CAMBRIDGE ASSOCIATES LLC

# TIMBERLAND INVESTING

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## ABSTRACT

1. While institutional investments in timberland remain relatively small, since the early 1990s the number of dedicated U.S.-based institutional timberland managers has doubled from six to 12 and assets under management have increased tenfold to $10 billion. U.S. timber prices have softened in recent years, as corporations have begun to divest their timberland assets, selling large blocks to Timberland Investment Management Organizations (TIMOs). This transfer of ownership represents a unique buying opportunity for timberland managers and should enhance long-term returns, as the price of timberland is a critical factor in the total return derived from timberland investments. In addition, the transfer of assets to TIMOs should support higher timberland returns going forward, since corporations tend to be more concerned with the immediate availability of raw materials than opportunistically harvesting timber at the best possible price and quality.

2. In the aggregate, global demand is projected to increase at a faster rate than supply over the next several decades. In addition, timber supply from natural forests is expected to decline, providing an opportunity for TIMOs, which specialize in timber production through plantations. The landscape for timberland investing has become increasingly global, as prices are set by global benchmarks, surplus and deficit regions are increasingly dependant on each other, and investors are influenced by both the physical location of timberland investments and the global economic environment for timber. While the dominant presence of the United States in worldwide production and consumption is likely to continue, faster-growing nations are expected to represent an increasing share of the opportunities (and risks) going forward as a result of the slowing population growth among industrialized nations and rapid growth in emerging countries. Some managers have captured these opportunities directly with investments in South America, New Zealand, and Australia.

3. From a long-term policy perspective, timberland has provided superior risk-adjusted returns[1] relative to U.S. equities over the period for which we have data, with negative correlations to U.S. equities, U.S. bonds, and public real estate. In addition, timberland has exhibited significant inflation-hedging characteristics, outperforming commodities in both high- and low-inflation environments. From January 1, 1970 through September 30, 2002, timberland[2] earned an average annual compound return (AACR) of 13.8%, a standard deviation of 14.9%, and a Sharpe ratio of 0.46, compared to an AACR of 10.6%, a standard deviation of 17.9%, and a Sharpe ratio of 0.20 for U.S. equities, as represented

[1] Historical timberland returns are based on the NCREIF Timberland Index and John Hancock Timberland Index. When comparing timberland index returns with those of other asset classes, investors should consider that a passive timberland investment alternative does not exist.

[2] The timberland market portfolio comprises 50% the value of the Southeast, 40% the value of the Pacific Northwest, and 10% the value of the Northeast.

by the S&P 500 Index. Timberland has significantly outperformed most financial assets in equity bear markets, but has either maintained its gains or delivered solid, albeit relatively lower, returns in equity bull markets. Nonetheless, timber prices remain susceptible to significant economic contractions, such as that experienced by many Asian nations in the late 1990s, as timber prices in the Pacific Northwest fell 2.7% in response to curtailed export demand in 1998.

4. Timberland returns are derived from a combination of diluted biological growth, in-growth, and active management. Diluted biological growth refers to the annual growth increment of trees net of the price paid for the land and should provide annual real returns in the range of 3% to 5%. In-growth captures the positive correlation between timber prices and tree diameter, and this component can produce annual real returns in the range of 2% to 3%. Finally, active management can add incremental return in a variety of ways, including purchasing land at depressed prices, employing new harvesting technologies, and leasing property rights. This component can be expected to add 1% to 3% in annual real returns on average. We assume that timber prices will remain flat, as we see no compelling reason why investors should expect price gains greater than inflation over the long term. Historically, total timber real returns have fallen in a range of 6% to 10% and we believe that this is a reasonable range of expectations for future long-term returns.

5. While timberland's favorable risk/reward, diversification, and inflation-hedging characteristics suggest that adding timberland to a portfolio enhances overall performance, there are some qualitative risks to consider. For example, depending on the investment vehicle, timberland can take longer to liquidate than private equity or venture capital. In addition, because of the relatively small number of timberland managers, investors can achieve only a limited degree of diversification through exposure to a relatively small number of properties, and therefore must accept a significant level of firm/fund specific risk. Timberland investments can also take a relatively long time to generate positive returns, as most institutional investments are in the form of timber plantations, which require significant levels of capital investment and high maintenance costs that may persist for years before earning any profits. Investors should also consider the risks associated with the ever-changing nature of the industry (e.g., regulatory environment).

6. There are three primary vehicles for investing in timberland: commingled funds, separate accounts, and direct investments. Commingled investments offer specified fund durations of ten to 15 years, diversified property holdings, and in some cases, general partners that will co-invest. However, commingled investments are the least flexible of the methodologies. As a result, institutions looking for greater control and willing to accept greater illiquidity and time demands may opt for separate account structures or direct investments. These vehicles allow investors to opportunistically harvest timber—ideally at the best possible price—as opposed to harvesting when capital is due to the pool

of investors. However, separate accounts have relatively high minimum commitments, while direct investing requires hiring both the financial and harvesting expertise to manage the investment, thus precluding all but the largest institutions. Investors may also investment in a publicly traded timberland REIT or Master Limited Partnership (MLP). While REITs and MLPs provide added liquidity, they have several disadvantages relative to private investments, including increased volatility and an incentive to harvest timber to maintain a high current yield, rather than opportunistically harvest to achieve the best possible pricing.

**SUMMARY**

**Introduction**

Over the last three decades, timberland investments have provided absolute and risk-adjusted returns greater than those of U.S. equities, while exhibiting negative or slightly positive correlations with most financial assets (e.g., stocks, bonds, and real estate).[1] As a result, institutional commitments to U.S. timberland assets have increased tenfold since the early 1990s and the number of dedicated timberland managers has doubled from six to 12. However, with total institutional holdings of just $10 billion, timberland remains a relatively nascent asset class that has yet to be employed by most institutional investors.

While global demand for timber products has been established and growing for several centuries, timberland as an asset class has been constrained by several industry factors. First, since the late 1800s, when U.S. forestry experts forecasted that a continuation of the rapid pace of timber harvesting would result in a timber famine by the early twentieth century, governments have regulated the harvesting of timber and protected forests. The precautionary stance has evolved over time and now includes a concern for the depletion of timber as a vital natural resource, the environmental role that timber plays in fighting greenhouse emissions, the natural habitat that forests provide, and the societal benefits of national parks and unfettered forests. Second, until recently, most of the industrial timberland was owned by paper and wood manufacturers that gobbled up large plots of timberland to support lumber and pulp production and to maximize the vertical integration of their operations. Finally, not only is nearly 30% of U.S. timberland owned by the government, but a nearly equivalent amount of timberland is owned by private individuals in small tracts of 500 to 1,000 acres each (see Exhibit 1).

Although the combination of public holdings and small private ownership leaves just 45% of timberland available for investment, corporations have recently begun to divest their timberland assets. This trend has resulted in large blocks of timberland being sold to Timberland Investment Management Organizations (TIMOs) and will likely continue as paper and wood manufacturers reduce debt and focus on core competencies. While this has contributed to soft timber prices in recent years, the transfer of ownership represents a unique buying opportunity for timberland managers and should enhance long-term returns, as the price of timberland is a critical factor in the total return derived from timberland investments. In addition, the transfer of assets to TIMOs should support higher timberland returns going forward, since corporations tend to be more concerned with the immediate availability of raw materials than opportunistically harvesting timber at the best possible price and quality.

[1] The timberland returns referenced in this report are index returns and therefore do not include fees, which may be significant. In addition, when comparing timberland index returns with those of other asset classes, investors should consider that a passive timberland investment alternative does not exist.

**Historical Performance**

From January 1, 1970 through September 30, 2002, a diversified portfolio of U.S. timberland assets achieved an average annual compound return (AACR) of 13.8% and a standard deviation of 14.9%, resulting in a Sharpe ratio of 0.46. This compares to an AACR of 10.6%, a standard deviation of 17.9%, and a Sharpe ratio of 0.20 for U.S. equities.[2] However, the timberland returns are based on a composite of timberland prices consisting of a constant blend of the Southeast (50%), Pacific Northwest (40%), and Northeast (10%) regions of the United States, with each region generating different returns.[3] For example, while the Southeast and Northeast regions both experienced an AACR of approximately 11% since 1970 with standard deviations of 9.8% and 9.0%, respectively, the two regions performed quite differently on a year-by-year basis and have significantly underperformed the Pacific Northwest, which returned 16.8% over the same period. Prices in the Pacific Northwest were inflated in the early 1990s by government restrictions that effectively reduced timber sales by 80% between 1989 and 1994[4] (see Exhibit 2). Finally, much of the performance history relies on the NCREIF Timberland Index, which is superior to other timberland return series, but may exhibit artificially low volatility due to the use of appraisal values. The NCREIF Timberland Index is also relatively narrow in scope, covering the performance of timberland properties valued at a total of approximately $3.5 billion, or just 35% of the value of institutionally owned timberland. The index has represented the portfolio holdings of just three TIMOs, Hancock Timber Resources Group, Forest Investment Associates, and PruTimber, over most of its history, and now represents the holdings of just two TIMOs, as PruTimber no longer provides data on its holdings.

In addition to its relatively high risk-adjusted performance, timberland's negative correlations with financial assets suggest that it offers significant diversification benefits when added to an investment portfolio. For example, timberland has negative correlations with U.S. equities, U.S. bonds, and public real estate and provides significant inflation hedging characteristics that are arguably equivalent to those of diversified commodity investments (see Exhibit 3). Timberland has outperformed commodities in both high and low inflation environments, while exhibiting a correlation with inflation (32%) that is nearly equivalent to that of the GSCI and inflation (31%) (see Exhibit 4). However, timberland has a slightly lower inflation beta (1.6) than does the GSCI (2.3), meaning that a 1% increase in inflation has

[2] Note: T-Bills had a historically high average return of 7.0% over this period due to high inflation in the 1970s.

[3] Historical performance is based on the performance of the John Hancock Timberland Index 1970-86 (Southeast, Northwest) and 1970-93 (Northeast); NCREIF Timberland Index 1987-present (Southeast, West) and 1994-present (Northeast). The NCREIF Timberland Index is patterned after the NCREIF Property Index for commercial real estate. Two TIMOs (Hancock and Forest Investment Associates) contribute information each quarter on appraised value, net income, capitalized expenses, and any partial sales or purchases for every property in the United States. The NCREIF Timberland Index tracks approximately 150 properties.

[4] Source: "Timberland – An Emerging Investment Alternative," William Whitaker, Robert Hess, and Willard McIntosh, Prudential Real Estate Investors, August 26, 1999.

resulted in a 1.6% increase in timber and a 2.3% increase in the GSCI, on average (see Exhibit 5). Historically, the inclusion of timberland in a portfolio has improved performance. For example, a portfolio of 45% U.S. Equities/15% EAFE/30% U.S. Bonds/5% Timberland/5% Cash outperformed a portfolio of 50% U.S. Equities/15% EAFE/30% U.S. Bonds/5% Cash by 7.5% cumulative over the period January 1970 to September 30, 2002. In other words, an initial investment of $100 in a portfolio including timberland would have grown to $2,733, compared to $2,542 in the non-timberland asset mix (see Exhibit 7).

Since 1970, timberland has significantly outperformed in equity bear markets, but has either maintained its gains or delivered solid, albeit relatively lower, returns in equity bull markets. For example, over the periods 1973-74 and January 1, 2000 to September 30, 2002, timberland achieved cumulative returns of 86.7% and 0.4%, compared to -37.3% and -42.5% for U.S. equities. On the other hand, timberland significantly underperformed in the periods 1982-86 and 1995-99, with cumulative returns of 1.5% and 80.8%, compared to 146.1% and 251.1% for U.S. equities. However, timberland's relatively low volatility—or, more specifically, the ability to generate significant gains in favorable environments, without subsequently giving back those gains—has driven its relative outperformance over the long-term. In fact, $100 invested in timberland in 1970 would have been worth more than $100 invested in U.S. equities by 1973, a lead which timberland never relinquished and subsequently built upon, resulting in cumulative wealth of $6,911 for the timberland portfolio and $2,681 for U.S. equities by September 30, 2002.

While timberland's favorable risk/reward, diversification, and inflation-hedging characteristics suggest that adding timberland to a portfolio enhances overall performance, there are some qualitative risks to consider. Timberland remains a relatively illiquid asset class that, depending on the investment vehicle, can take longer to liquidate than private equity or venture capital. In addition, most institutional investments are in the form of timber plantations, which require significant levels of capital investment and high maintenance costs that may persist for years before a profit is earned. Finally, the ever-changing nature of the industry (e.g., regulatory environment) and relative immaturity of timberland as an asset class should not be underestimated. For example, the fact that timberland has produced higher relative returns while incurring less volatility than most financial assets may be as much a testament to the lack of investor interest as it is the nature of timberland investing.

**Sources of Returns**

Entry price is a crucial factor in determining whether a timberland investment will ultimately be profitable. If a timberland manager overpays for a parcel of land, biological growth and market factors are unlikely to overcompensate enough to generate attractive total returns. However, assuming that a timberland manager has purchased the land at a fair value, returns are derived from the following factors:

**Diluted Biological Growth**

Diluted biological growth is the annual biological growth increment of trees adjusted for the amount paid to purchase bare land. For competitive offerings on North American opportunities, this figure should be in the range of 3% to 5%. Many managers present biological growth figures, which can be dramatically higher—as high as 11% to 13% in some cases. Because there is a direct correlation between the speed at which trees grow on a site and the price of the bare land, diluted biological growth is a more telling measure of investment return than biological growth.

**In-Growth**

In-growth represents the value of an individual log related to its potential uses. Value increases with tree size, compounding the benefits of biological growth. As trees grow into larger size classes, their value increases on a per-unit basis. In other words, large diameter trees are disproportionately more valuable than small diameter trees. The value attributed to in-growth will vary by species and location, but in-growth can result in a 2% to 3% annual increase in value, on average.

**Real Appreciation in Timber Prices**

Historically, timber price increases have outpaced inflation; however, there is no compelling reason to expect that timber prices will continue to do so over the long term (e.g., the next 50 years). In fact, many managers assume a price return of 0% when estimating total expected returns going forward. However, timber is a commodity, which means that it may rise more or less than inflation over short time horizons, depending on relative supply and demand conditions and the sources of inflation. For example, a relatively tight supply of slow-growing high-quality hardwoods in the United States suggests that over the next ten years prices for this particular species will appreciate 4%, approximately twice the expected rate of inflation. On the other hand, approximately 60% of the current 1.6 billion cubic meters ($m^3$) in worldwide consumption consists of softwoods, or conifer species such as pine, and this relationship is expected to hold going forward. Softwoods generally offer more consistent wood characteristics, cheaper prices, and are the major industrial wood type for most construction applications and paper products.

**Active Management**

Timberland is still a relatively inefficient market, enabling managers to seek alpha by purchasing land at extremely favorable prices. In addition, harvesting professionals and land managers can add incremental return. The use of genetically enhanced seedlings, selective harvesting, and other technological advances can increase yields and wood quality significantly, boosting returns if the resulting improvements outweigh the implementation costs. Land managers often add income by leasing their property rights for

recreational uses (e.g., hunting licenses) and, most recently, to environmental groups seeking to curb urban sprawl. For example, Potlatch Corporation, a timberland firm in Washington, has agreed to sell development rights on 600,000 acres of private timberland to the Trust for Public Land (a San Francisco-based environmental group) for approximately $40 million.[5] This follows a recent trend of similar deals between paper companies and environmental groups nationwide. Finally, some timberland managers have been able to add value simply by improving the efficiency of harvesting processes, thereby reining in high operational costs. The combination of these various sources of active management can add 1% to 3% to annual returns, but unique opportunities or unforeseen risks can certainly result in added value outside that range.

**Total Returns**

Historically, timberland managers have provided total real long-term returns in the range of 6% to 10%, with the upper end accruing to managers that invest globally. Income levels can vary from year to year, but the income return has represented approximately 40% of the total return over the long term (see Exhibit 9). While timber prices tend be the wild card over short-to-intermediate periods, we assume that the historical range of total returns is an appropriate proxy for long-term expected returns, even assuming no real price appreciation over the long term. However, as stated earlier, these returns are gross of investment management fees, which vary widely and have the potential to consume significant portions of value-added.

## History of Institutional Timberland Investing

While there was some institutional investment in timberland dating back to the 1960s, the passage of the Employee Retirement Income Security Act in 1974, and institutional investors' concomitant desire to diversify their portfolios, increased institutional interest in timberland. However, timberland investing remained the domain of only the largest institutions, as separate accounts provided the only access to this asset class.

By the early 1980s, using their lending relationships with forest products companies as an entry point, several large banks and insurance companies (e.g., Hancock, Prudential, Wachovia) had expanded their lines of business to become TIMOs and acquire properties from forest product companies. These TIMOs began marketing their timberland investment expertise to pension funds, endowments, and foundations. Over the years, individuals with experience at some of the early TIMOs have broken off to establish their own organizations, creating a recent proliferation of new timberland managers. However, the overall number of timberland investment managers remains small.

[5] Source: "Saving Private Wildlands," Jim Carlton, *The Wall Street Journal*, November 13, 2002.

**Current Investment Environment**

Due to the higher than average supply of timber properties for sale, industry sources characterize the current timberland environment as the strongest buyers' market in the past five to seven years. As of November 2002, Forest Capital Partners estimated that there were roughly four million acres, or $4 billion, of timberland available for sale in the market. As a result, forestland valuations have declined over the past two to three years.

The overhang of timberland is a result of two factors. First, forest product companies have been chronically frustrated with the low market values assigned to their timberland holdings and have been able to secure sufficient timber supply through outsourcing. By selling off timberland, forest products companies can in turn use proceeds to engage in stock buybacks, debt reduction, and infrastructure modernization. Second, several of the major forest product companies have consolidated over the last two years (e.g., International Paper acquired Champion, Weyerhaeuser bought Willamette). The resulting combined entities are divesting non-core timberland holdings from their balance sheets.

In addition to prices falling because of supply-side factors, global demand for timber has been relatively weak over the past two years. While timberland outperformed financial assets during recessionary periods since 1970, when our return series begins, timber prices remain susceptible to significant economic contractions. For example, the economic malaise experienced by many Asian nations in the late 1990s curtailed U.S. export demand, resulting in a 2.7% price decline in the Pacific Northwest in 1998 and a supply glut that softened prices in other U.S. regions. However, there is not a consistent, one-to-one correlation between timber prices and timberland prices, as other factors (e.g., government restrictions) can affect this relationship. For example, in the Pacific Northwest, log prices are currently off 40% from their historical peak in 1994, while timberland prices are down roughly 10% to 15% from 1994 levels.[6]

**Global Timber Economics**

In 1997, total worldwide production of timber was 3.4 billion $m^3$, which was divided between fuel wood (1.9 billion $m^3$) and industrial round wood (IRW, 1.5 billion $m^3$).[7] Timberland investment companies generally focus on the production of IRW through the management of timberland plantations, which currently account for approximately 20% of the IRW supply. Looking forward, Prudential Real

[6] Sources: Timber Mart-South, Resource Information Systems, and Forest Capital Partners.

[7] Source: "Long-Term Changes in Location and Structure of Forest Industries," M. Bazett, Global Vision 2050 for Forestry, World Bank/WWF Project, January 2000. Throughout the Global Timber Economics section of this report, unless cited otherwise, the regional data used comes from this World Bank/WWF (WB/WWF) publication.

Estate Investors estimates that plantations could represent nearly 50% of total IRW supply by 2050. However, overall plantation production figures include that of national governments, which subsidize and regulate plantations in many countries, in addition to TIMOs. North and Central America (39%), Asia (21%), and Europe (20%) account for 80% of total global consumption of industrial wood and produce an almost equal share of total supply, 77%.

Industrialized countries consume 71% of the world's supply of IRW and wood-based products, down significantly from 87% in 1961. The decline is due to the combined effects of slowing population growth among industrialized nations and rapid growth in emerging countries. For example, between 1961 and 1998, worldwide IRW consumption grew 0.6% annually in *developed* nations, but 3.2% annually in *developing* nations.[8] While the dominant presence of the United States in worldwide consumption is likely to continue, faster-growing nations are expected to represent an increasing share of the opportunities (and risks) going forward. For example, China's domestic IRW production (110 million $m^3$), which is exclusively maintained by high-yield plantations, falls significantly short of China's growing domestic demand. As a result, China is likely to remain a net importer of timber products and become an increasingly important factor in the growth of worldwide timber demand (and prices).

For a variety of reasons, only 50% of global forest coverage is suitable for timberland investments, according to the Food and Agriculture Organization of the United Nations (FAO). Prudential Real Estate Investors estimates that the sustainable annual supply of industrial wood from existing forests is approximately 2.5 billion $m^3$, which significantly exceeds actual production of about 1.5 billion $m^3$. Much of this disparity is the result of environmental restrictions and the extreme remoteness of significant portions of forestland. While sustainable industrial wood supply is expected to increase to 3.2 billion $m^3$ by 2030, demand is expected to increase at a much faster pace, reaching 2.7 billion $m^3$ by 2030[9] (see Exhibit 10). Although the majority of institutional timberland investments are in the United States, four TIMOs have diversified beyond U.S. borders (i.e., Hancock, Prudential, GMO, and UBS) particularly in South America, New Zealand, Australia, and Canada. In addition, China and other Asian nations are significant net importers of timber, while other nations have seen domestic production fall well behind domestic demand (e.g., Brazil). As a result, the landscape for timberland investing has become increasingly global, as prices are set by international benchmarks, surplus and deficit regions are increasingly dependant on each other, and investors are influenced by global timber economics as well as the physical location of their timberland investment.

[8] Sources: Timber Mart-South, Resource Information Systems, and Forest Capital Partners.

[9] Source: Wood Resources International, Ltd.

**North America**

While North American demand has been met domestically in the past, most industry experts believe that future demand will outstrip current supply, thus increasing the importance of specific supply regions and domestic timber plantations. Overharvesting, environmental restrictions to preserve forests and natural habitats, and higher harvesting costs have constrained natural forest production in the western United States. As a result, much of the focus has shifted from the Pacific Northwest to the southern United States, where plantations, new harvesting technologies, and a flatter topography more conducive to tree growth offer significant promise. The southern United States currently produces 250 million $m^3$ of IRW per year, an amount greater than the production of any other single country in the world. While southern production has increased significantly to accommodate for the shortfall in other regions, the USDA reported of the region in 1999, "private timberlands in the USA have the biological potential to provide larger quantities of timber on a sustainable basis than they do today."

Recent estimates suggest that total U.S. production will increase from 400 million $m^3$ today to 700 million $m^3$ in 2040, with most of the increase coming from the southern United States. This estimate is predicated on the assumption that the area of planted forests (plantations) will triple within the next 30 years. While the outlook is certainly promising, there are some hurdles to overcome in realizing this potential, most significant of which may be the high level of individual, private ownership: 20% of the timberland in the southern United States is privately owned industrial timberland, while 70% is owned by private individuals—the remaining 10% is owned by the government. This makes it particularly difficult for timberland managers to acquire large blocks of existing timberland for conversion to plantation forestry—approximately 50% of plantations established in the 1990s were on land converted from natural forest (i.e., reforestation of cleared natural forestland).

Canada provides 30% of North American IRW production and 10% of worldwide production. However, most of this forestland is covered by mature stands, thus raising the call for intensive forest management techniques to increase the long-term sustainable supply. Some believe that these techniques alone could increase the annual sustainable harvest from approximately 70 million $m^3$ to 100 million $m^3$ over the long term. Meanwhile, concerns of overharvesting have resulted in a reduction in the allowable cut from 90 million $m^3$ to 72 million $m^3$. In addition, British Columbia has increased harvesting restrictions in concert with a greater focus on the environmental and social values of forests.

**South America**

Overall, South America produces 130 million $m^3$, or 8% of the world's total IRW, despite having 25% of the world's closed commercial forests. However, much of the South American forestland is remotely located in the Amazon region, which global constituencies have increasingly fought to protect. The greatest lure to the South American region from an investment standpoint rests in the form of fast-growing hardwood plantations, which are capable of producing high-quality yields in seven- to 20-year rotations (compared to the 60 to 80 years that it takes hardwoods to grow naturally in the United States). South America appears to be one of the fastest-growing production regions with average annual production growth of 4.2% since 1961. However, much of this growth occurred in the 1970s, when production increased 8.2% per year, and has steadily declined since—the average growth rate was 2.3% in the 1980s, and just 1.7% from 1990-98.

The South American market is heavily concentrated in Brazil and Chile, which produce 65% and 15% of the region's total IRW, respectively. Brazil, which achieves much of its production through plantations that were established with government subsidies in the early 1980s, has experienced a dramatic fall-off in the establishment of new plantations as subsidies have ceased. The Brazilian Society of Silviculture has estimated that an additional 1.2 million acres of plantations per year are required to support the potential expansion of the nation's industrial sector. This signals a ripe investment opportunity for timberland management companies with established plantations in Brazil as well as those looking to diversify outside the United States, albeit the economic and political conditions in Brazil add to the complexity of such investments. Chile, on the other hand, with 3.7 million acres of long-established plantations, produces approximately 20 million $m^3$ of IRW, despite its relatively small population. This has resulted in significant timber surpluses and a burgeoning export market.

**Oceania**

This region accounts for just 2.7% of total global production, 90% of which comes from Australia (50%) and New Zealand (40%). However, Oceania is one of the few regions with a significant domestic IRW surplus, equal to approximately 40% of annual production, with much of its production serving the growing demand from neighboring Asian nations (e.g., China). While Australia has been traditionally split 50/50 between natural forests and plantations, New Zealand's production is almost exclusively from plantations (95%), though both areas support short-rotation, high-yield plantations. In fact, the combination of fertile plantation conditions and a vibrant export market has attracted some TIMOs to this region.

### Russia

Russia is covered by vast timberland, much of which is not protected or restricted by law from harvesting. However, unlike the United States, where most forestland is physically reachable, the majority of Russia's forests are so remote as to render them economically inaccessible. In addition, the transition of the former soviet state in the early 1990s and the financial hardships that ensued delivered lasting impairments to the forest industry. For example, the FAO estimates that 130 million $m^3$ of wood was felled in Russia in 1999, compared to 400 million $m^3$ in 1989. In fact, this difference alone explains the decline in global production of IRW from 1.7 billion $m^3$ in 1990 to 1.5 billion $m^3$ in 1998, as Russia now produces just 6% of global industrial wood, compared to 18% in 1990[10] (see Exhibit 12). Russia's economic challenges have also significantly curtailed its demand, which in turn has reduced total global consumption by 12%. However, industry experts believe that significant opportunities exist in the Russian market, which are unlikely to be realized without foreign capital.

## Competitive Substitutes

Substitutes for traditional wood and paper products have emerged over the last several decades, though the popularity and development of these products tends to rise and fall with timber prices. The most significant competitive threats exist in the paper, packaging, and construction lumber categories. In the late 1990s, some economic and industry experts predicted that the advent of the Internet and other forms of electronic communication would result in a near "paper-less" society, and grave consequences for the paper industry. While overall paper consumption has been slightly curtailed, the declines have been well short of expectations as the Internet actually distributes more information to more end-users, many of which print it off for consumption. In the packaging industry, the use of plastics and other packaging alternatives represent the most significant competition for pulp manufacturers. In construction, the largest threat is in the form of metal framing materials and wood composites, such as Oriented Strandboard (OSB). However, OSB, which is a substitute product for plywood, is less durable than plywood made from large saw timber. In short, while competitive substitutes exist and new ones will emerge, timber demand is likely to outstrip supply over the long term. However, timber's demand will also be affected by the quality of the wood being produced—that is, fast-rotation, *low*-quality plantation pine could make some substitute materials more competitive.

[10] Source: "Long-Term Changes in Location and Structure of Forest Industries," M. Bazett, Global Vision 2050 for Forestry, World Bank/WWF Project, January 2000.

## Implementing a Timberland Allocation

Timberland managers generally focus on a plantation strategy, though some managers harvest timber from natural regenerating timberland. (See Appendix A for a description of harvesting strategies.) There are four primary vehicles for investing in timberland: commingled investment in a timberland partnership/fund, a separate timberland account, direct investment, and investment in a publicly traded timberland REIT or Master Limited Partnership (MLP), the relative merits of which are discussed below.

### Commingled Investment

Commingled investments are the most popular choice in the relatively untapped timberland arena. This type of investment offers several advantages: specified fund durations of ten to 15 years, diversified timber holdings, and in many cases, general partners that are willing to co-invest, thus aligning the interests of investors and managers. We tend to recommend commingled managers that only offer this type of product, since managers offering both commingled and separate account products may feel pressure to allocate their highest-quality timber holdings to separate accounts with greater assets. Some of the advantages to commingled structures might be construed as relative disadvantages for institutions that can afford greater illiquidity in their allocations. For example, although timberland managers can let mature trees remain "on the stump" if prices are temporarily weak during the harvesting window (two to five years), commingled fund managers operating under a predetermined duration may be forced to cut trees in a weak price environment in order to return capital. In addition, management fees, which can include one-time land acquisition fees, annual management fees, and performance-based fees, are difficult to negotiate in a commingled structure built to appease several groups of investors.

### Separate Account

The greatest advantages of separately managed accounts, relative to commingled funds, are more flexibility and negotiating power. Not only can investors negotiate the fee structure in separate accounts (within reason), but they can also seek the best possible price by determining when they want the timber harvested. However, the more customized a separate account agreement, the more difficult it may be to find a buyer if the institution seeks an early exit—that is, it may be difficult to execute crossing trades from a separate account structure. In addition, separate accounts generally require greater commitments, and therefore may be less attractive to institutions looking to make relatively small allocations.

### Direct Investing

For institutions that can withstand the illiquidity constraints, direct investment has several advantages. Direct investment allows investors to cut timber at their discretion—ideally the best possible

price—and can therefore provide higher long-term returns relative to commingled accounts. In addition, by directly owning the property, investors reap the full benefits of outsourcing their land for additional income. However, direct investing has some disadvantages, including the greatest illiquidity of the available vehicles and full exposure to any property-specific risks or catastrophes that impair the land or harvest. In addition, direct ownership requires hiring both the financial and harvesting expertise to manage the investment and a significant dedication of internal resources that may preclude all but the largest institutions.

**REITs and MLPs**

Currently, there is just one publicly traded REIT, Plum Creek, which is listed on the NYSE, though several timber MLPs also provide investors with a public investment alternative. Although public investments provide greater liquidity, they have several disadvantages relative to private investments. For example, by their very structure, REITs create a conflict of interest between maintaining a high current yield and harvesting timber at the best possible price. Timber REITs may cut enough trees to maintain a certain yield, rather than reduce the yield to seek better prices and higher long-term total returns. In addition, REITs and MLPs are likely to be more volatile and less pure than private timberland investments as the structure of the firm and investor sentiment, in addition to the value of the underlying holdings, factor into performance. However, institutions with a need for significantly greater liquidity may find REITs or MLPs to be the vehicle of choice.

**Common Risks**

With the exception of investing in a timberland REIT or MLP, which we generally don't recommend, all forms of private timberland investments carry significant illiquidity risk. In addition, because of the relatively small number of timberland managers, investors can achieve only a limited degree of diversification through exposure to a relatively small number of properties, and therefore must accept a significant level of firm/fund-specific risk. In contrast, diversified venture capital, private equity, and private real estate programs typically include allocations to dozens of partnerships.

## Conclusion

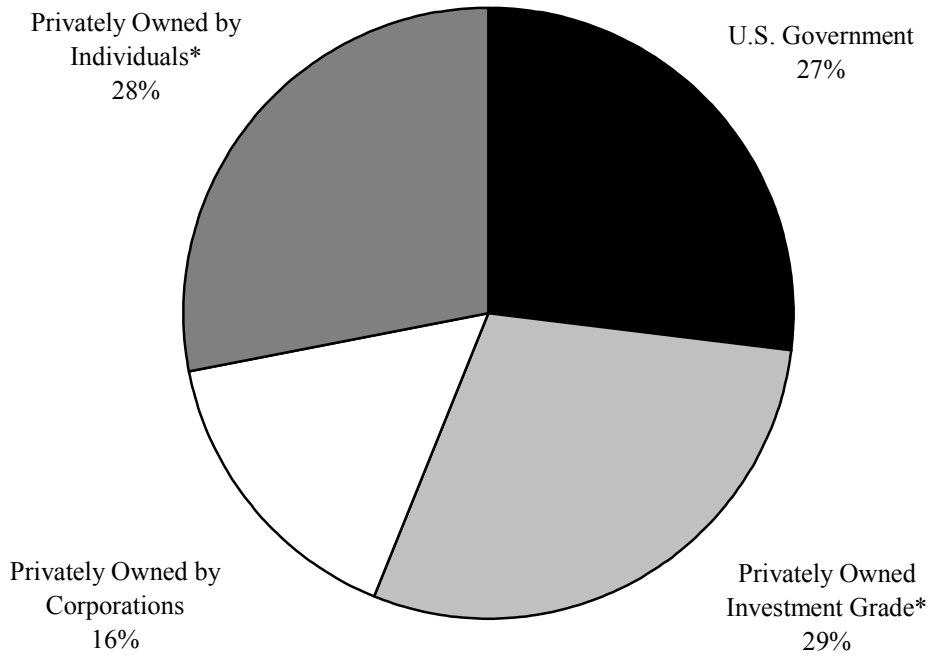
Timberland represents a compelling investment asset class with attractive risk, return, diversification, and inflation-hedging characteristics. Increasing global demand for wood products and a concomitant decline in timber supply from natural forests will provide both risks and opportunities going forward. The opportunities appear obvious, as demand growth is forecast to outpace supply growth and privately funded plantations are the strategy of choice for timberland investors. Plantations provide

relatively greater harvest control and significantly reduce the risk of government restrictions. On the other hand, plantations are capital intensive, and natural disasters or other harvest problems can saddle a potentially profitable plantation with significant losses. Furthermore, as additional investors see the forest for *more* than just the trees, timberland's efficiency and liquidity will increase, resulting in a decline in the premium for incurring these risks. However, given its relatively high barrier to entry, long duration, and favorable economics, timberland should provide attractive risk-adjusted returns over the foreseeable future.

**EXHIBITS**

**Exhibit 1**

**OWNERSHIP OF UNITED STATES FORESTLAND**




Sources: U.S. Forest Service and "Timberland Return Drivers and Investment Styles for an Asset That Has Come of Age," Jon P. Caufield, *Real Estate Finance* , Winter 1998, pp. 65-78.

*Privately Owned Investment-Grade timber represents the current holding of timber investment management organizations and other private timber harvesting corporations, while that which is Privately Owned by Individuals is considered "non-investable" due to its relatively small size (plots of 500 to 1,000 acres each) and other qualitative factors.

## Exhibit 2

## RELATIVE TIMBERLAND PERFORMANCE

**Annual Total Returns (%)**

**As of September 30, 2002**

| | Timberland Indices | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Southeast | Pacific Northwest | Northeast | Market* Portfolio | NCREIF Property Index | S&P 500 | SSB High Grade | CPI-U |
| 1970 | 4.0 | -3.7 | 4.8 | 0.9 | -- | 3.9 | 18.4 | 5.6 |
| 1971 | 14.1 | -8.1 | 6.2 | 4.1 | -- | 14.6 | 11.0 | 3.3 |
| 1972 | 18.6 | 2.7 | 6.6 | 10.8 | -- | 18.9 | 7.3 | 3.4 |
| 1973 | 25.5 | 112.1 | 11.4 | 54.7 | -- | -14.8 | 1.1 | 8.7 |
| 1974 | 16.3 | 25.2 | 25.6 | 20.7 | -- | -26.4 | -3.1 | 12.3 |
| 1975 | 1.6 | -3.9 | 20.5 | 1.1 | -- | 37.2 | 14.7 | 6.9 |
| 1976 | 17.5 | 16.4 | 7.2 | 16.0 | -- | 23.6 | 18.7 | 4.9 |
| 1977 | 32.3 | 78.1 | 11.0 | 47.1 | -- | -7.4 | 1.7 | 6.7 |
| 1978 | 31.0 | 31.3 | 14.5 | 29.4 | 16.1 | 6.4 | -0.1 | 9.0 |
| 1979 | 25.1 | 40.3 | 22.4 | 30.8 | 20.5 | 18.2 | -4.2 | 13.3 |
| 1980 | -2.4 | 14.2 | 9.4 | 5.2 | 18.1 | 32.3 | -2.7 | 12.5 |
| 1981 | 6.9 | -4.6 | 9.9 | 2.5 | 16.6 | -5.0 | -1.2 | 8.9 |
| 1982 | 3.2 | -9.2 | 3.0 | -1.9 | 9.4 | 21.4 | 42.5 | 3.8 |
| 1983 | 12.6 | -14.7 | 1.4 | 0.0 | 13.1 | 22.4 | 6.3 | 3.8 |
| 1984 | 8.4 | -4.1 | 6.2 | 3.1 | 13.8 | 6.1 | 16.9 | 3.9 |
| 1985 | -8.0 | 2.6 | 4.0 | -2.7 | 11.2 | 31.6 | 30.1 | 3.8 |
| 1986 | -3.6 | 11.3 | 6.2 | 3.1 | 8.3 | 18.6 | 19.8 | 1.1 |
| 1987 | 14.1 | 36.3 | 8.9 | 22.4 | 8.0 | 5.1 | -0.2 | 4.4 |
| 1988 | 14.0 | 71.1 | 9.8 | 36.4 | 9.6 | 16.6 | 10.7 | 4.4 |
| 1989 | 12.6 | 74.4 | 11.0 | 37.2 | 7.8 | 31.7 | 16.2 | 4.6 |
| 1990 | 13.6 | 7.8 | 8.5 | 10.8 | 2.3 | -3.1 | 6.8 | 6.1 |
| 1991 | 10.8 | 29.9 | 3.5 | 17.7 | -5.6 | 30.5 | 19.9 | 3.1 |
| 1992 | 13.1 | 60.5 | 8.3 | 31.6 | -4.3 | 7.6 | 9.4 | 2.9 |
| 1993 | 15.1 | 27.3 | 22.0 | 20.7 | 1.4 | 10.1 | 13.2 | 2.7 |
| 1994 | 20.0 | 10.7 | 14.0 | 15.7 | 6.4 | 1.3 | -5.7 | 2.7 |
| 1995 | 13.7 | 15.3 | 3.3 | 13.3 | 7.5 | 37.6 | 27.2 | 2.5 |
| 1996 | 11.5 | 8.9 | 17.6 | 11.0 | 10.3 | 23.0 | 1.4 | 3.3 |
| 1997 | 24.3 | 11.6 | 18.1 | 18.6 | 13.9 | 33.4 | 13.0 | 1.7 |
| 1998 | 10.7 | -2.7 | 34.9 | 7.8 | 16.2 | 28.6 | 10.7 | 1.6 |
| 1999 | 7.1 | 13.7 | 34.3 | 12.5 | 11.4 | 21.0 | -7.4 | 2.7 |
| 2000 | 2.3 | 8.3 | 7.5 | 5.2 | 12.3 | -9.1 | 12.9 | 3.4 |
| 2001 | -4.1 | -8.4 | -6.2 | -6.0 | 7.3 | -11.9 | 10.6 | 1.6 |
| 2002 | 0.9 | 1.1 | 6.1 | 1.5 | 4.9 | -28.2 | 13.9 | 2.4 |
| **Average Annual Compound Return (%)** | | | | | | | | |
| Since Inception | 11.3 | 16.8 | 11.0 | 13.8 | 7.0 | 10.6 | 9.5 | 4.9 |
| 30-Years | 11.2 | 19.1 | 11.6 | 14.7 | -- | 10.4 | 9.3 | 5.0 |
| 10-Years | 10.1 | 8.4 | 14.9 | 10.0 | 9.3 | 8.7 | 8.8 | 2.5 |
| 5-Years | 3.4 | 2.2 | 14.9 | 4.2 | 10.9 | -2.3 | 8.3 | 2.5 |
| **Standard Deviation** | | | | | | | | |
| Since Inception | 9.8 | 29.7 | 9.0 | 14.9 | 6.4 | 17.9 | 11.1 | 3.2 |
| 30-Years | 10.2 | 30.2 | 9.3 | 15.3 | 6.4 | 18.7 | 11.5 | 3.4 |
| 10-Years | 8.8 | 10.0 | 13.1 | 8.1 | 4.5 | 21.9 | 10.3 | 0.7 |
| 5-Years | 5.7 | 8.8 | 18.4 | 7.0 | 4.4 | 23.9 | 8.8 | 0.8 |

Sources: Bureau of Labor Statistics, Hancock Timber Resources Group, National Council of Real Estate Investment Fiduciaries, Salomon Smith Barney, and Standard & Poor's.

Notes: Timberland Index represents the John Hancock Timberland Index 1970-86 (Southeast, Northwest) and 1970-93 (Northeast); NCREIF Timberland 1987-present (Southeast, West) and 1994-present (Northeast). Salomon Smith Barney High Grade Bond Index represents Salomon Brothers High Grade Corporate Bond Total Rate of Return Index 1969-79 and Salomon Smith Barney High Grade AAA-AA Long-Term Corporate Bond Index 1980-Present.

*Market portfolio is 50% of value in the Southeast, 40% in the Pacific Northwest, and 10% in the Northeast.

## Exhibit 3

## CORRELATION OF RELATIVE TIMBERLAND PERFORMANCE

### January 1, 1970 - September 30, 2002

| | Timberland Indices | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Timberland Indices | Southeast | Pacific Northwest | Northeast | Market Portfolio* | NCREIF Property Index** | S&P 500 | SSB High Grade Bond Index | CPI-U | GSCI |
| Southeast | 1.00 | | | | | | | | |
| Pacific Northwest | 0.54 | 1.00 | | | | | | | |
| Northeast | 0.30 | 0.12 | 1.00 | | | | | | |
| Market Portfolio* | 0.76 | 0.96 | 0.25 | 1.00 | | | | | |
| NCREIF Property Index** | 0.07 | -0.28 | 0.30 | -0.16 | 1.00 | | | | |
| S&P 500 | -0.11 | -0.16 | 0.10 | -0.15 | 0.16 | 1.00 | | | |
| SSB High Grade Bond Index | -0.43 | -0.26 | -0.47 | -0.37 | -0.29 | 0.35 | 1.00 | | |
| CPI-U | 0.27 | 0.28 | 0.21 | 0.32 | 0.52 | -0.20 | -0.47 | 1.00 | |
| GSCI | 0.29 | 0.45 | 0.03 | 0.45 | 0.08 | -0.26 | -0.27 | 0.31 | 1.00 |

Sources: Bureau of Labor Statistics, Hancock Timber Resources, National Council of Real Estate Investment Fiduciaries, Salomon Smith Barney, Standard & Poor's, and Thomson Datastream.

Notes: Timberland Index represents John Hancock Timberland Index 1970-86 (Southeast, Northwest) and 1970-93 (Northeast); NCREIF Timberland 1987-present (Southeast, West) and 1994-present (Northeast). Salomon Smith Barney High Grade Bond Index represents Salomon Brothers High Grade Corporate Bond Total Rate of Return Index 1969-79 and Salomon Smith Barney High Grade AAA-AA Long-Term Corporate Bond Index 1980-Present.
* Market portfolio is 50% of value in the Southeast, 40% in the Pacific Northwest, and 10% in the Northeast.
** NCREIF data begins January 1, 1978.

## Exhibit 4

## HISTORICAL NOMINAL RETURNS AND INFLATION

**Investing in a High Inflation Environment**

| Calendar Years | CPI-U | S&P 500 | LB Govt/Credit Bond Index | MSCI EAFE Index | Real Estate | GS Commodity Index | Change in Crude Oil Price | Timberland Index |
|---|---|---|---|---|---|---|---|---|
| 1973 | 8.7 | -14.8 | 2.3 | -14.9 | 9.3 | 75.0 | 184.0 | 54.7 |
| 1974 | 12.3 | -26.4 | 0.2 | -23.2 | 8.8 | 39.5 | 10.4 | 20.8 |
| 1975 | 6.9 | 37.2 | 12.3 | 35.4 | 8.3 | -17.2 | 0.0 | 1.1 |
| 1976 | 4.9 | 23.6 | 15.6 | 2.5 | 8.5 | -11.9 | 24.6 | 16.0 |
| 1977 | 6.7 | -7.4 | 3.0 | 18.1 | 10.7 | 10.4 | 6.8 | 47.1 |
| 1978 | 9.0 | 6.4 | 1.2 | 32.6 | 16.1 | 31.6 | 0.0 | 29.4 |
| 1979 | 13.3 | 18.2 | 2.3 | 4.8 | 20.5 | 33.8 | 118.9 | 30.8 |
| 1980 | 12.5 | 32.3 | 3.1 | 22.6 | 18.1 | 11.1 | 16.9 | 5.2 |
| 1981 | 8.9 | -5.0 | 7.3 | -2.3 | 16.6 | -23.0 | -7.9 | 2.5 |
| AACR | 9.2 | 5.0 | 5.1 | 6.6 | 12.9 | 12.8 | 28.9 | 21.8 |

**Investing in a Low Inflation Environment**

| Calendar Years | CPI-U | S&P 500 | LB Govt/Credit Bond Index | MSCI EAFE Index | Real Estate | GS Commodity Index | Change in Crude Oil Price | Timberland Index |
|---|---|---|---|---|---|---|---|---|
| 1982 | 3.8 | 21.4 | 31.1 | -1.9 | 9.4 | 11.6 | -8.6 | -1.9 |
| 1983 | 3.8 | 22.4 | 8.0 | 23.7 | 13.1 | 16.3 | -7.3 | 0.0 |
| 1984 | 3.9 | 6.1 | 15.0 | 7.4 | 13.8 | 1.1 | -11.0 | 3.1 |
| 1985 | 3.8 | 31.6 | 21.3 | 56.2 | 11.2 | 10.0 | -0.4 | -2.7 |
| 1986 | 1.1 | 18.6 | 15.6 | 69.4 | 8.3 | 2.0 | -31.7 | 3.1 |
| 1987 | 4.4 | 5.1 | 2.3 | 24.6 | 8.0 | 23.8 | -7.0 | 26.5 |
| 1988 | 4.4 | 16.6 | 7.6 | 28.3 | 9.6 | 27.9 | 3.3 | 30.1 |
| 1989 | 4.6 | 31.7 | 14.2 | 10.5 | 7.8 | 38.3 | 26.4 | 37.4 |
| 1990 | 6.1 | -3.1 | 8.3 | -23.4 | 2.3 | 29.1 | 30.5 | 11.1 |
| 1991 | 3.1 | 30.5 | 16.1 | 12.1 | -5.6 | -6.1 | -32.8 | 20.3 |
| 1992 | 2.9 | 7.6 | 7.6 | -12.2 | -4.3 | 4.4 | 2.9 | 37.3 |
| 1993 | 2.7 | 10.1 | 11.0 | 32.6 | 1.4 | -12.3 | -27.8 | 22.4 |
| 1994 | 2.7 | 1.3 | -3.5 | 7.8 | 6.4 | 5.3 | 23.0 | 15.4 |
| 1995 | 2.5 | 37.6 | 19.2 | 11.2 | 7.5 | 20.3 | 12.2 | 13.8 |
| 1996 | 3.3 | 23.0 | 2.9 | 6.0 | 10.3 | 33.9 | 32.4 | 10.7 |
| 1997 | 1.7 | 33.4 | 9.8 | 1.8 | 13.9 | -14.1 | -31.4 | 18.9 |
| 1998 | 1.6 | 28.6 | 9.5 | 20.0 | 16.2 | -35.7 | -32.2 | 9.0 |
| 1999 | 2.7 | 21.0 | -2.1 | 27.0 | 11.4 | 40.9 | 112.4 | 12.9 |
| 2000 | 3.4 | -9.1 | 11.9 | -14.2 | 12.3 | 49.7 | 4.7 | 4.4 |
| 2001 | 1.6 | -11.9 | 8.5 | -21.4 | 7.3 | -31.9 | -26.0 | -5.2 |
| 2002 | 2.4 | -28.2 | 9.1 | -21.0 | 4.9 | 28.0 | 53.5 | 1.3 |
| AACR | 3.2 | 12.8 | 10.5 | 9.4 | 7.8 | 9.2 | -0.7 | 12.2 |

Sources: Bureau of Labor Statistics, Hancock Timber Resource Group, Lehman Brothers, Inc., National Council of Real Estate Investment Fiduciaries, Prudential Realty Group, Standard & Poor's, and Thomson Datastream. MSCI data are copyrighted by and proprietary to Morgan Stanley Capital International, Inc.

Notes: Real Estate data for 1973 through 1977 are Prudential's PRISA Index, 1978 through present are the NCREIF Property Index. Timberland data for 1973 through 1986 are the John Hancock Timberland Index, 1987 through present are the NCREIF Timberland Index. All 2002 data are through September 30.

088a

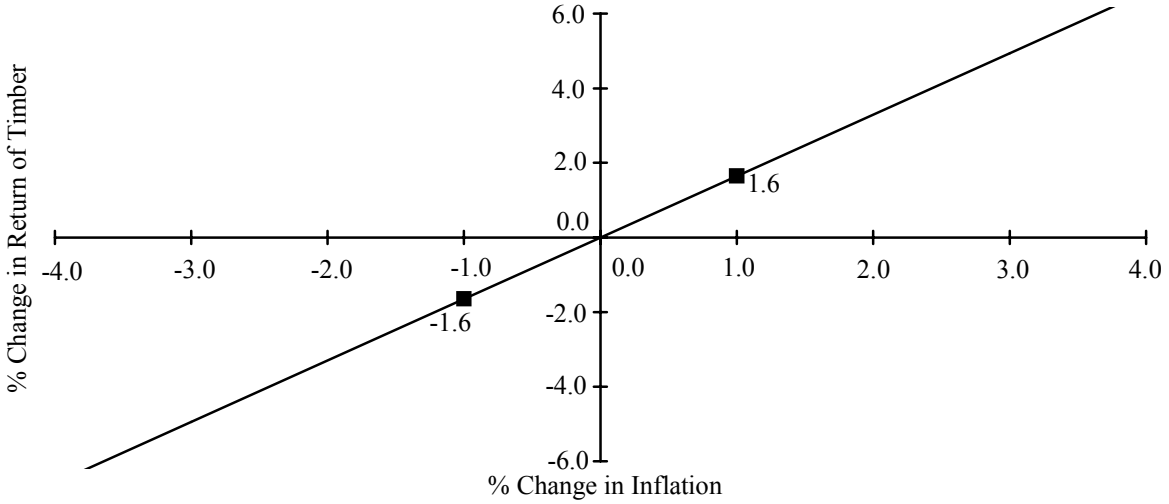
## Exhibit 5

## HEDGING AGAINST INFLATION

### Inflation Betas

### January 1, 1960 - September 30, 2002

| Asset Class | Inflation Beta |
|---|---|
| U.S. Equity | -1.0 |
| Non-U.S. Equity | -0.8 |
| U.S. Bonds | -1.1 |
| Non-U.S. Bonds | -0.2 |
| Venture Capital* | -2.0 |
| GSCI Energy | 4.5 |
| Gold | 4.4 |
| Public Real Estate | 0.1 |
| Private Real Estate | 0.9 |
| Oil & Gas | 3.7 |
| Timber | 1.6 |
| Commodities (GSCI) | 2.3 |
| Cash | 0.7 |




Sources: Bureau of Labor Statistics, Cambridge Associates LLC Non-Marketable Alternative Assets Database, Hancock Timber Resources Group, National Association of Real Estate Investment Trusts, Inc., National Council of Real Estate Investment Fiduciaries, Standard & Poor's, and Thomson Datastream.

Notes: Inflation betas measure the relative sensitivity of each asset class to changes in the rate of inflation. For each 1% change in inflation, the percentage return of an asset class is affected by the amount of its inflation beta. For example, in a year in which inflation increases by 2%, the expected returns on U.S. Equity will be -2% less than if inflation had not increased. Timberland data for 1960 through 1986 are the John Hancock Timberland Index, 1987 through present are the NCREIF Timberland Index. Commodity and GSCI Energy Sector data begin January 1, 1970.

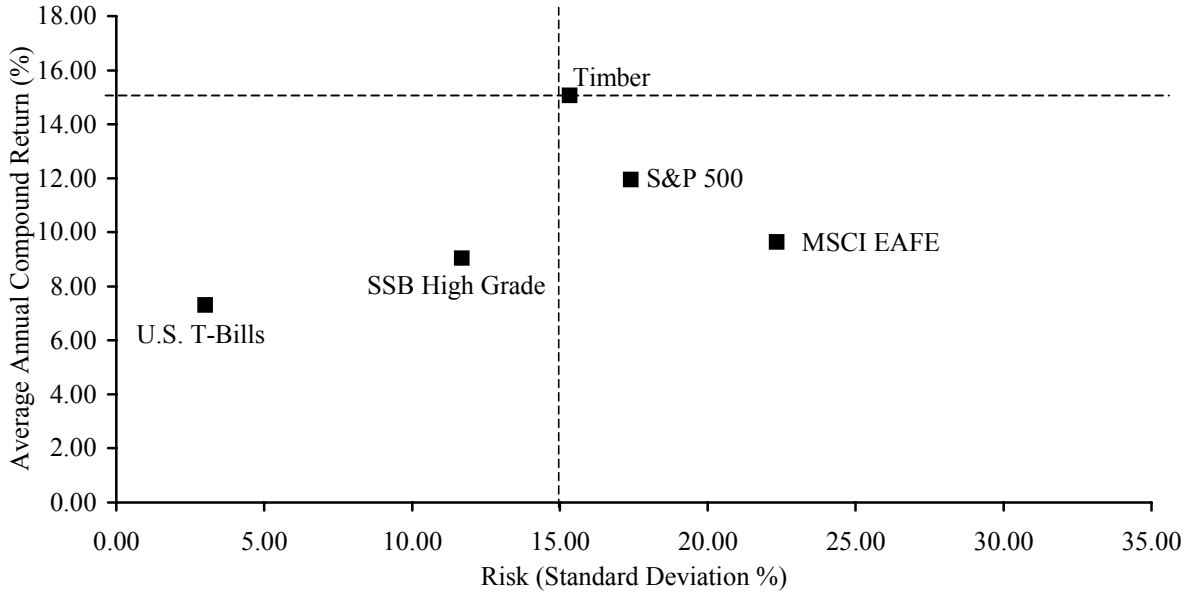
*Data are through June 30, 2002.

525a

**Exhibit 6**

## RISK/RETURN ANALYSIS OF COMMODITY INDICES AND CAPITAL MARKET RETURNS

**January 1, 1970 - December 31, 2001**




| | Average Annual Compound Return (%) | Annual Standard Deviation (%) | Return to Deviation Ratio | Sharpe Ratio |
|---|---|---|---|---|
| Timberland | 15.06 | 15.34 | 0.98 | 0.52 |
| S&P 500 | 11.94 | 17.40 | 0.69 | 0.37 |
| SSB High Grade Bond | 9.04 | 11.69 | 0.77 | 0.24 |
| MSCI EAFE | 9.64 | 22.33 | 0.43 | 0.23 |
| U.S. T-Bills | 7.31 | 3.01 | --- | --- |

Sources: John Hancock Timber Resources Group, Lehman Brothers Inc., National Council of Real Estate Investment Fiduciaries, Salomon Smith Barney, Standard & Poor's, and Thomson Datastream. MSCI data are copyrighted by and proprietary to Morgan Stanley Capital International, Inc.

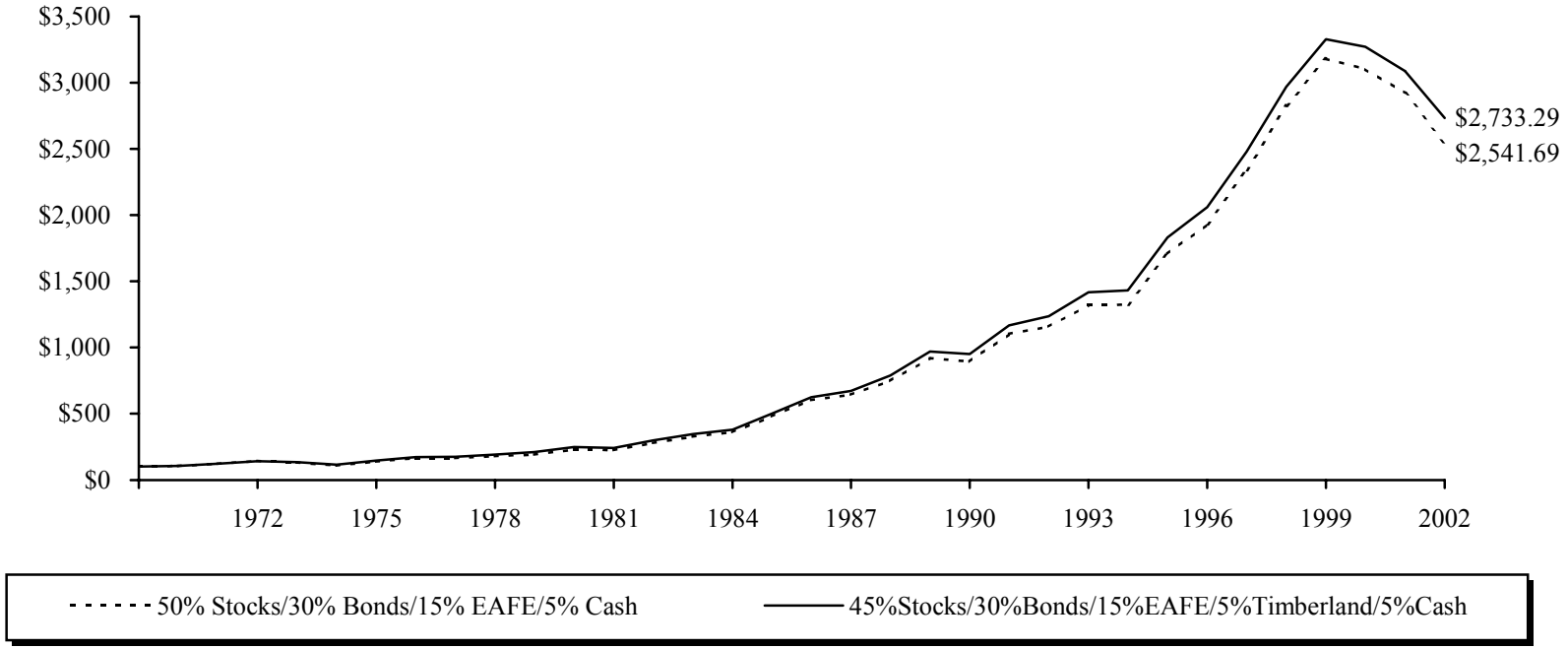
Notes: Timberland Index represents the John Hancock Timberland Index 1970-86 (Southeast, Northwest) and 1970-93 (Northeast); NCREIF Timberland 1987-present (Southeast, West) and 1994-present (Northeast). The timberland market portfolio is 50% of value in the Southeast, 40% in the Pacific Northwest, and 10% in the Northeast. Salomon Smith Barney High Grade Bond Index represents Salomon Brothers High Grade Corporate Bond Total Rate of Return Index 1969-79 and Salomon Smith Barney High Grade AAA-AA Long-Term Corporate Bond Index 1980-Present.
Simple Return to Deviation Ratio: Calculated by dividing the average annual compound return by the annual standard deviation. This ratio does not consider risk-free alternatives.
Sharpe Ratio: Calculated by subtracting the average monthly T-Bill return (risk-free return) from the index's average monthly return, then dividing by the index's monthly standard deviation. Interpreted as the amount of return over the risk-free rate that can be expected for each unit of risk accepted.
Risk/Return analysis calculated through year-end 2001 because some historical timberland index returns are only available on an annual basis.

**Exhibit 7**

**DIVERSIFICATION BENEFITS OF INCLUDING TIMBERLAND IN A PORTFOLIO**

**January 1, 1970 - September 30, 2002**

**Cumulative Wealth**



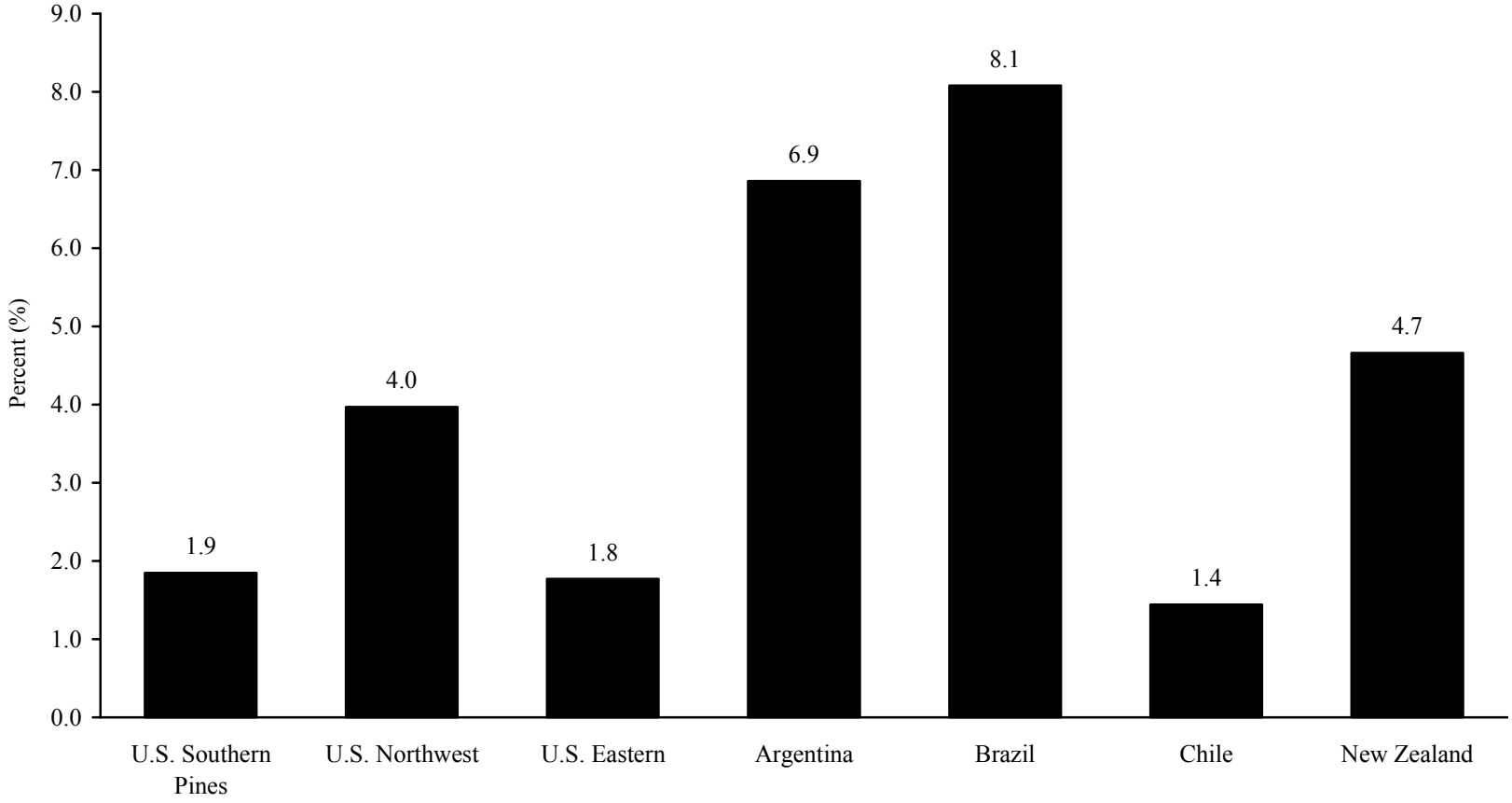

Sources: Hancock Timber Resources Group, National Council of Real Estate Investment Fiduciaries, Salomon Smith Barney, Standard & Poor's, and Thomson Datastream. MSCI data are copyrighted by and proprietary to Morgan Stanley Capital International, Inc.

Notes: Timberland Index represents the John Hancock Timberland Index 1970-86 (Southeast, Northwest) and 1970-93 (Northeast); NCREIF Timberland 1987-present (Southeast, West) and 1994-present (Northeast). Salomon Smith Barney High Grade Bond Index represents Salomon Brothers High Grade Corporate Bond Total Rate of Return Index 1969-79 and Salomon Smith Barney High Grade AAA-AA Long-Term Corporate Bond Index 1980-Present. Timberland Market portfolio is 50% of value in the Southeast, 40% in the Pacific Northwest, and 10% in the Northeast.

**Exhibit 8**

**EXPECTED ANNUAL GROWTH RATE OF STUMPAGE PRICES**

**2000-10**

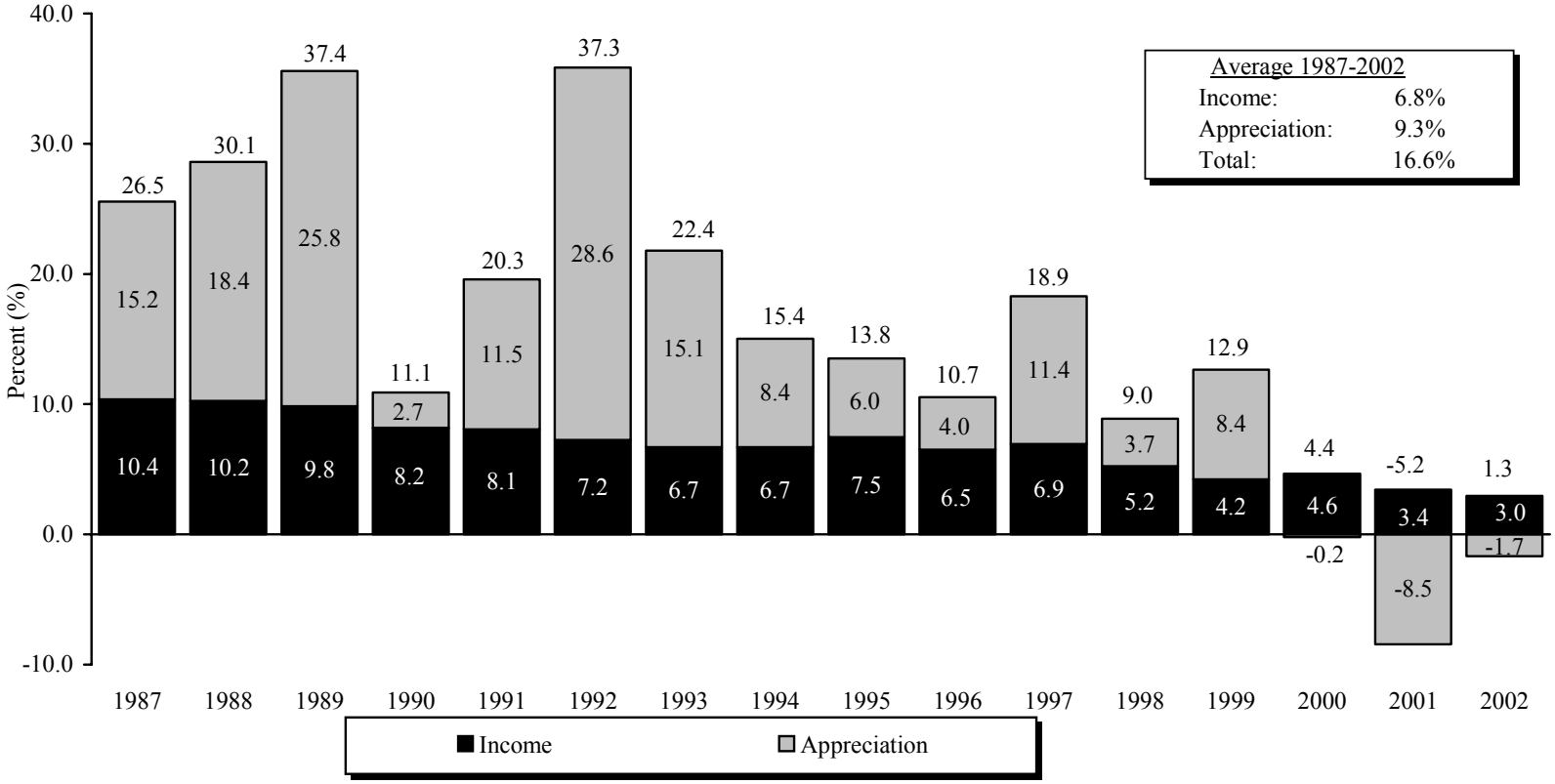



Source: Wood Resources International Ltd.

**Exhibit 9**

**NCREIF TIMBERLAND INDEX: DISAGGREGATION OF TOTAL RETURN**

**1987-2002**




Source: National Council of Real Estate Investment Fiduciaries.

Notes: Total return values, as indicated above the boxes, may not equal the sum of the income and appreciation returns due to rounding. Data for 2002 are as of September 30.

## Exhibit 10

## SUPPLY AND DEMAND OF TIMBER SPECIES

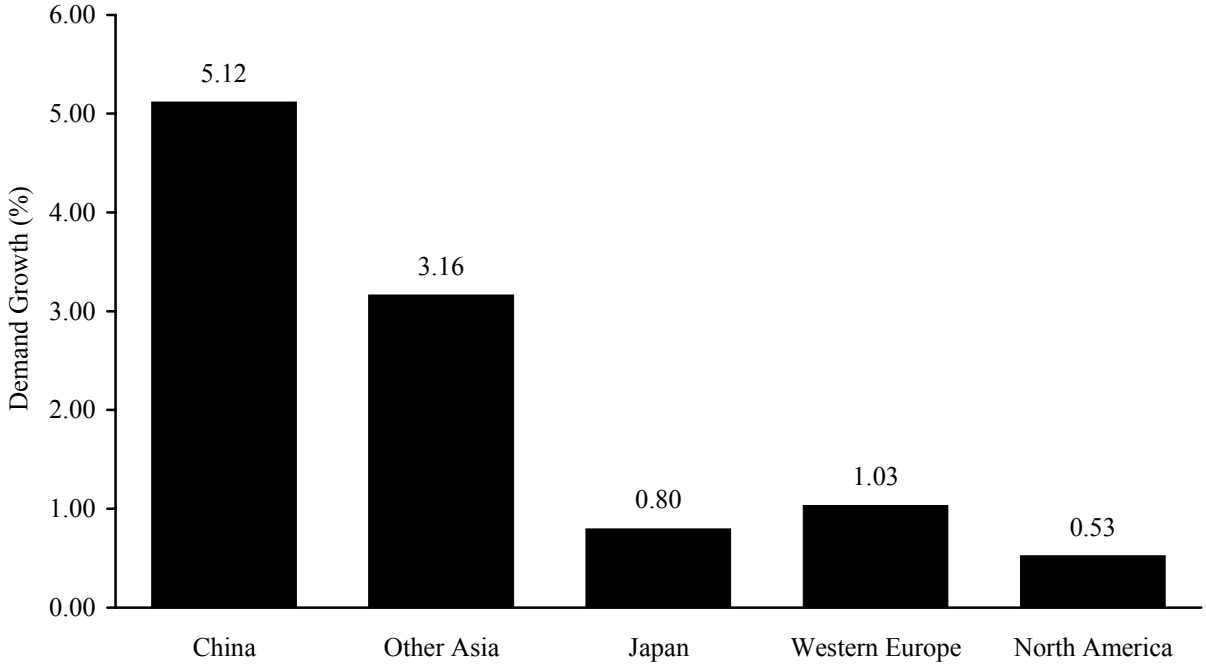
**Sustainable Supply of Timber (cubic meters per year in billions)**
**1997-2030**

| Supply | 1997 | 2010 | 2020 | 2030 |
|---|---|---|---|---|
| Total | 2.5 | 2.6 | 2.9 | 3.2 |
| Conifer | 1.2 | 1.3 | 1.4 | 1.5 |
| Non-Conifer | 1.3 | 1.4 | 1.5 | 1.7 |

**Demand for Industrial Timber (cubic meters per year in billions)**
**1997-2030**

| Demand | 1997 | 2010 | 2020 | 2030 |
|---|---|---|---|---|
| Total | 1.6 | 1.9 | 2.3 | 2.7 |
| Conifer | 1.0 | 1.1 | 1.3 | 1.6 |
| Non-Conifer | 0.6 | 0.8 | 0.9 | 1.1 |

**Projected Growth in Demand for Conifer Products**
**1998-2010**



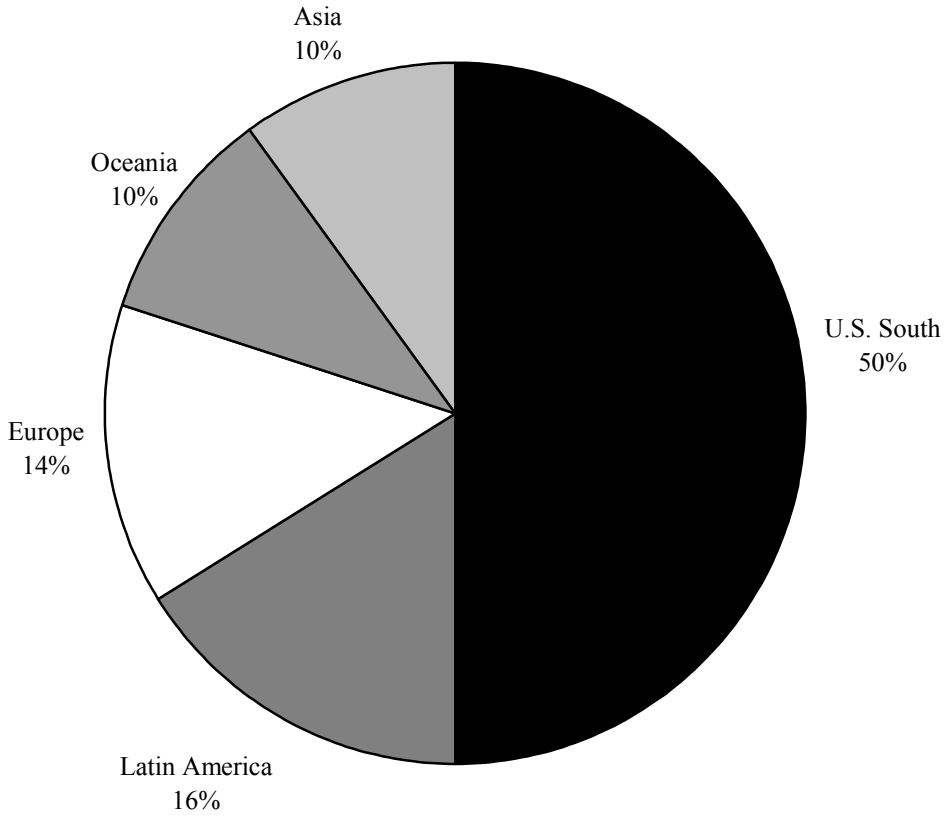

Sources: Food and Agriculture Organization of the United Nations (FAO), Wood Resources International Ltd., and World Bank/WWF Project.

**Exhibit 11**

## GLOBAL DISTRIBUTION OF FOREST PLANTATIONS (CONIFERS ONLY)

**Global Distribution of Intensively Managed Conifer Plantations**

**1998**




Sources: Food and Agriculture Organization of the United Nations (FAO) and Wood Resources International Ltd.

**Exhibit 12**

**INDUSTRIAL ROUNDWOOD PRODUCTION**

**(cubic meters in millions)**

**1970-98**

| Region | 1970 | 1980 | 1990 | 1998 |
|---|---|---|---|---|
| Africa | 40 | 51 | 58 | 69 |
| North/Central America | 439 | 489 | 594 | 618 |
| South America | 39 | 86 | 110 | 130 |
| Asia | 172 | 233 | 262 | 262 |
| Oceania | 20 | 28 | 33 | 41 |
| Europe | 268 | 282 | 339 | 296 |
| Former USSR/Russia | 299 | 278 | 305 | 116 |
| **World Total** | **1,277** | **1,447** | **1,701** | **1,532** |

Sources: Food and Agriculture Organization of the United Nations (FAO) and World Bank/WWF Project.

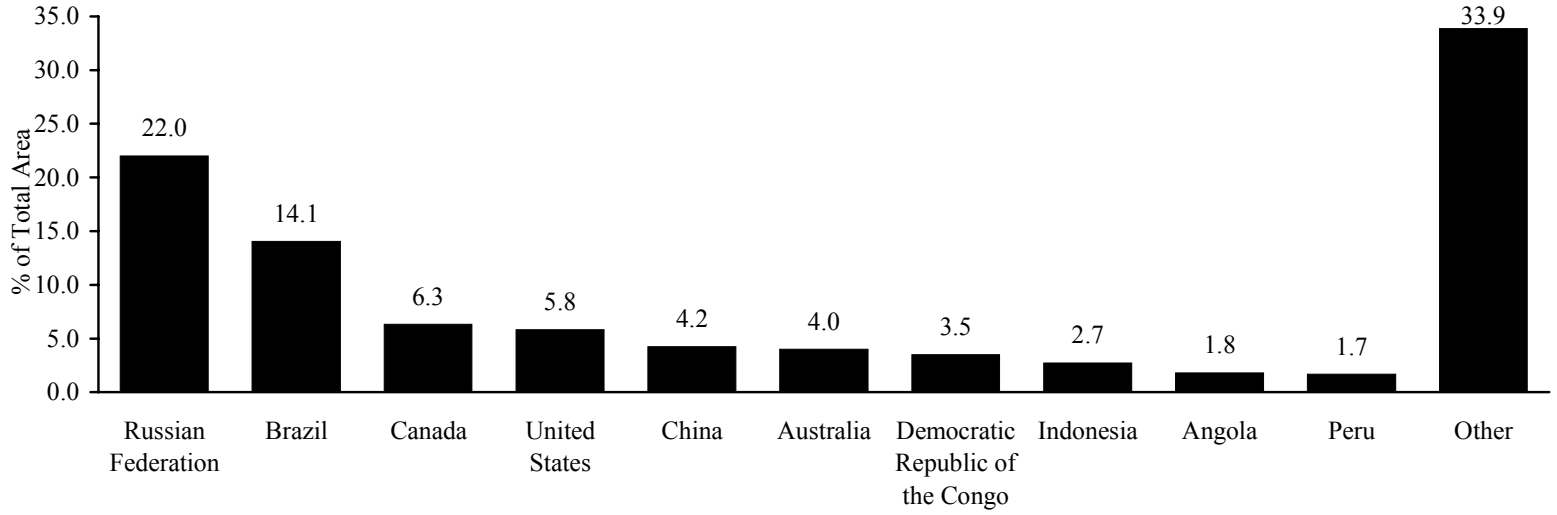
## Exhibit 13

## FOREST AREA BY REGION

### 2000

| Region | Land Area (million hectare) | Total Forest (Natural Forests and Forest Plantations) | | | Natural Forest (million hectare) | Forest Plantation (million hectare) |
|---|---|---|---|---|---|---|
| | | Area (million hectare) | % of Land Area | % of World's Forests | | |
| Africa | 2,978 | 650 | 22 | 17 | 642 | 8 |
| Asia | 3,085 | 548 | 18 | 14 | 432 | 116 |
| Europe | 2,260 | 1,039 | 46 | 27 | 1,007 | 32 |
| North and Central America | 2,137 | 549 | 26 | 14 | 532 | 18 |
| Oceania | 849 | 198 | 23 | 5 | 194 | 3 |
| South America | 1,755 | 886 | 51 | 23 | 875 | 10 |
| **World Total** | **13,064** | **3,869** | **30** | **100** | **3,682** | **187** |

**Countries with the Largest Percentage of the World's Forests**




Source: Food and Agriculture Organization of the United Nations (FAO).

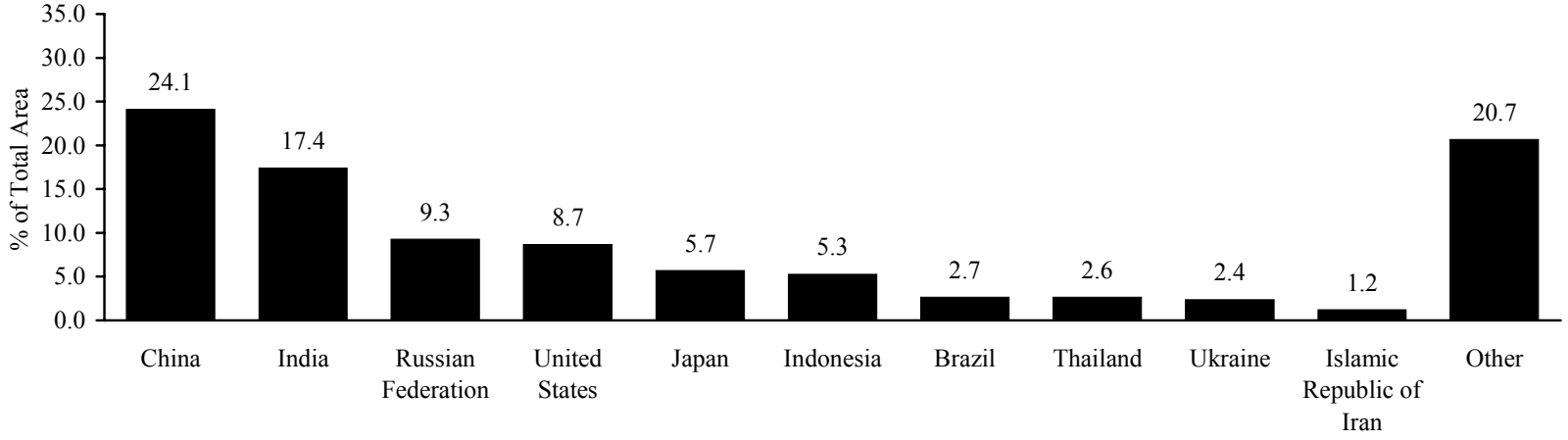
## Exhibit 14

## GLOBAL DISTRIBUTION OF FOREST PLANTATIONS

**Forest Plantation Area by Region**
**2000**

| Region | Total Forest Area (million hectare) | Natural Forest Area (million hectare) | Forest Plantation Area (million hectare) | Plantations as % of the Region's Total Forest | % of Total Plantation Area |
|---|---|---|---|---|---|
| Africa | 650 | 642 | 8 | 1 | 4 |
| Asia | 548 | 432 | 116 | 21 | 62 |
| Europe | 1,039 | 1,007 | 32 | 3 | 17 |
| North and Central America | 549 | 532 | 18 | 3 | 9 |
| Oceania | 198 | 194 | 3 | 2 | 2 |
| South America | 886 | 875 | 10 | 1 | 6 |
| **World Total** | **3,869** | **3,682** | **187** | **5** | **100** |

**Countries with the Largest Proportion of the World's Forest Plantations**
**2000**




Sources: Food and Agriculture Organization of the United Nations (FAO) and Wood Resources International Ltd.

## Exhibit 15

## REPRESENTATIVE TIMBERLAND MANAGERS

| Manager | Founded | Offices | Portfolio | Strategy | Geographic Focus | Fund | Target Size (millions) | Status | Target Returns | Minimum (millions) | Contact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **The Campbell Group** | 1981 | Portland, OR | $1.6 billion | Hardwood forests in NW | Northwest U.S. | Campbell Timber Fund I | $250 | Open | 10%-12% nominal | $5-$10 | Angie Davis (503) 275-9675 |
| **Evergreen** | 1981 | Atlanta, GA | $1 billion | Plantation focus, some naturally regenerating hardwood | U.S. Southeast, Lake States | Wachovia Select Timberland Investment Fund I | $25-$100 | Open | 8% real | $5 | Jim Webb 800 457-8184 |
| **Forest Capital** | 2000 | Boston, MA | $250 million | Both hardwood and softwoods | U.S. - NE, SE, NW | ForCap Opportunity II | $100 | Open | 12%-15% nominal | $5-$10 | Matt Donegan (617) 261-9722 |
| **The Forestland Group** | 1996 | Boston, MA Chapel Hill, NC | $366 million | Naturally regenerating hardwood | U.S. - NE, Mid- Atlantic | Heartwood IV | $300 | Open | 8% -10% real | $3 | F. Christian Zinkhan (919) 929-2497 |
| **Forest Investment Associates, L.P.** | 1986 | Atlanta, GA | $1.1 billion | 50/50 hardwood softwood split | U.S.- South | Separate accts | N/A | Open | 12%-14% nominal | $20 | Marc A. Walley (404) 495-8595 |
| **GMO Renewable Resources** | 1995 | Boston, MA | $140 million | Both hardwood and softwoods | 80% U.S.; 20% Intl | Forestry Fund VI | $100 | Q4-02 | 8%-10% real | $5 | Eric Oddleifson (617) 346-7592 |
| **Hancock Timber Resources Group** | 1985 | Boston, MA | $2.8 billion | Plantation in SE and NW, some naturally regenerating in NE | 40% U.S. South, 30% NW, 10% NE, 20% non-U.S. | ForesTree VI | $100-$200 | Open | 8% real | $5 | Phil Boole (617) 747-1527 |

**Exhibit 15 (continued)**

**REPRESENTATIVE TIMBERLAND MANAGERS**

| Manager | Founded | Offices | Portfolio | Strategy | Geographic Focus | Fund | Target Size (millions) | Status | Target Returns | Minimum (millions) | Contact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lyme Timber** | 1976 | Lyme, NH | $55 million | Timberland with a conservation component | New England, Midwest, Mid-Atlantic | Lyme Northern Forest Fund II | $50 | Q4-03 | 8% real | N/A | Stuart McCampbell (603) 795-2129 |
| **Molpus Woodlands Group** | 1996 | Jackson, MI | $850 million | Plantation focus, some naturally regenerating hardwood | U.S.- South | Fund I | $100 | Q3-02 | 8% real | $1 | Charles Hovey, Jr. (978) 282-8251 |
| **Prudential Timber** | 1990 | Boston, MA | $502 million | Plantation focus | U.S. South, NW, Intl. | Viking Global Timber Fund | $150 | Open | 15% real | N/A | Paul Young (617) 585-3503 |
| **Timbervest** | 1995 | Woodstock, GA | $357 million | Plantation focus, some naturally regenerating hardwood | U.S. South, NE, West | T/tis Progressive Timber Fund | $40 | Open | 8%-12% real | $2 | Amy Rhoads (215) 885-5882 |
| **UBS** | 1987 | West Lebanon, NH | $1.5 billion | Plantation focus, softwoods | U.S./Intl. | Timber Investors 9, LLC | $100 | Open | 8% real | $5 | Peter Mertz (603) 298-7001 |

**APPENDICES**

## Appendix A

## HARVESTING STRATEGIES

### Plantation Forestry

Future demand growth, aging forests, and greater harvesting restrictions are expected to make plantation forestry a dominant factor in global IRW supply. Prudential Real Estate Investors estimates that plantation supply could increase from 20% presently to nearly 50% by 2050. This increase in plantation yield could be influenced by many factors, not the least of which are the high start-up costs that plantations incur, the technological advances that will drive plantations' yields, and the lower wood quality produced by plantation forestry. The following factors have been cited as necessary conditions for developing a successful plantation:*

- country economic and political conditions conducive to investment;
- sufficient land to build up a resource without unduly impacting land prices or leases;
- low population in plantation areas;
- fast-growing tree species;
- proven species technology; and
- market access.

The vast majority of timberland managers concentrate on a plantation strategy. In the United States, virtually all plantation forestry involves softwoods such as spruce and pine. While the amount of time that it takes a seedling to grow into a harvestable tree varies by site and soil condition, plantation softwood species are fast-growing and are typically ready for harvest in 20 to 30 years. Outside of the United States, there are some rapidly growing hardwood species that can also be grown profitably using a plantation strategy. Plantation forestry requires both significant start-up cost and substantial maintenance costs (i.e., 20% of operational budgets may be spent on herbicides, fertilizers, and thinning).

### Naturally Regenerating Timberland

This refers to natural, pre-existing forests from which timber is harvested. While such timberland typically includes a mixture of hardwood and softwood, the attraction of this strategy is that many types of high-value hardwood (most notably cherry, walnut, and oak) require at least 60 to 80 years to grow to economic maturity and are in relatively short supply. Managers pursuing a naturally regenerating strategy have determined that the costs and complications of managing and harvesting timber from a multi-species, multi-age piece of land are compensated for by the high value of the timber associated with this land.

* Source: Nielson, D. A., "World Wood Supply Issues: An Asian Perspective," Issues in Global Forestry, Miller Freeman, 1999.

## Appendix B

## TAX CHARACTERISTICS

For taxable investors, timberland offers some unique characteristics that may increase the after-tax returns relative to investments in other financial assets. For example, all costs associated with the purchase, planting, or seeding of timberland are capital costs and are therefore deductible from the income generated on the property. In addition, the cost of any capital equipment with a useful life of greater than one year may be deducted for tax purposes, while the tax basis value of timberland is continuously adjusted up or down for additional capital improvements or depletion allowances, respectively. Finally, tax credits are granted for the reforestation of existing timberland. Although these tax advantages may increase effective after-tax returns, there are hundreds of pages of interpreted timberland tax codes and taxable institutions should consult tax experts to determine how the features mentioned above, as well as gains and losses on investment, impact their specific after-tax returns.