Institutional Ownership of US Timberland

(Clark S. Binkley, Charles F. Raper, and Courtland L. Washburn - September 1996)
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History, Rationale, and Implications for Forest Management

Institutional investors are organizations that hold assets as fiduciaries for the benefit of others. They include pension funds, insurance companies, banks, university and other endowments, and foundations. With literally billions of dollars invested in millions of acres of timberland managed by hundreds of foresters, such investors now occupy an important position in the forestry profession.

Development of institutional investment has been intertwined with changes in pension regulations and the massive corporate restructuring of the 1980s. Most importantly, the timberlands generate respectable returns when viewed in light of their low level of financial risk, creating an economic rationale for institutional ownership. Many integrated forest products companies no longer regard owning the land they manage as a prerequisite to financial success. And institutions possess the large pools of capital and investment objectives required for large-scale ownership of timberland.

This paper discusses the history, economic rationale, and forest management consequences of institutional timberland ownership in the United States. The discussion begins with a historical review of how this form of ownership accelerated to its present level. It then reviews the economic rationale for institutional timberland investment, including a discussion of the alternative means for measuring historical timberland returns. That rationale depends on the financial diversification afforded by timberland investments, and the relatively high returns that attend these possibilities for diversification. The authors conclude that this form of ownership offers many benefits to forestry and will leave no aspect of the forestry sector and profession unchanged.

History of Institutional Ownership

Beginning in the mid-1970s, two forces combined to accelerate institutional ownership of timberland. One was passage of the 1974 federal Em-
Both hardwoods and softwoods are abundant in the Northeast. Here, a harvesting operation is nearly complete.

Employee Retirement Income Security Act (ERISA) for private pension plans, and similar state legislation for many public pension plans, endowments, and foundations. Importantly, these laws encouraged institutional investors to diversify from their traditional reliance on fixed-income securities such as government and corporate bonds. This led first to greater investment in stocks, and then extended to other assets such as commercial real estate. Direct ownership of timberland provided institutional portfolio managers with yet another opportunity for diversification.

During this same period of time, many forest products companies were reexamining the strategic role of their timberland holdings. The perception—real or imagined—that the stock market undervalued timberland made companies with large land holdings attractive targets for hostile takeovers (Zinkhan 1988). Some forest products companies also began to view the large values accumulated in their forests as a potential source of capital for investment in processing facilities (Rinhehart 1985). More efficient logging equipment and transportation systems were expanding wood procurement zones and increasing the supply of wood from noncompany lands.

Some companies decided to reduce or restructure their timberland holdings. A few spun their lands off into publicly traded master limited partnerships; others entertained the possibility of outright sales. But outright sales raised the question of who would buy the timberland. Selling timberland to a competitor would not be an attractive alternative because the selling company could lose the ability to repurchase the timber on the open market. Furthermore, many other firms were also seeking ways to reduce their investments to timberland, and were therefore not motivated buyers. Pension funds and other institutions—with vast amounts of capital and a legal mandate to diversify their investments—were thus logical buyers of this “surplus” timberland.

Investment packages were prepared, but transactions were slow to occur for several reasons. Because of their fiduciary responsibilities, institutional portfolio managers are cautious, reticent to invest in an asset they do not fully understand. Furthermore, many early offerings were structured as joint ventures with forest products companies, which at least gave the appearance of being disadvantageous to investing institutions. Third-parties were needed to provide an intermediary between buyer and seller.

The logical providers of such third-party management were some of the life insurance companies and commercial banks that, since the 1950s, had been making loans secured by timberland. Although few of these lenders held significant amounts of timberland directly, they had observed the performance of their timberland securities and become familiar with the results of direct ownership. Many of them had foresters on staff, so they had people that understood both the needs of the institutions and the investment characteristics of the timberland asset class.

A few of these firms saw a good opportunity and decided to parlay their timberland lending programs into direct timberland investment management services. Joined by some other investment management firms, they began to market their services to investing institutions and develop relationships with forest products companies.

They were eventually successful. Institutional ownership of US timberlands—particularly by pension funds—has grown rapidly during the last several years and now amounts to more than $2.5 billion (fig. 1). Although some institutions manage their timberland investments themselves, the bulk of these institutional holdings are managed by five firms on behalf of a variety of institutions, including pension funds, endowments, foundations, and insurance company accounts. Table 1 shows each firm’s share of the market and ownership as of year-end 1994.

Why Do Institutional Investors Hold Timberland?

Concern for risk tempers the institutional investor’s quest for high financial returns. Sophisticated financial models help institutional fund managers and their advisors select combi-
nations of investments that balance risk against return. Most institutional investors require that timberland be described in the same terms that financial analysts use to evaluate such conventional investments as stocks and bonds. For over a decade, forest economists have worked to provide this kind of information for timberland.

Mills (1988), Rinehart and Saint-Pierre (1991), and Zinkhan et al. (1992) chronicle the forest economists' labors. Although their research has extended recently to topics such as the informational efficiency of markets for timber and its implications for forest management practices (e.g., Washburn and Binkley 1990a, 1993; Haight and Holmes 1991; Zhang and Binkley 1994) and the use of option pricing models to value timberland assets (e.g., Zinkhan 1991, 1994; Thomson 1992), the bulk of their efforts have focused on two questions:

1. What role should timberland play in diversified investment portfolios (Mills and Hoover 1982; Conroy and Miles 1989; Zinkhan 1990; Thomson 1991)?

2. How risky are timberland investments, and what risk-adjusted rate of return should they be required to generate (Redmond and Cabbage 1988; Zinkhan 1988; Thomson 1989; Washburn and Binkley 1990b)?

Measuring timberland returns. Answering these questions is complicated by the fact that there is no continuous, centralized auction market such as the New York Stock Exchange to regularly price timberland assets and to monitor their returns. As a result, analysts have been forced to construct models of what the past performance of timberland might have been if someone had been able to observe and record the data (Washburn and Binkley 1989).

The basic approach is to estimate the value of a prototypical timberland investment (usually a normal, or fully regulated, forest consisting of an equal acreage in each age class up to some “optimal” rotation). Then the return to timberland investment can be estimated as the period-to-period change in asset value plus the net timber harvest income (see “Measuring Value” pp. 25). This procedure is analogous to the conventional method for calculating the return to a stock as the change in price plus any dividend payment.

Several approaches have been adopted to create these “synthetic” timberland investments. The simplest method asserts that the value of timberland moves with the price of timber. Then a return series can be constructed by combining the available data on timber prices with an assumption about the historical income or dividend rate for a fully regulated forest (e.g., Redmond and Cabbage 1988).

Another method accounts explicitly for the three major components of an investment in timberland: mature timber, immature growing stock, and underlying land. The value of the mature timber is measured by current timber prices. The value of the land is commonly assumed to follow the price of agricultural land (Washburn and Binkley 1990c). This is probably a good assumption for some parts of the South where a considerable amount of land can move freely between agriculture and timber production. The assumption does not suit conditions as well in such places as the Northeast, where past settlement attempts confirm that most timberland is unsuitable for agriculture, or in the Pacific Northwest, where most timberland is too steep for

![Figure 1. Market value of US timberland held directly by institutional investors.](image-url)

Table 1. Acreage and market value of US timberland managed for institutional investors (pension funds, endowments, foundations, and insurance company accounts) as of year-end 1994.

<table>
<thead>
<tr>
<th>Investment management firm</th>
<th>Acreage (thousand acres)</th>
<th>Market value (million dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>West</td>
<td>South</td>
</tr>
<tr>
<td>Forest Investment Associates</td>
<td>0</td>
<td>237</td>
</tr>
<tr>
<td>Hancock Timber Resource Group</td>
<td>469</td>
<td>1,101</td>
</tr>
<tr>
<td>Resource Investments, Inc.</td>
<td>21</td>
<td>312</td>
</tr>
<tr>
<td>Subtotal</td>
<td>490</td>
<td>1,850</td>
</tr>
<tr>
<td>Prudential Timber Investments, Inc.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wachovia Timberland Investment Management</td>
<td>0</td>
<td>201</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:** The West region includes Washington, Oregon, and California; the South region includes Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas; the North region includes the New England states and the Lake states. **Sources:** Forest Investment Associates, Hancock Timber Resource Group, and Resource Investments, Inc. kindly provided the authors with acreage and market value data. Prudential Timber Investments, Inc. and Wachovia Timberland Investment Management declined to provide similar information. The market values of timberland managed by these firms were estimated from information they supplied to Nelson's Directory of Institutional Real Estate—1996. For Prudential, this value is the sum of "assets under management" in Pru Timber Fund I and Pru Timber Fund II. For Wachovia, this value is the sum of "assets under management" in Established Growth Timberland Fund, Emerging Growth Timberland Fund, Timberland Investment Group, and Timberland Fund A. The regional distribution of value for Wachovia was also estimated from information in the Nelson's Directory that 90% of Wachovia's investments are located in the "southeastern US" and 10% in the "midwestern US."
agricultural cultivation. Valuation of immature growing stock remains problematic, but is generally assumed to follow the price of mature timber.

A third approach to calculating the return on past timberland investment is to use data from actual timberland transactions to reconstruct historic market values of a "standardized" forest investment. Washburn (1990) examined more than 2,500 timberland transactions in the South and used the hedonic pricing method to estimate the contribution of each of a parcel's characteristics to asset value. The resulting sale-price equation can be used to reconstruct what the value of any parcel would have been as it moved through time and grew.

As institutional investment in timberland has expanded, the performance of institutional holdings has come to provide a measure of the performance of the timberland asset class as a whole. The National Council of Real Estate Investment Fiduciaries (NCREIF)—a not-for-profit association of investment managers, pension plans, consultants, appraisers, and academicians that represent the institutional real estate industry—has recently begun to assemble quarterly cash return and appraisal data from several of the firms that manage timberland for institutional investors. In December of 1994, NCREIF initiated ongoing publication of the NCREIF Timberland Index, a measure of actual timberland performance based on this cash return and appraisal data (NCREIF and Frank Russell Company 1994). In a similar vein, Caulfield (1994) has used return and value information for a set of institutional timberland funds to construct a historical index of timberland performance. Although many analysts believe that such appraisal-based series of real estate returns underestimate their volatility and do not precisely capture the relationships between the performance of real estate and other assets (e.g., Miles et al. 1990), the availability of consistent, comparable measures of the returns from actual timberland properties will advance our ability to understand this class of investment.

In summary, the extant data only approximate the actual returns from timberland investments. Imperfect as these data are, they form the basis for most institutional investment in US timberlands. As a result, it is useful to review the historical returns and diversification potential implied by this information.

Historical timberland returns. To perform such a review, the authors used estimates of historical timberland returns calculated from the John Hancock Timber Index (JHTI) (Hancock Timber Resource Group 1994). The JHTI is a variation of the first method for reconstructing timberland returns described above. It assumes that forestland and timber growing stock values track a weighted average of past timber prices. The simple structure of the JHTI permits us to estimate timberland returns throughout the United States—the Pacific Northwest, South, and Northeast—from historical data on timber prices. Although there are alternatives, the JHTI is the only index available over a long period on a consistent, national basis.

Figure 2 plots the average level and volatility of annual returns estimated from the JHTI from 1960 through 1994 for timberland in the Pacific Northwest, South, and Northeast. According to the JHTI, timberland returns have been highest and most volatile in the Northwest, and lowest and least volatile in the Northeast. Returns have been of intermediate magnitude and uncertainty in the South. Thus, timberland investments in these three regions form a "capital market line" signifying a direct relationship between return level and volatility.

Moreover, because returns from timberland in the three regions have not tracked one another perfectly through time—the correlation coefficient during this period was 0.57 between timberland returns in the Northwest and the South; 0.44 between the Northwest and the North-
Measuring Value

The timberland held by most pension funds, endowments, and foundations is "marked to market." In other words, the institutions carry their timberland assets at the land's estimated market value—rather than its conventional book value—and measure their periodic returns by the "total return" method:

\[
\text{Return}_t = \frac{[\text{Net Income}_{t-1} + (\text{Market Value}_{t-1} - \text{Market Value}_{t})]}{\text{Market Value}_{t-1}}
\]

where Net Income$_t$ is the net revenue produced by the timberland during period $t$ (this formula assumes receipt at the end of the period), and Market Value$_t$ is the market value of the investment—generally estimated at least once each year by an independent, third-party appraiser—at the conclusion of period $t$. As a consequence of this procedure, unrealized gains are equivalent to realized gains, and balance sheets have no hidden values.

This approach is at great variance to conventional, generally accepted accounting principles (GAAP) used in the United States. Operationally, GAAP treats a tree farm much like a mine, and requires that companies carry assets on their balance sheets at book value. For timberland, book value equals purchase price plus any capitalized costs less timber depletion. Many forest products companies acquired their timberland years ago. Its market value has risen as a consequence of real timber price increases, inflation, and—in cases where timber growth exceeded harvest—rising timber volumes. As a result, GAAP book value understates the market value of timberland held by many forest products companies.

east; and 0.47 between the South and the Northeast—regional mixes of timberland form a "risk-efficient frontier" above the capital market line (fig. 2). In other words, the uncertainty of returns from a geographically diversified timberland portfolio has been less than the average uncertainty of its component parts. This implies that regional mixes of timberland can deliver targeted rates of return with more certainty than can be delivered by timberland in any one region alone.

To provide a benchmark to compare timberland returns with returns for other assets, the authors used the JHTI to calculate historical rates of return for a geographically diversified timberland portfolio with 40% of its value in the Pacific Northwest, 50% in the South, and 10% in the Northeast. This regional mix approximates the market basket of timberland available for investment on an institutional scale, and lies about midway along the risk-efficient timberland frontier illustrated in figure 2. It was assumed that the portfolio was rebalanced each year. Figure 3 compares the level and volatility of returns for this timberland portfolio to returns obtained from Ibbotson Associates (1994) for common stocks, 30-day US Treasury bills, corporate bonds, US government bonds (split evenly between long and intermediate term), small company stocks, and consumer price inflation during the period 1960 through 1994. Of the assets plotted, only small company stocks outperformed timberland over this period. Timberland returns have been higher than returns for common stocks and bonds.

Diversification potential of timberland. In financial analysis, risk generally refers to the variability of returns. However, investors that hold diversified portfolios of many assets are not concerned with the uncertainty of returns for individual asset classes by themselves. Rather, they evaluate the risk of an individual asset in terms of the variability it contributes when added to their already diversified portfolio.

The entire portfolio must be considered because not all assets have the same pattern of returns over time. An asset that is weakly correlated with other types of investments in a portfolio does not contribute substantially to the uncertainty of returns for a diversified portfolio, even if the individual asset itself is highly variable. And assets that are inversely correlated with other investments can actually reduce the uncertainty of overall portfolio returns.

Figure 4. The Security Market Line (1960–1994). The market portfolio consists of 35% common stock, 6% small company stock, 11% corporate bonds, 33% US government bonds (split evenly between intermediate and long-term), and 15% US Treasury bills. Sources: Timberland returns are calculated from the John Hancock Timber Index (Hancock Timber Resource Group 1994). Returns for financial assets were obtained from Ibbotson Associates (1994).
called the CAPM beta, measures the systematic or nondiversifiable risk of asset \( i \). The larger the value of beta, the greater the asset’s systematic risk. Investors expect assets with a beta of one, for example, to earn the rate of return for the overall market, those with a beta of zero to earn only the risk-free rate of return, and those with a negative beta to earn even less than the risk-free rate.

Because expected returns cannot be observed, the model must be estimated from \textit{ex post} data. Following Jensen (1969), historical risk premiums for asset \( i \) are typically regressed on contemporaneous risk premiums for the market portfolio:

\[
R_i - R_f = \alpha_i + \beta_i (R_m - R_f) + \epsilon_i,
\]

where the error term \( \epsilon_i \) is a random disturbance. Risk-free rates of return are calculated from a proxy for a riskless asset, such as US Treasury bills, and market rates of return from a proxy for the overall market portfolio.

The appropriate proxy for the market portfolio is arguable (e.g., Webb 1990). Most analyses use stock returns calculated from an index such as the Standard and Poor’s 500. In this study, the authors used a broad-based market portfolio composed of 35% common stock, 6% small company stock, 11% corporate bonds, 53% US government bonds (split evenly between long and intermediate term), and 15% US Treasury bills. The distribution of portfolio value among the asset classes was based on information in Ibbotson Associates’ 1991 \textit{US Wealth Portfolio}. No privately traded commercial real estate was included due to lack of reliable long-term data.

The intercept term \( \alpha_i \) in this final equation, called the CAPM alpha, measures the difference between the rate of return that an asset has actually generated and the rate that was justified by that asset’s level of systematic risk. If capital markets have been in equilibrium, then the value of alpha is expected to be zero. If alpha is greater than zero, then the asset has generated excess returns for its level of CAPM risk. If alpha is less than zero, then the asset has been overpriced. According to the CAPM, if capital markets are in equilibrium, when returns are plotted against risk (as measured by the CAPM beta), all assets should fall on a straight line (called the security market line).

The authors’ estimates of the CAPM for timberland and other assets—obtained by ordinary least squares estimation of the third equation—are presented in table 2 and figure 4. According to these results, timberland is a negative-beta asset. Furthermore, timberland has a positive alpha and lies substantially above the security market line. At face value, these results suggest that timberland is a “negative-risk” investment and should be required to generate even less than the return earned by a risk-free asset. The results also suggest that timberland has been undervalued, generating substantial excess returns given its low risk. These conclusions, similar to those obtained by other researchers (e.g., Redmond and Cubbage 1988), have important implications not only for institutional investment in timberland, but also for any facet of timberland investment that requires the use of a discount rate (Zinkhan 1988).

CAPM results for a nonfinancial asset such as timberland must be interpreted with caution, however. The CAPM is a single-factor model, postulating that the risk of an asset derives solely from exposure to fluctuations in returns for the overall market portfolio. The relatively low \( R^2 \) values for timberland CAPM estimates here suggest that overall market returns explain only a small proportion of the variability in timberland returns. Other factors may be “priced” by asset markets, and thus increase or decrease the “riskiness” and required return for an asset. For timberland, these additional factors include comparatively high information and transactions costs and illiquidity. Thus, there may logically be a disparity between the level of return that timberland has produced (and is expected to produce in the future) and the level the CAPM suggests.

More sophisticated asset pricing models simultaneously recognize multiple sources of asset risk. The simplest of these examines inflation and market risk together. In such a two-factor model, Washburn and Binkley (1993) demonstrate that timberland appears to be a particularly effective hedge against unexpectedly high inflation. A more complex approach, the arbitrage pricing model (Ross 1976), seeks to uncover and price all of the sources of risk for a particular asset. Although this model has been widely applied to equities (Roll and Ross 1980) and other assets

| Table 2. CAPM estimates for timberland and financial assets, 1960–1994. |
|-----------------|-------|-----|-----|-----|
| Asset           | \( \alpha \) | \( \beta \) | \( R^2 \) | \( DW \) |
| Pacific Northwest | 10.22* | -0.88* | 0.14 | 1.40 |
| Southeast       | 5.89* | -0.54* | 0.15 | 0.81 |
| Northeast       | 2.60* | -0.21** | 0.09 | 0.82 |
| All regions     | 7.31* | -0.65* | 0.18 | 0.99 |
| Financial assets |      |      |      |      |
| Common stocks   | 0.00 | 1.67* | 0.85 | 2.17 |
| Small company stocks | 3.04 | 1.98* | 0.48 | 1.21 |
| Long-term corporate bonds | -0.01 | 0.87* | 0.53 | 1.85 |
| US government bonds | (50% long-term and 50% intermediate-term) | -0.01 | 0.60 | 0.42 | 1.96 |

*Indicates statistical significance at the .05 level of confidence.  
Indicates statistical significance at the .10 level of confidence.  
Sources: Timberland returns are calculated from the John Hancock Timber Index (Hancock Timber Resource Group 1994). Returns for financial assets were obtained from Ibbotson Associates (1994).
such as commercial real estate (Chan et al. 1990) and farmland (Collins 1988; Arthur et al. 1988), applications to timberland remain limited.

In sum, all or part of the apparent excess return for timberland may be accounted for by non-CAPM risk factors such as high transaction and information costs and illiquidity. The risk-adjusted discount rate for timberland investments may be higher than suggested by the CAPM. Nonetheless, institutional investors that can accept some of these non-CAPM risk factors at little cost—for instance, a large pension fund that can accommodate illiquidity of a portion of its portfolio—will benefit from owning timberland.

Conclusions
Institutional ownership of timberlands has become significant in the last decade. The observed rapid growth in institutional interest derives from a combination of increased supply of investment-grade timberland and increased demand for these same assets. Restructuring in the forest products industry drives the former, and legislative changes combined with improved analytical understanding of the financial aspects of timberlands drive the latter.

Historically, timberland has been viewed as a high-risk investment. This view derives from excessive emphasis on biophysical factors associated with growth and damage from such random agents as fire and disease. Inadequate attention has been paid to the financial aspects of the asset class.

During the last decade, forest economists have applied traditional financial economic models to timberland and have concluded that timberland provides some useful opportunities to diversify portfolios consisting of financial assets. This analysis confirms that, broadly considered, timberlands are low-risk investments in a traditional CAPM context. Ongoing research is beginning to examine whether non-CAPM risk factors for timberland—information costs, and illiquidity—might alter this conclusion.

These changes in the perception of timberlands will trigger profound changes in the forest sector and in the practice of forestry. Concerning the former, we now understand that the appropriate, risk-adjusted guiding rates of interest for timberlands may actually be lower than the yields available from financial markets taken as a whole. Virtually no economic aspect of forestry will escape this realization, from optimal economic rotations to questions of appropriate land use.

Concerning the practice of forestry, nontraditional investors in timberlands offer a new opportunity for forest stewardship. While institutional investors may impose soft cash-flow targets, forest management instructions generally focus on maximizing the asset value of the forest rather than on meeting the requirements of individual mills or supporting the idiosyncratic consumption needs of various nonindustrial forest owners.

Meeting the financial objectives outlined in this article may alter the forest sector as a whole. For example, in order to meet cash-flow constraints in times of economic downturn, forest products companies may find themselves cutting timber that is best left uncut for a period or two. This means that more timber enters the market in economic downturn than otherwise would be the case. This perverse supply response exacerbates declines in timberland profitability that always attend inward shifts of demand.

Institutional investors are apt to be a bit more patient in their timber-sales decisions. Not needing to meet hard annual cash flow targets, one would expect these owners to put less timber on the markets at times of economic downturn. This change in the supply response will, all else equal, reduce the volatility of prices and reduce the risks associated with timberland ownership.

Literature Cited


