline, however, as larger portions of the cut come from second-growth stands.

2) **Reduced public harvest [LONF]**: assumes that national forest harvest falls by roughly 42 percent from **HINF** levels while cut from other government lands falls by 15 percent. The national forest

reduction is roughly the equivalent of changes indicated for "Alternative L" in the Forest Service's spotted owl EIS (USFS, 1988). The reduction for other government is the authors' estimate for changes that might be implemented on western Oregon BLM and Washington DNR lands. These are relatively large shifts and are intended to represent a pessimistic view of future cut. Projected harvest levels are shown in Figure 5.

3) **Increased private investment [HIMGT]**: assumes that private timberland owners expand their investment in forest management activities in response to the stumpage price increases in the **LONF** scenario. Nonindustrial owners adopt all those practices that promise to earn at least a 4 percent real rate of return as identified in a Forest Service study of investment opportunities (USFS, 1989). Industrial owners are assumed to shift still more acres into the most intensive forms of management. Trends in land area and concentration by management intensity class under this scenario are shown in Table 3. Operating on the **LONF** public harvest levels, this scenario examines the extent to which further private timber management intensification can offset reductions in public cut.

All scenarios employ the same assumptions regarding trends in demand determinants for solidwood and fiber products, non-wood production costs, technology, nonindustrial harvest response, and trade with countries other than Canada (including log exports).[5]

U.S. product demand: Growth in demand for solidwood products is limited over the course of the simulation. As the population ages, growth in real GNP slows and new housing construction is stable to declining. Consumption increments come almost entirely from increased wood use in residential upkeep and alteration, nonresidential construction, and manufacturing. U.S. lumber consumption rises to 56 billion board feet by 2040 (the 1987 peak was 50.6 billion feet). Plywood consumption returns to 23 billion square feet by 2040 (the current level is 21 billion feet) after a period of modest substitution-induced decline over the next 20 years. In the fiber products sector, consumption growth slows in line with GNP and also because of assumed increases in the use of recycled fibers. For the Douglas-fir region, pulp output is projected to grow by roughly 20 percent over the 50 year projection period.

Costs and technology: Real non-wood costs (output basis) for solidwood mills fall by less than .5 percent per year as labor productivity continues to improve and use of other materials and energy falls. Recovery (product output per cubic foot of log input) rises at roughly .1 percent year over the

fifty year projection. This is a far slower rate than observed in the 1980's due to rapidly declining future log size and quality.

Nonindustrial harvest response: To track the observed increases in nonindustrial harvest between 1985 and 1988, the timber supply relations for this owner group were augmented by increasing their response to levels of inventory. We have assumed that this is a permanent shift in behavior and all scenarios employ the augmented relations. In the absence of a complete explanation of recent harvest increments, this assumption allows an assessment of the sustainability and inventory impacts of higher harvest levels.

International markets and log exports: Canadian softwood lumber producers experience gradually rising delivered wood costs as haul distances increase and stand densities fall. The real Canadian-U.S. exchange rate is expected to change little from current levels. In export markets, the region's off-shore shipments of lumber and plywood grow very little over the projection period. Log exports fall, from the 1984-1988 average level of 3.1 billion board feet per year (1988 peak level of 3.6 billion feet) to an average of 2.5 billion board feet by 2000. Limitations in product and declining log export volumes derive from the assumption of increased competition from Canadian, southern hemisphere, and Soviet Union sources, particularly in the "low end" of the quality spectrum, and projections of continued decline in the average size and quality of exportable logs produced in the Douglas-fir region.

**High Public Cut [HINF] Results**

Projections of sawtimber stumpage prices in Figure 5 provide a useful indicator of key timber supply events in the **HINF** scenario. Stumpage prices rise rapidly in the first two decades of the projection then remain nearly constant in the remaining thirty years. With only limited volume in stands at or above minimum harvest age, industrial lands can not sustain the rates of harvest observed during the late 1980's. Harvest falls steadily (though not dramatically) through the 1990's, stabilizing during the 2000-2010 decade (Figure 5). Relative to current (1984-88 average) levels, industrial cut is 5 percent lower by 2000 (50 MMCF) and 8 percent lower (83 MMCF) by 2010. Under our assumption of increased harvest responsiveness, nonindustrial cut remains at current levels, nearly twice the trend level in the early 1980's. This increment is more than offset, however, by the combined drop in industrial cut and the downward adjustment of public harvest to long-term

levels. Total regional harvest falls roughly 6 percent below current levels by 2010 as a result (Figure 4). These supply limitations force stumpage prices upward as seen in Figure 6. Between 1990 and 2013, when prices stabilize, the average rate of increase is 2.5 percent per year, slightly less than the average growth rate from 1950 through 1988. Escalating wood costs and declining margins force capacity reductions in the solidwood sector. Lumber output falls below peak levels of the late 1980's (Figure 1) and the region's share of total national production drops from 26 percent in 1988 to roughly 22 percent by 2020. Rising regional costs coupled with weak demand lead to far larger losses in plywood. The region's share of national output falls from 44 percent in 1988 to only 28 percent by 2020.

Developments in competing North American regions have major impacts on these results. In the first decade of the projection, Douglas-fir stumpage price growth results almost entirely from constraints on timber supply within the region itself. In the period from 2000 to 2010, while regional harvest is roughly stable and aggregate private inventory is rising, significant supply restrictions are encountered on nonindustrial lands in the U. S. South. Southern stumpage prices rise rapidly, limiting the region's comparative cost advantage in both lumber and plywood, and consumers look elsewhere for cheaper products. Timber supply conditions retard the response of Douglas-fir region producers (note small increments in both lumber and plywood output during this period in Figure 1) but pressure on stumpage prices is maintained. After 2010, as large areas of young timber reach minimum merchantable harvest age in the South, timber supplies expand dramatically, stumpage prices are stabilized, and historical rising trends in Southern output continue. Competition forces similar price conditions in the Douglas-fir region, and timber harvest and product output drift gradually upward in the remainder of the projection.

In the period after 2010, adjustments to a predominantly young-growth private inventory in the Douglas-fir region are complete. Stocks on both industrial and nonindustrial lands are rising. By 2040 inventory structures are approaching something like the forester's classical regulated state, with a rotation at roughly the minimum harvest age. On industrial lands, more than 90 percent of the land base is in age classes of 50 years or less. Despite a sustained increase in harvest relative to historical levels, nonindustrial inventories end the projection with somewhat more area in 50+ year age classes than in 1980 (Table 1).

**Low Public Cut [LONF] Results**

Reductions in public harvest, relative to levels in the **HINF** scenario, should raise projected stumpage prices and stimulate some partially compensating response in private harvest. The extent and duration of this private substitution will depend on the price sensitivity of private supply and the availability of inventory above minimum harvest age. In the **LONF** simulation, private cut does expand during the years 1990-1998, offsetting on average 29 percent of the public harvest loss in this period. This increment can not be maintained, however. Private inventories (particularly the portions above minimum harvest age) drop below levels in the **HINF** simulation and, despite substantially higher stumpage prices, private cut falls below **HINF** levels. For industrial lands, projected cut in 2000 is 11 percent (110MMCF) below current levels and 14 percent (137 MMCF) by 2010. As a result, the total regional harvest reduction after 2000 is larger than the decline in public cut alone, and both industrial and nonindustrial cut remain below **HINF** levels for the remainder of the projection.

As public harvest adjusts downward during the first decade of the projection (1990-2000), stumpage price growth accelerates from roughly 2.0 percent in the **HINF** run to 4.6 percent (see Figure 6). In the face of rising wood costs, the region's competitive position deteriorates, profits fall, and solidwood output and capacity drop (Figure 1). After 2000, lumber output is fairly consistently 2.0 billion board feet below **HINF** levels. Plywood production is more variable, averaging about 1.0 billion square feet lower. Stumpage prices stabilize after 2013 at about 10 real (1967) dollars per MBF higher than the **HINF** projection. As before, price stability drives from developments in the U. S. South.

**Increased Private Investment [HIMGT] Results**

As indicated in Table 3, the basic assumptions regarding trends in management intensity have all but 28 percent of the industrial softwood base shifting by 2040 to some form of management involving treatments beyond planting. In the **HIMGT** case the lower intensity fraction drops by about half to 15 percent. On nonindustrial lands, the shift between management intensity classes is less marked but the area loss to other uses is reduced to about one third the level in the other scenarios. Projection results show regional timber harvest only 2 percent higher than the **LONF** scenario by 2040. All of this increment comes from nonindustrial lands (Figure 5). Impacts on stumpage prices

are somewhat more substantial, 2040 levels falling by 5 percent below **LONF** levels. Increments in product output are discernable but limited (see Figure 1).

From a timber supply standpoint, the most important shifts in management intensity involve reductions in minimum harvest age. While some lands can be shifted to more intensive management and younger harvest ages in mid-rotation, the bulk can not and enter more intensive management only as they are regenerated. Thus the combination of additional practices (and additional area) implemented here yields higher growth and inventory but only limited increments in harvest over the course of projection. Most of the harvestable volume impacts occur after 2040.

## Summary and Discussion

Six key conclusions emerge from the projections and analysis presented above:

(1) Industrial lands in the Douglas-fir region can not sustain current (1984-88 average) levels of harvest. By 2010, reductions range from 8 percent in the **HINF** run to 14 percent in the **LONF** case. After 2010, inventory accumulation may be sufficient to support a return of harvest to current levels. More than three-quarters of these future harvests, however, will come from stands 50 years of age or younger.

(2) Nonindustrial lands can sustain current harvest levels for at least the next fifty years with no reduction in aggregate inventory volumes. The projections assume, however, that the increased willingness to harvest by this owner group observed during the past five years will continue in the future.

(3) More intensive management on private lands may provide the basis for harvest expansion in the long-term but would have little or no effect on harvestable volumes in the next two decades.

(4) Real stumpage price inflation over the next two decades would, at a minimum, follow long-term trend growth (2.5 percent per year). In the period 1990-2000, price growth is driven by timber supply limitations within the region. Between 2000 and 2010, supply limitations in the U. S. South protract the period of price increase. Following 2010, prices may stabilize. In our analysis this latter result depends primarily on the realization of projected increments in softwood supplies in the U. S. South and to a lesser extent on expanding inventories and harvest in the Douglas-fir region itself.

(5) Reductions in public harvest (of the general extent and timing examined here) influence the rate of stumpage price growth over the next two decades and the level at which prices stabilize after

2010. Given the magnitude of projected expansion in Southern supplies, however, they do not influence the ultimate attainment of price stability in the long-term.

(6) With highly constrained private inventories, there is only limited opportunity for expansion of private harvest in response to reductions in public cut. By the end of the first decade following the initiation of a reduction in public harvest, total regional harvest would be lower by at least the amount of the public cut reduction.

These results present a dilemma for regional forest policy makers. Given prospective merchantability standards for timber, the biology of the region's forests, and the apparent political realities of public land management, future *timber supply* options are essentially limited to the rate and timing of reductions. If public supply is to fall, is there any way to maintain aggregate output in the near term? Feasible policy options appear to offer little promise.

Traditional forest policy tools aimed at the private sector--timber and land taxation, forest practice regulation, timber investment subsidies, and landowner information/technical assistance programs--are almost all concerned with the regeneration decision. And while the impacts of these measures may be large, their effects are one rotation away. Actions of this sort may still be valuable, particularly as a means of maintaining the region's competitiveness in the post-2010 period when Southern supplies expand sharply. But they are of little value as offsets to declining public cut in the next one to two decades.

At an early stage in the development of the Forest Service's planning process, accelerated harvests from old-growth stocks on the national forests, so-called "departures", were seen as a potential vehicle for spanning near-term gaps in private cut (see, for example, Adams and Haynes, 1982). Related alternatives would involve increased investment in intensified management or reduction in statutory rotation ages on public lands. Both changes, acting through the even-flow constraint and assuming sufficient stocks of merchantable timber, could raise current cut. Under the draft national forest plans, departures can provide only limited harvest increments. With the prospective expansion of old-growth withdrawals from the timber base, departures or departure-like actions may be effectively impossible.

A further option, raised at times in the current debate, would involve the expansion of volumes available for *domestic* processing through the restriction of log exports. In its most exacting

form, such a policy might link or "couple" reductions in public harvest directly to quotas reducing log export volumes by equivalent amounts. Lower supply and higher prices in the domestic market resulting from limitations in public harvest would be offset by reductions in the export component of stumpage demand. Even if such a scheme could work exactly as intended, and there is ample reason in theory to think that it would not,[6] pressure on the private resource would continue unabated. Short-term price and profit prospects for mills would be unchanged and long-term recovery in harvest would continue to depend on the volumes just reaching minimum harvest age on private lands. Total regional harvest would, of course, be lower by the amount of the public reduction with attendant employment and income impacts. Thus, coupled export restrictions would do nothing to augment timber supply, only redirect a reduced volume to target groups.

**Notes**

1. We define the Douglas-fir region in the traditional manner as the 38 western-most counties in Oregon and Washington.

2. On a simple linear trend basis, U. S. softwood lumber consumption grew by some 13.6 billion board feet between 1965 and 1988 while softwood plywood consumption increased on trend 6.2 billion square feet over the same period.

3. Only the Siskiyou National Forest plan is final at this writing.

4. The figure reported here is the "gross" or total product sale quantity for the first decade of the plans, including both sawtimber and other convertible products. This figure is larger than the annual sale quantity or ASQ by the amount of these nonsawtimber products and is more nearly comparable to the sale volumes usually reported by the agency. Based on agency cut and sold reports, the authors estimate that the net to gross ratio for the Douglas-fir region forests is roughly .85.

5. The macroeconomic, cost, technology and trade conditions as well as assumptions regarding management intensity and land base changes outside of the Douglas-fir region are those employed in the BASE CASE of the 1990 RPA Timber Assessment. The interested reader may consult USFS (1989) for detailed discussion of these elements.

6. Most discussion of the "coupling" option ignores quality differentials in the log market. Under a perfectly imposed scheme of quotas, where export volumes in each quality stratum are reduced by the amount of public harvest reduction in that stratum, private cut would fall in the higher quality classes and domestic prices would rise from their pre-quota levels.

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Table 1. Percent of timberland base and harvest by age group for private ownerships: figures for 2000 and 2030 from HINF scenario.

| OWNER / AGE GROUP (YEARS) | 1980 AREA | 1980 HARVEST | 2000 AREA | 2000 HARVEST | 2030 AREA | 2030 HARVEST |
|---|---|---|---|---|---|---|
| | (PERCENT) | | | | | |
| **INDUSTRIAL** | | | | | | |
| < 50 | 76.2 | 1.7 | 88.7 | 21.1 | 93.5 | 76.5 |
| 50 - 100 | 17.1 | 62.9 | 11.2 | 67.7 | 6.5 | 23.5 |
| > 100 | 6.7 | 35.4 | .1 | .2 | .0 | .0 |
| **NONINDUSTRIAL** | | | | | | |
| < 50 | 61.5 | 7.0 | 50.7 | 3.1 | 55.4 | 1.3 |
| 50 - 100 | 31.4 | 42.6 | 48.0 | 91.0 | 44.1 | 95.9 |
| > 100 | 7.0 | 50.5 | 1.3 | 5.9 | .5 | 2.8 |

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Table 2. Softwood growing stock inventories by private owner group from HINF, LONF, and HIMGT scenarios.

| OWNER | 1952 | 1962 | 1970 | 1977 | 1987 | 2000 | 2010 | 2040 |
|---|---|---|---|---|---|---|---|---|
| | BILLION CUBIC FEET | | | | | | | |
| | | | | | | | HINF | |
| **INDUSTRIAL** | 32.7 | 27.4 | 23.8 | 22.0 | 20.1 | 17.8 | 18.3 | 23.6 |
| | | | | | | | LONF | |
| | | | | | | 17.2 | 18.2 | 23.6 |
| | | | | | | | HIMGT | |
| | | | | | | 17.3 | 18.2 | 24.6 |
| | | | | | | | HINF | |
| **NONINDUSTRIAL** | 9.5 | 9.5 | 10.3 | 8.5 | 10.2 | 12.0 | 12.2 | 12.4 |
| | | | | | | | LONF | |
| | | | | | | 11.8 | 11.8 | 12.3 |
| | | | | | | | HIMGT | |
| | | | | | | 12.0 | 12.2 | 14.2 |

Table 3. Timberland base in softwood forest types (million acres) and distribution of softwood base by management intensity classes in the Douglas-fir region with assumptions for HINF, LONF, and HIMGT scenarios.

| OWNER/SCENARIO | | 1980 | 1990 | 2010 | 2040 |
|---|---|---|---|---|---|
| **INDUSTRIAL** | | | | | |
| | SOFTWOOD LAND BASE | 6.068 | 6.165 | 7.003 | 6.968 |
| | MANAGEMENT DISTRIBUTION[1] | | | | |
| | NATURAL | 60.9% | 46.4% | 25.1% | 13.5% |
| **HINF/LONF** | PLANT | 4.7% | 7.1% | 10.8% | 14.2% |
| | INTENSIVE | 34.4% | 46.5% | 64.1% | 72.3% |
| | SOFTWOOD LAND BASE | | | 7.003 | 6.968 |
| | MANAGEMENT DISTRIBUTION | | | | |
| | NATURAL | | | 23.2% | 11.5% |
| **HIMGT** | PLANT | | | 4.6% | 3.5% |
| | INTENSIVE | | | 72.2% | 85.3% |
| **NONINDUSTRIAL** | | | | | |
| | SOFTWOOD LAND BASE | 2.627 | 2.570 | 2.246 | 2.061 |
| | MANAGEMENT DISTRIBUTION | | | | |
| | NATURAL | 87.1% | 82.0% | 70.1% | 52.4% |
| **HINF/LONF** | PLANT | 1.8% | 4.2% | 8.1% | 15.9% |
| | INTENSIVE | 11.1% | 13.8% | 21.8% | 31.7% |
| | SOFTWOOD LAND BASE | | | 2.567 | 2.383 |
| | MANAGEMENT DISTRIBUTION | | | | |
| | NATURAL | | | 59.0% | 43.3% |
| **HIMGT** | PLANT | | | 9.3% | 15.0% |
| | INTENSIVE | | | 31.7% | 41.8% |

(1) Management intensities include: NATURAL, natural regeneration only; PLANT, planting only (without genetically improved stock); INTENSIVE, comprises three additional levels of management treatment including planting and precommercial thinning; planting with genetically improved stock, fertilization and PCT; and planting with improved stock, fertilization, PCT, and commercial thinning.

Figure 1. Douglas-fir region lumber and plywood output.

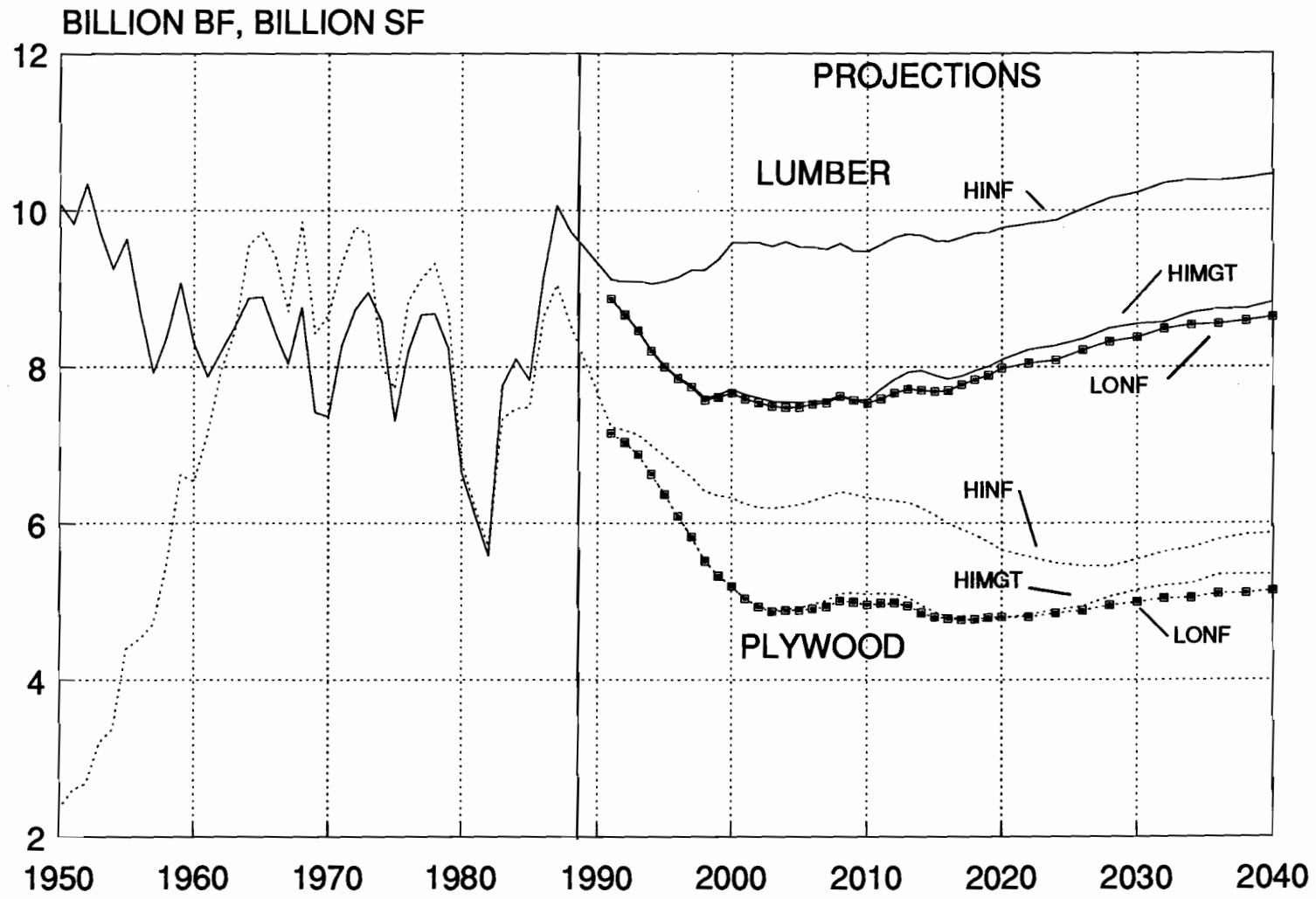


Figure 2. Douglas-fir region pulp, paper and board output.

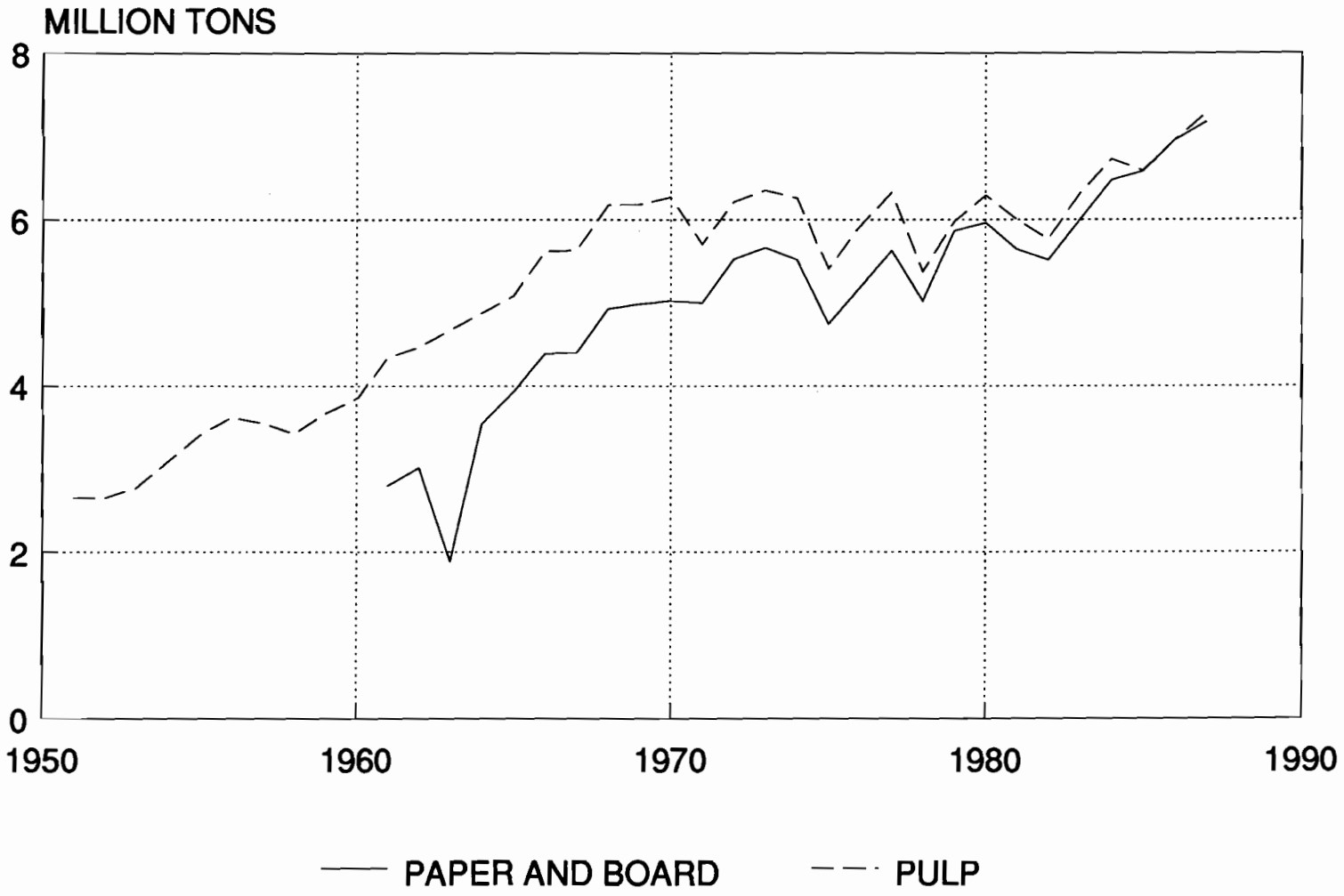


Figure 3. Douglas-fir region softwood log exports.

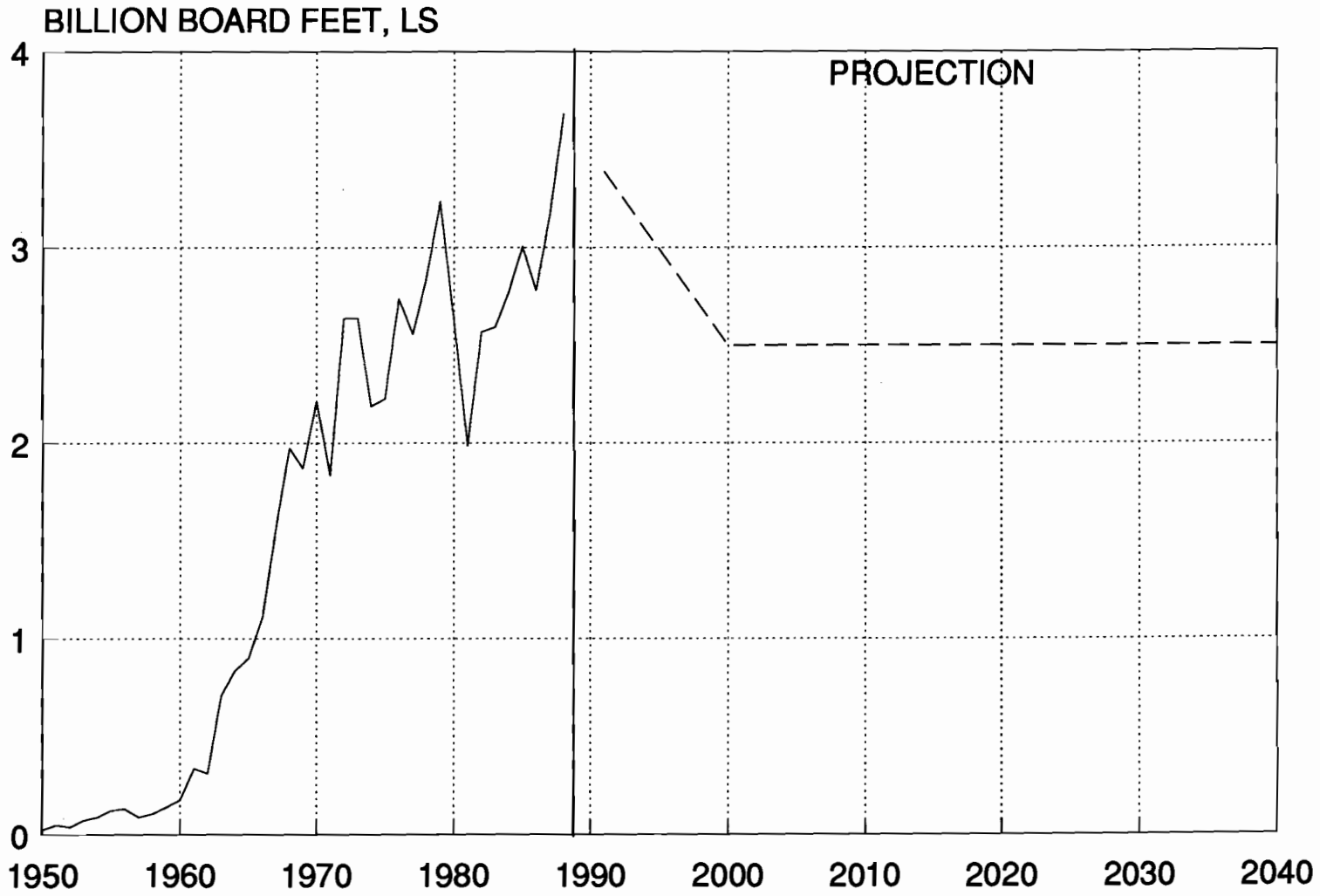


Figure 4. Douglas-fir region total sawtimber harvest.

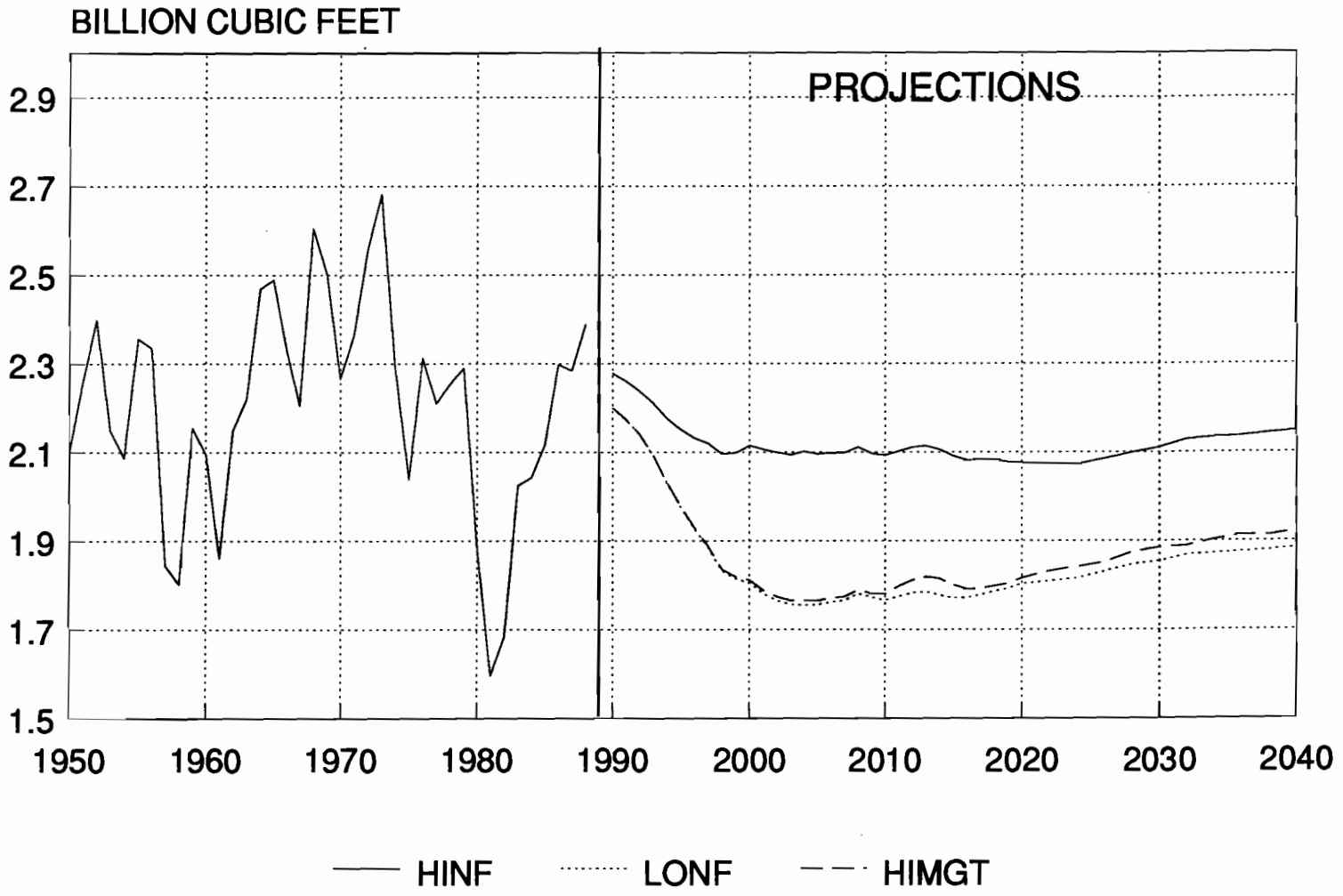
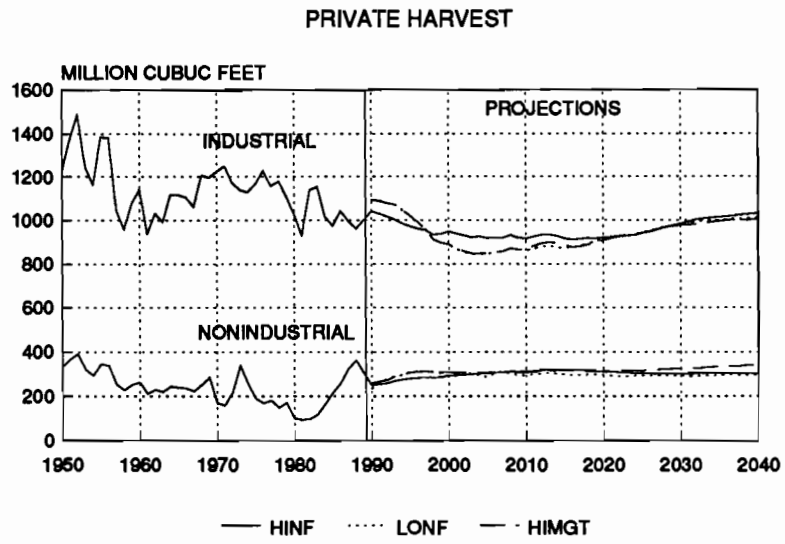


Figure 5. Douglas-fir region sawtimber harvest by ownership.



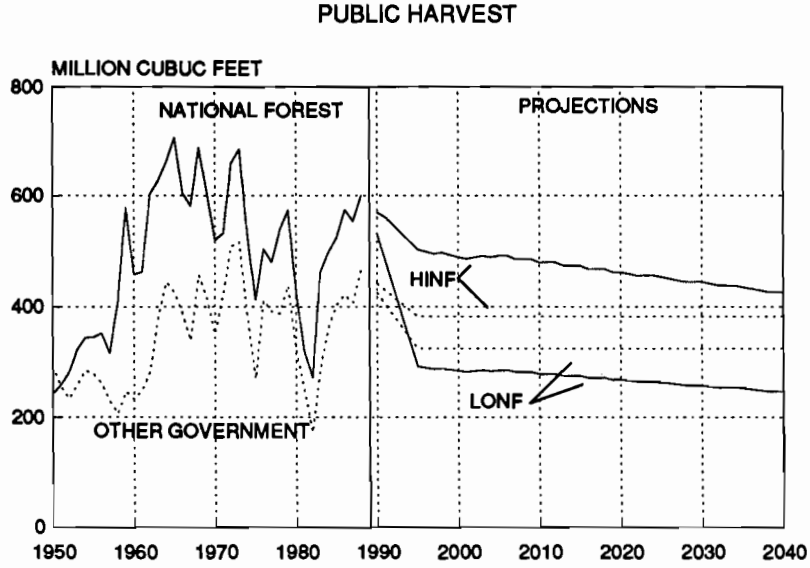



Figure 6. Douglas-fir region sawtimber stumpage prices.