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Executive Summary

Why Timberland?
The primary reason investors initially consider adding timberland to their portfolios is diversification. Due to its strong long-term history of performance with relatively low risk, it has provided decades of risk-adjusted returns that are superior to those of many traditional asset classes. These qualities become readily apparent when timberland is added to an efficient portfolio analysis, pushing the curve higher (total return) and to the left (lower standard deviation). In addition to being a diversifier to a traditional portfolio, timberland has many inherent diversifying properties within itself including age class, geography, species, product, market and end-use. Timberland traditionally provides a solid yield, due in part to its biological growth, with relatively low ongoing capital investment. The risks associated with timberland are broken down into two categories: physical and economic. While the economic risks (price, supply, demand and liquidity) are similar to those of other assets, the physical risks more associated with timberland are identifiable and manageable, with losses due to physical risks (natural disasters, pests, disease, animal damage and theft) being only a fraction of a percentage over its long-term history.

Importance to Economy
Although timberland is a relatively new investment for institutional investors, it is not a new investment asset. Timberland is one of the oldest forms of investment, and an extremely important component of many global economies. Quality of life is highly dependent upon the diversity of products produced from timber resources. Everything from lumber used to build homes, to the way food is packaged, is based on forest resources.

It is important to note that timberland cannot be overbuilt. As an example, U.S. commercial real estate was overbuilt in the 1980’s, resulting in decreasing value and returns for investors. Timberland is finite. The ability to increase the timberland investment supply can only happen over longer investment cycles.

Benefits of Wood Use
The many benefits of using wood stem primarily from the renewability of forests. Forests constitute an energy system that is an important source of oxygen. To grow a pound of wood, a tree consumes about 1.47 pounds of carbon dioxide and releases approximately 1.07 pounds of oxygen. Realistically, an acre of trees could be expected to grow 4,000 pounds of wood per year. In the process, 5,880 pounds of carbon dioxide would be consumed, and 4,280 pounds of oxygen would be produced.
The energy efficiency of the forest extends to forest products. When compared to other building materials, wood products are among the most efficient. Building products made from aluminum, for example, require 126 times more energy than wood to fashion a final product. Products made from steel, glass, plastic, cement and/or brick require approximately 24, 14, 6 and 4.5 times more energy, respectively, than does wood to make a final product.

**Thermal Resistance of Various Building Materials**

<table>
<thead>
<tr>
<th>Material</th>
<th>Resistance [R value] per inch of thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softwood Lumber</td>
<td>1.25</td>
</tr>
<tr>
<td>Hardwood Lumber</td>
<td>.91</td>
</tr>
<tr>
<td>Brick</td>
<td>.11</td>
</tr>
<tr>
<td>Concrete/Stone</td>
<td>.08</td>
</tr>
<tr>
<td>Steel</td>
<td>.0032</td>
</tr>
<tr>
<td>Aluminum</td>
<td>.0007</td>
</tr>
</tbody>
</table>

*Source: American Forest & Paper Assoc.

*Resistance [R value] per inch of thickness
Investment Attributes

Return Components

Total timberland return is comprised of five main components: acquisition, biological growth, active management, price trends and timberland value changes.

### Total Timberland Return

<table>
<thead>
<tr>
<th>Active Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisitions (Buying Right)</td>
</tr>
<tr>
<td>Biological Growth</td>
</tr>
<tr>
<td>Non-Timber Income</td>
</tr>
<tr>
<td>Timber Price Changes</td>
</tr>
<tr>
<td>Land Value</td>
</tr>
</tbody>
</table>

**Acquisition (Buying Right).** Achieving the best value at purchase cannot be overemphasized. Any asset delivers little relative advantage if the investor overpays. Buying the property “right” is accomplished by (1) sourcing attractive acquisition opportunities, (2) focusing on opportunistic transactions, (3) capitalizing on market inefficiencies and (4) a stringent and exhaustive due diligence and investment process.

**Biological Growth.** This component offers investors a unique opportunity for reliable asset appreciation, while lowering investment risks. The biological growth component helps lower the standard deviation of timberland returns, mitigates short-term log price fluctuations, and augments price increases. The rate of biological growth can be impacted by management practices. Campbell Global employs cost-effective management practices that maximize and enhance the biological growth rate. These management practices include thinning, fertilization and other silvicultural activities that protect and nurture the trees.

**Active Management.** Actively managing timberlands can also add significant value and increase financial return, while at the same time reduce risk. Campbell Global applies numerous state-of-the-art techniques in managing timberland assets. An example of some of the techniques used include:

- Optimizing the selection and rotation of harvest units by using advanced computer-modeling software,
- Planting genetically superior seedlings,
- Controlling competing vegetation,
- Alleviating forest nutrient deficiencies through selective fertilization,
- Enhancing timber growth and quality through commercial and pre-commercial thinning,
• Controlling natural hazards like fire and insects,
• Preserving overall forest integrity, including wildlife habitat and water quality, by employing management techniques appropriate to specific forest types and sites,
• Obtaining harvest and other necessary permits on a timely basis, and
• Managing stewardship projects and initiatives to both enhance the environment and mitigate risk.

Timber Changes. Log prices are derived from the demand of the products. As end product prices fluctuate so do the prices for wood fiber. Short-term price fluctuations impact the cash return generated from a property. There is not a direct correlation between short-term price changes and timberland values, however, long-term price trends do impact price forecasts used in determining timberland pricing.

Land Value. Comprised of the change in the bare land value and the change in the value of the standing timber on the land. The bare land value fluctuates based on the supply and demand of the land available for timber production as well as changes in demand of the land for alternative uses. Change in timber value is based on three components: growth in volume, increase in quality value of a tree and market prices. Quality value of a tree occurs when the tree grows from one diameter class into a higher value class (i.e., sub-merchantable to merchantable wood).
Annualized Returns

Bonds, Commodities, Stocks & Timberland | 1987-2014

The National Council of Real Estate Investment Fiduciaries (NCREIF) publishes a timberland index patterned after the NCREIF Property Index, which is well known for measuring commercial real estate returns. NCREIF compiles the data from members who submit return information specific to the properties they manage. This becomes the basis for the composite return figures for the timberland asset class.

Based on statistics compiled by Campbell Global, timberland returns, represented by the NCREIF Timberland Index, have outperformed stocks and long-term corporate bonds since 1987.

Real Returns

Timberland is considered a “real” asset. It is real in terms of a hard asset that you can see and touch. It provides a “real” rate of return, meaning it returns cash back to the investor and is positively correlated to inflation. Projected timberland returns are typically calculated in real terms (without the effects of inflation). In addition, timberland has a unique biological growth attribute. Even when timber is not harvested and sold as logs, the trees continue to grow in size as well as value.

Timberland return results can vary due to a number of factors. One such factor is the change in log prices. Short-term log price volatility is directly affected by changes in the regional supply/demand balance, and can have a significant impact on income return. For instance, supply changes in the U.S. Northwest, related to withdrawals of federal timber supply, dramatically affected prices and returns during the 1990’s.
Long-term log price changes can ultimately affect timberland values. Typically, these trends are influenced by fundamental changes in wood consumption relative to supply. In the future, log price variability is expected to be less volatile than in the past, resulting in potentially more predictable timberland returns.

**U.S. Regional Returns**

There are two generally recognized timber-growing regions in the U.S. Each of these regions exhibits different return profiles based on the species of timber grown, the ratio of private to public ownership, the demand trends for the species in these regions, the ratio of export to domestic sales, and other regional, national and international economic factors.

In the Northwest, western hemlock and Douglas-fir constitute as much as 90 percent of the commercial volume, while species such as cedar, ponderosa pine and other fir species account for about 10 percent. The rotation age is typically 45-60 years.

In the Southeast, the dominant commercial species by far is Southern yellow pine, accounting for about 80 percent of the commercial volume. The other 20 percent includes a variety of other pine and hardwood species. The rotation age is usually between 20-40 years.

The returns for the two regions are shown above. The returns are from the NCREIF Timberland Index sub-regions. The Northwest has outperformed the Southeast based on annual average return since inception.

![Northwest & Southeast | 1987-2014](image)
Inflation Hedge

There is support for timber serving as a hedge against inflation, especially with respect to unanticipated inflation. Binkley and Washburn note, in their article Do Forest Assets Hedge Inflation, "the land and growth components of timberland hedge inflation in the long run, but that due to log or stumpage price volatility, standing timber values do not, in the short term, hedge inflation."

The above chart indicates the correlation of various investment indices to Inflation (CPI). The NCREIF Timberland Index and Campbell Global returns are both positively correlated to inflation.

Our findings are that, since 1987, timberland properties managed by Campbell Global have hedged inflation, on a total return basis, more effectively than any other asset class, with the exception of 90-day Treasury securities and The S&P GSCI. Timber appears to hedge inflation over the longer term, although in lower inflation periods the relationship may not be as strong.

Source: NCREIF, NAREIT, Morningstar, S&P, Federal Reserve
Correlation of Returns Among Asset Classes

Historical timberland returns have low, and in some cases negative, correlation of annual returns with other assets such as stocks, bonds and commercial real estate. This low correlation supports the inclusion of timberland in a diversified portfolio, and indicates that lowered risk, as measured by the standard deviation of portfolio returns, may be realized by allocating a portion of portfolio assets to timberland.

As a background perspective, suppose the correlation of timberland and the Barclays Aggregate Bond Index were +1. This would imply perfect positive correlation, meaning that when Corporate Bonds move up, timberland moves up at exactly the same time. Perfect negative correlation of -1 implies just the opposite. When one asset is up, the other is down. Combining negatively correlated assets is a desirable diversification strategy, and significantly reduces the overall volatility of a portfolio. Diversification can also be achieved by combining assets with zero correlation or low positive correlation.

A notable result of the correlation analysis was the negative correlation between commercial real estate, as measured by the FTSE NAREIT U.S. Real Estate Index, and NCREIF Total Timberland Index. In general, real estate has not been correlated with timberland returns due to the many fundamental business and economic differences between commercial real estate and timberland.

Although timberland is often included in the real estate asset class, it is really very different than real estate. Although both use real property, or land, to support income-generating activities, there are very few other shared economic attributes. Where
land value for commercial property may comprise a significant percentage of total real property valuations, for timberland the percentage value of land to total property value is low. Other differences between “traditional” real estate and timberland include, but are not limited to, the following:

• Timberland is a growing asset, and requires moderate to low added capital investment over time relative to asset value;

• Timberland generates income through the harvesting and selling of trees (logs), which are a raw material sold to companies that produce a multitude of wood-based products;

• In a way, timberland is a commodity, not unlike petroleum, which can be “warehoused” indefinitely by simply not harvesting;

• Prices for timberland are less volatile than commercial real estate as the economic cycle for timberland, from planting to harvest, is longer;

• Environmental laws regarding streams, harvest practices, endangered species and other types of laws and regulations change more rapidly relative to commercial real estate;

• Federal government restrictions on harvests from national forests impact the supply of logs available from federal lands. Interpreted as a long-term supply constraint these restrictions resulted in significant price and value increases in private and institutionally owned Northwest timberland in the early 1990’s; and

• The sale of logs is the primary business focus for timberlands, whereas commercial real estate usually supports some other economic or business operations.
Portfolio Diversification

Timberland investments offer investors high cash flow, strong real returns, and low risk. In addition to these fundamental investment characteristics, timberland also offers attributes specific to the asset class such as biological growth and the ability to warehouse the asset and time harvests to market conditions without suffering potential impairment (write-down) due to technological or market obsolescence common to other inventoried tangible assets.

Overview

In an effort to maximize portfolio expected return at an acceptable level of risk, investors seek optimal diversification amongst investment asset classes. Asset class allocation within a portfolio is generally the largest determinant of portfolio performance, both from a performance and risk standpoint.

A cornerstone of Modern Portfolio Theory (“MPT”), introduced by Harry Markowitz and others, is the concept of seeking portfolios that lie along an efficient frontier. The efficient frontier is formed by a set of portfolios which exhibit the maximum expected return for a given level of risk. Investors would be expected to choose a portfolio that lies along this efficient frontier based on their risk tolerance. There are an almost endless variety of portfolios that an investor could form with risky assets, but we would expect investors to choose portfolios that lie along the efficient frontier, as any alternative portfolio is by definition inefficient.

Diversified portfolios will generally exhibit less risk for a given level of return because specific risk can be reduced and low or negative covariance provides a risk offset. This paper explores the role of timberland in a well-diversified efficient portfolio.

Timberland exhibits several unique attributes that support inclusion in institutional investment portfolios. Benefits of owning timberland can include ongoing operational cash flows and attractive real risk-adjusted returns. In addition to these fundamental investment characteristics, timberland offers benefits unique to this particular asset class that can help a portfolio retain and even grow value during times of market volatility. The first of these is biological growth; the timber inventory on a tract of timberland continues to grow irrespective of market conditions. The second benefit is the ability to warehouse inventory in place, or “store on the stump.” This represents the owner’s option to reduce or forgo harvesting, which allows the unharvested trees to grow until market conditions are ideal for harvesting.

Building the Efficient Portfolio

There are a few basic building blocks required to construct a portfolio that lies along the efficient frontier. We require an estimate of each asset’s expected return, expected standard deviation, and expected covariance with all other assets included in the investment universe. In our analysis, we included asset classes that are typically found in an institutional portfolio, as well as timberland.
We informed our return, standard deviation, and covariance expectations based on data provided by Callan Associates in their 2014 Capital Market Projections publication. Timberland expected return, standard deviation, and covariance of returns with asset classes included in the analysis was provided by Campbell Global’s research department. We utilized optimization software to determine portfolio weights to maximize expected return, given various levels of risk. To examine the impact of including timberland in a given portfolio, the analysis is performed both with and without timberland.

Efficient frontier analysis is quite sensitive to the parameters that are used. The results of the analysis can yield an efficient frontier that is mathematically sound, but unlikely to be implemented by a typical institutional investor. To address this we constructed efficient portfolios under two different portfolio weight constraint scenarios. The first scenario constrains portfolio weights to a maximum of 75%, so no single asset class completely dominates the portfolio. In the second scenario we applied portfolio weight constraints that more closely align with institutional portfolio’s asset allocations.

**Scenario 1: Portfolio Weights Limited to 75%**

We first constructed an efficient frontier of portfolios whose asset class weights could rise to a maximum of 75%. This series of portfolios provides a theoretical illustration of how timberland can enhance portfolio outcomes. It is unlikely that an investor would allocate 75% of their portfolio to a single risky asset class, but when the efficient frontier contains such portfolios, the benefits of adding timberland are clearly highlighted.

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Expected Return (Nominal)</th>
<th>Standard Deviation</th>
<th>Max Asset Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity- US Large Cap</td>
<td>7.50%</td>
<td>18.30%</td>
<td>75%</td>
</tr>
<tr>
<td>Equity- US Small Cap</td>
<td>7.90%</td>
<td>23.00%</td>
<td>75%</td>
</tr>
<tr>
<td>Equity- Developed Ex-US</td>
<td>7.50%</td>
<td>20.20%</td>
<td>75%</td>
</tr>
<tr>
<td>Equity- Emerging Ex-US</td>
<td>7.90%</td>
<td>28.00%</td>
<td>75%</td>
</tr>
<tr>
<td>FI- US Corporate</td>
<td>3.00%</td>
<td>3.80%</td>
<td>75%</td>
</tr>
<tr>
<td>FI- US Treasury</td>
<td>2.80%</td>
<td>2.30%</td>
<td>75%</td>
</tr>
<tr>
<td>FI- US T-Bills</td>
<td>2.00%</td>
<td>0.90%</td>
<td>75%</td>
</tr>
<tr>
<td>FI- US TIPS</td>
<td>3.00%</td>
<td>5.30%</td>
<td>75%</td>
</tr>
<tr>
<td>FI- Non-US</td>
<td>2.80%</td>
<td>9.40%</td>
<td>75%</td>
</tr>
<tr>
<td>Private Real Estate</td>
<td>6.20%</td>
<td>16.50%</td>
<td>75%</td>
</tr>
<tr>
<td>Private Equity</td>
<td>8.50%</td>
<td>33.10%</td>
<td>75%</td>
</tr>
<tr>
<td>Absolute Return (Hedge Funds)</td>
<td>5.10%</td>
<td>8.90%</td>
<td>75%</td>
</tr>
<tr>
<td>Commodities</td>
<td>3.10%</td>
<td>18.30%</td>
<td>75%</td>
</tr>
<tr>
<td>Private Timberland</td>
<td>8.18%</td>
<td>15.00%</td>
<td>75%</td>
</tr>
</tbody>
</table>
The analysis produced an efficient frontier with expected returns ranging from 4.50 percent to 7.25 percent. The benefit of diversifying a portfolio with private timberlands becomes evident quickly as Portfolio B (with timber) achieved higher total returns than Portfolio A (no timber) at any level of risk. For example, at a 7% standard deviation, the return of Portfolio B is nearly 100 bps higher than Portfolio A and the gap continues to widen as risk increases. For the given target returns examined, the risk (standard deviation) is 169 to 640 basis points lower for Portfolio B than Portfolio A.

**Graph 1 | Portfolio Weights Limited to 75%**

*Portfolio Efficient Frontier for Multi-Asset “Traditional” Portfolio
Maximum Allocation to Any Asset is 75%*

Source: Campbell Global and Callan
Scenario 2: Analyzing a Realistic Institutional Portfolio

As a demonstration of what may be more realistic for institutional investors, our second analysis sets the portfolio weight constraints at levels that are more consistent with observed real-world portfolios. As in the previous analysis, one efficient frontier curve includes timberland and one does not.

Table 2 | Analyzing a Realistic Institutional Portfolio

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Expected Return (Nominal)</th>
<th>Standard Deviation</th>
<th>Max Asset Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity - US Large Cap</td>
<td>7.50%</td>
<td>18.30%</td>
<td>100%</td>
</tr>
<tr>
<td>Equity - US Small Cap</td>
<td>7.90%</td>
<td>23.00%</td>
<td>30%</td>
</tr>
<tr>
<td>Equity - Developed Ex-US</td>
<td>7.50%</td>
<td>20.20%</td>
<td>50%</td>
</tr>
<tr>
<td>Equity - Emerging Ex-US</td>
<td>7.90%</td>
<td>28.00%</td>
<td>30%</td>
</tr>
<tr>
<td>FI - US Corporate</td>
<td>3.00%</td>
<td>3.80%</td>
<td>100%</td>
</tr>
<tr>
<td>FI - US Treasury</td>
<td>2.80%</td>
<td>2.30%</td>
<td>100%</td>
</tr>
<tr>
<td>FI - US T-Bills</td>
<td>2.00%</td>
<td>0.90%</td>
<td>100%</td>
</tr>
<tr>
<td>FI - US TIPS</td>
<td>3.00%</td>
<td>5.30%</td>
<td>100%</td>
</tr>
<tr>
<td>FI - Non-US</td>
<td>2.80%</td>
<td>9.40%</td>
<td>50%</td>
</tr>
<tr>
<td>Private Real Estate</td>
<td>6.20%</td>
<td>16.50%</td>
<td>30%</td>
</tr>
</tbody>
</table>

In the second scenario, the analysis yielded expected returns ranging from 5.25 percent to 7.50 percent, solving each for the lowest portfolio standard deviation consistent with the target return. Returns in excess of 7.50 percent were not solvable due to the individual asset allocation limitations.

Graph 2 | Analyzing a Realistic Institutional Portfolio

Source: Campbell Global and Callan

[Source: Campbell Global and Callan]
Once again, Portfolio B (with timber) achieved a higher total return than Portfolio A (no timber). For example, at a standard deviation of 8.5%, the return of Portfolio B is once again nearly 100 bps higher than Portfolio A. For any given target return studied, the risk (standard deviation) is between a minimum of 287 and a maximum of 462 basis points lower for Portfolio B. Once again it is evident that the portfolio with timber outperforms the portfolio without.

**Conclusion**

Our exploration of two different portfolio weight scenarios suggests that timberland can enhance return for a given level of risk along the full spectrum of an efficient frontier. This result is consistent with timberland’s attractive risk-adjusted return track-record and its low correlation with other asset classes. In addition to its ability to enhance the efficient frontier of possible portfolios, timberland also has many attractive characteristics that enhance portfolio outcomes including biological growth which is uncorrelated with drivers of systematic risk and the option to store vs. harvest inventory during adverse market conditions.

**Potential Tax Benefits**

For investors with taxable portfolios, timberland offers certain advantages related to the unique attributes of the asset. Current U.S. federal tax laws allow income from timber harvesting to be treated as capital gains. Federal law also gives timberland owners a tax deduction known as depletion, which is the annual cost assigned to timber harvested. This is similar to the annual depreciation allowance for tangible assets such as plant and equipment.

In the Northwestern U.S., at the state level, property tax codes have been modified to tax timberland on bare land value only and not on the value of standing timber, deferring tax on timber value until harvesting or stumpage sales generate cash income. States are paid severance or harvest taxes only when the timber is actually harvested.

Campbell Global has developed an LLC and a private REIT structure to provide investors with tax efficient investment vehicles. For tax-exempt investors, income generated from timberland can be structured to prevent Unrelated Business Taxable Income (UBTI). Campbell Global manages the UBTI issue through the use of an LLC structure for both separate accounts and commingled funds. Within the REIT structure, the IRS has ruled that amounts distributed as dividends by a qualified REIT do not constitute UBTI.
Risks
There are various risks with any investment asset class or opportunity. Often risk is defined as the historical volatility associated with an investment’s return. The following chart compares the Sharpe ratio, (calculation which includes investment volatility) of various asset class indices since 1987. The NCREIF Timberland Index ranks highest for historical risk-adjusted performance among the asset class indices based upon the calculated Sharpe ratio.

Specific risks associated with timberland investments can be classified into two major categories: physical risks and economic risks. With proactive timberland and portfolio management, most risk factors can be dramatically minimized. Campbell Global, through its extensive timberland management experience, has implemented numerous controls and policies to minimize physical and economic risks to its investors.

Physical Risks

Fire
Fire risk varies greatly across geographies. Areas with longer, drier summers are most susceptible. Fire risk is minimized through the implementation of comprehensive fire protection plans designed to provide for early detection and extinguishing of wildfire. Cooperative fire protection services are utilized during fire season. During high-risk periods, regional firefighting agencies, which usually include government agencies, are on stand-by ready to respond to any reported incidents of fire. Harvest activities and public access are curtailed or eliminated during high-risk fire season. We also proactively manage risks through stocking level control designed to maintain healthy stands with minimal ground fuel (needles and dead wood) accumulation. Well-maintained roads provide access for firefighting agencies, thus minimizing response times and risks. Since our inception, fire loss on lands managed by Campbell Global has averaged less than one-tenth of one percent.
Weather
Wind damage is isolated, and generally limited, to prominent ridges in mountainous areas. Overall, wind damage is insignificant. Areas susceptible to damage are fairly predictable, and risk is minimized through appropriate timber harvest unit placement, avoidance of clear-cut boundaries on damage-susceptible ridge tops, and maintenance of vigorous, wind-resistant stands of timber. Losses due to wind damage have been less than one-tenth of one percent per year.

Hurricane risk is generally limited to southern coastal timberlands. While devastating in nature and difficult to predict, damage losses due to hurricanes are minimized through active salvage efforts directed at capturing the value of downed timber.

Ice and snow damage is minimized through species selection and stocking level controls. Overstocked stands are generally more susceptible to damage. Timely salvage of damaged trees minimizes loss. Campbell Global has experienced little damage of this nature since our inception.

Insects
The southern pine beetle poses the most notable insect risk to Southern U.S. timberland. Over the last twenty years, reported losses have been less than three-tenths of one percent annually. The greatest risk of infestation is associated with widespread devastation resulting from hurricanes or similar natural occurrences. Where salvage efforts have failed to remove downed timber, beetle infestations and damage can occur. Scientific silviculture helps maintain healthy forests. Early detection and removal of infested trees minimizes the risk associated with this pest.

In the Western U.S., the mountain pine beetle and western spruce budworm have caused damage over the years. As with other pests, these species are most likely to affect trees already stressed due to lack of active management or due to extraordinary drought. Losses due to these pests are insignificant due to active management practices employed by Campbell Global, which includes salvage programs minimizing value loss.

Disease
Disease damage generally occurs in single trees or small stands of trees. Disease may not cause immediate death of the tree, but rather a reduction in value. Fusiform rust is one of the more common diseases affecting pines in the Southern U.S. Careful management of seedling selection and continued research through seedling cooperatives helps to keep losses at a minimum. Root diseases are one of the more common diseases in the Western U.S. Physical removal of affected trees or treatment designed to treat root rot on site eliminates spread of the disease. Another disease in
the West is Swiss needle cast affecting Douglas-fir in the coastal region of Oregon. This fungus disease is best managed by avoiding Douglas-fir in the affected areas where western hemlock is more appropriate. As with other physical and biological risks, disease losses are minimal due to active management and maintenance of healthy, well-stocked stands of timber.

**Animal Damage**

Deer, bear, mountain beaver and porcupine are attracted to trees at various stages, potentially killing individual trees, but more often reducing growth rates. Deer and mountain beaver damage occurs most frequently in young seedlings where portions of seedlings are damaged, slowing the rate of height growth. Seedling protective devices minimize the risk associated with deer and mountain beaver browsing. Bears and porcupines can damage the bark or cambium of saplings and mature trees. Campbell Global has implemented “bear feeding” programs to provide alternative food sources during the season when trees are vulnerable to bear damage. County-based animal control programs minimize porcupine damage.

**Theft**

Timber harvesting creates the product of raw logs. As with any product, the potential for theft exists. Numerous controls are in place within the industry, and Campbell Global has implemented additional controls to reduce the risk of theft. Each log and load of logs is tracked and accounted for in a customized log accounting system, providing timely management information to field foresters.

**Economic Risks**

Economic risks can cause the most material risks to timberland. Again, through proactive timberland and portfolio management, these risks can be greatly reduced. Economic risks include:

**Price**

Log and stumpage prices are volatile. Price changes occur based on cyclical and seasonal fluctuations and demand dynamics. The impacts of price volatility can be diminished through active management, harvest scheduling, and diversification of a timber portfolio among log markets and regions. Campbell Global has decades of experience in log marketing and has the capacity to maximize investor returns through appropriate market analyses and follow-through.

**Supply**

Supply risk is composed of two factors: productivity and environmental constraints. Harvest scheduling and long-term planning incorporate these factors and minimize supply risk enabling the operations forester to respond to price fluctuations in a manner designed to capture market opportunities. Campbell Global projects supply utilizing economic optimization techniques while providing flexibility for operations foresters to accelerate or withhold supply in response to market changes.
Productivity is a measure of the ability of forestland to grow trees. Productivity is improved through active management such as silvicultural activities, which include planting genetically improved seedlings, fertilization, thinning, and weed and brush control. Risks to productivity include poor management practices that degrade site productivity, or poor recognition of site productivity and the inappropriate application of otherwise sound management. Campbell Global’s silvicultural principles minimize risk to productivity.

Environmental constraints include regulations associated with environmental protection and wildlife conservation. In the Northwestern U.S., the northern spotted owl and various species of salmon have been listed as threatened or endangered species, resulting in changes in harvesting practices on both private and public timberlands. Other protected species in the Northwest include the marbled murrelet and bald eagle. The restrictions have led to significant reductions in timber supply on federally owned lands and have helped increase the value of private lands. The value of some individual private timberlands can be negatively affected if previously unknown habitat is discovered, and restrictions on harvesting are imposed. Comprehensive due diligence at the time of acquisition minimizes financial risks associated with environmental constraints.

The red-cockaded woodpecker is a notable protected species in the Southern U.S. Numerous less notable species have also been protected in these and other regions. Other environmental constraints include the protection of streams and rivers, archaeological sites and scenic areas.

Campbell Global constantly monitors state and federal regulations that may impact forest management. In addition, we have established stewardship practices that meet or exceed industry standards minimizing environmental risks.

Demand

Reductions in the demand for raw logs are driven by various external factors. These factors include:

- Substitution of other finished products, such as steel or various recycled materials for wood products.
- Substitution of other wood products for domestic wood, for example, imported logs or finished products.
- Reduction in overall demand for forest products related to usage, such as a decline in housing starts or increased recycling rates.
**Liquidity**

Liquidity risk can be minimized through acquisition due diligence, sound stewardship principles, and the ability to identify and respond to disposition opportunities that enhance investment returns. The acquisition of well-managed properties, and the continuation of high-quality management enhance the value of a given property and maintain or enhance liquidity. As with many other risks, diligent active forest management based on sound investment objectives minimizes liquidity risk. Various investment products, including commingled funds and Real Estate Investment Trusts, provide numerous structural opportunities for timberland investors, and increase the liquidity of timber assets.

In conclusion, there are two major risk categories that exist: physical and economic. Through active management, these risk factors can be greatly reduced. In addition, timberland investments can reduce the overall risk of an investor’s portfolio, as many of the individual risk factors associated with timberland tend to be counter-cyclical with those of other investment classes.
Opportunities for Timberland Investment

Global Timberland Supply and Outlook

According to FAO data, Canada and the United States accounted for 15% of total forest area in 2010. However, these two countries accounted for 26% of industrial log production in 2013. Those high production levels plus the large area of investable timberland (i.e., privately owned, high volume, industrial grade timber) still makes North America the core region for any timberland investment portfolio.

**Total Forest Area | 2010**

2010 Area: 4.03 billion ha

![Pie chart showing global forest area distribution: USA 7%, South America 21%, Europe (less Russian Federation) 5%, Russian Federation 20%, China 5%, Indonesia 2%, Oceania 5%, Canada 8%, Africa 17%, Other 10%.

Source: FAO [E14]

**Production of Softwood & Hardwood Industrial Roundwood | 2013**

2013 Production: 1.74 billion m³

![Pie chart showing global production distribution: USA 17%, South America 13%, Europe (less Russian Federation) 21%, Russian Federation 10%, China 10%, Indonesia 4%, Oceania 3%, Canada 9%, Africa 4%, Other 9%.

Source: FAO [E14]
Given the global recession, timber harvests are recovering from the low in 2009. Historical world log production levels show two dramatic declines: once in 1989-91 with the collapse of the Soviet Union and in 2007-2010 with the economic recession.

### World Softwood Log Production

![World Softwood Log Production Graph](source: FAO)

International forest products companies continue to expand into new regions, responding to opportunities arising from reductions in barriers to international trade and capital movements, moving away from relatively high cost and highly regulated regions. Much of this expansion is taking place in countries in the form of eucalypt plantations (planted forests) particularly in South America. Increasingly important for investors is third party certification, verification that forest management is sustainable.

### Percentage Changes in Planted Forest Area

![Percentage Changes in Planted Forest Area](source: FAO)
Resource availability is a key factor in determining timber production rates. The biggest changes in resource availability are reflected in increased area of plantations. In 2000, timber harvest from both softwood and hardwood plantations accounted for about 35% of total industrial harvest (though only 6% of global forest cover). In 2005, the available wood for industrial use from planted forests was about 66% of global industrial roundwood production. This proportion could rise up to 80% by 2030. The chart above shows the countries with the largest percentage increases in plantations over the past decade are in Latin America and Oceania. All of these countries are showing the greatest increase in hardwood, primarily eucalypt, plantations. The major timber producers that rely mostly on softwoods, Russia, the U.S., and New Zealand have shown very little plantation expansion.

**U.S. Timber Supply**

The United States is both the world largest producer and consumer of softwood lumber. Compared with many other countries in the world, the U.S. has a very strong tradition of wood use, directly reflecting the historical availability of wood. The United States is the dominant world softwood lumber consumer, using 22% of the world’s softwood lumber supply.

**Top 20 Softwood Lumber Producers | 2013**

The U.S. is also the world’s largest producer of softwood lumber, followed by Canada, Russia, China, Germany, and Sweden in 2013.

![Source: FAO](image-url)
As might be expected given its status as a net importer of forest products, the U.S. exports only a small proportion of its production (about two percent). These exports can be quite significant, as has been the case for softwood logs exported from the U.S. West Coast to Asia. In general though, U.S. domestic demand and a desire among importers to diversify their sources of supply are likely to constrain future exports of U.S. forest products.
Given the gap between production and consumption, the U.S. has long been and will continue to be a net importer of softwood lumber. Historically much of this volume has been sourced from Canada and this trend is likely to continue although Canada has increased softwood exports to China in recent years. As shown in the chart below, China has dramatically increased its softwood lumber imports over the past seven years. In spite of a slowdown in Chinese economic growth, high demand for softwood logs and lumber is expected to continue in China for the foreseeable future.

**China Softwood Production, Imports & Exports | 1961-2013**

Source: FAO
Timber Prices

Delivered Sawlog Prices

Housing and the Sawlog Price Cycle

Residential construction consists of new housing and repair and remodeling, and accounts for about 70% of softwood lumber consumption in the U.S. The key long-term drivers are household formation and income growth. On a trend basis, the outlook for these factors is positive for the U.S., implying favorable prospects for both housing growth and softwood lumber consumption.

U.S. new home construction peaked in 2005, with starts approaching an unsustainable high of approximately 2.1 million units. Housing starts declined to a low of 0.6 million units in 2009 and have been improving since. This decline in housing starts is cyclical in nature however, rather than a more fundamental structural change in the demand for housing. Housing starts will continue to recover substantially over the next three to four years. Sawlog prices in the US West-coast region have seen a sharp rise since 2009, largely due to the high log export volumes to China in recent years. Since Southern US log demand is largely dependent on domestic markets, sawlog prices in the US South have been slow to recover.

To better conceptualize the factors that will affect prices, it is useful to think in terms of the short-term (1-2 years), when we have the clearest knowledge about the current business cycle; the mid-term (3-5 years), when supply issues may contribute most strongly to price effects; and the long-term (6+ years), when demographic factors are the primary demand drivers.
Short-Term Outlook (1-2 years)
A recovering U.S. economy, specifically housing starts, will increase the domestic demand for wood products over the next 18-24 months. House buying activity will increase given high levels of affordability, improving credit markets, and increasing softwood lumber demand for repair and remodeling purposes. Increased government spending will also boost consumption of softwood lumber used in non-residential construction projects (such as infrastructure development). Export demand for US west-coast sawlogs will decline as China’s construction sector slows, the US dollar strengthens, and US residential construction gains momentum.

Mid-Term Outlook (3-5 years)
Timber supply limitations are expected to underpin log prices in mid-term.

The biggest supply-related issue is associated with an insect epidemic in Interior British Columbia. Harvests have been accelerated to salvage dead trees, most of which are expected to become unmarketable after 2017. Signs of diminishing timber availability are emerging already. Other provinces in Canada- Quebec and Ontario- have also substantially reduced their allowable annual cuts and further reductions are expected due to policy changes. These harvest reductions will increase softwood lumber prices and timberland values in the U.S. Furthermore, U.S. imports of softwood lumber from relatively more expensive non-Canadian sources will increase (aided by a strengthening U.S. dollar), to the further benefit of U.S. timberland owners.

Conversion of timberland to other uses will continue to reduce the operable timberland base in the U.S., particularly near major population centers. The timberland base will be further reduced as a consequence of increasing regulation of timberland management practices, further supporting timberland values.

Long-Term Outlook (6+ years)
In the US, many favorable demographic trends suggest increasing softwood lumber consumption, especially rising housing demand. These trends will create positive price pressure in the long-term.

Worldwide demand factors include increasing middle class affluence in many developing countries, potentially increasing demand for wood even where there is not a wood-use tradition. China will consolidate its position as a primary wood trade destination in Asia.

On the negative side, there is an increasing worldwide supply of plantation fiber. Much of this fiber will come from hardwood species (especially eucalypt), and be utilized for pulp rather than lumber.
Pricing of Timberland

The pricing of delivered product (sawlogs) correlates to the pricing and/or value of the underlying timberland asset, though not on a one-to-one basis. For instance, timberland values have remained relatively stable despite log price declines of the order of 40 percent in certain regions over the same period.

Valuation of timberland is based on a combination of “comparable sale” analysis and discounted cash flow analysis. These analyses reflect both wood-flow over time for an entire property and costs of operations. Professional forest managers who practice intensive forestry enhance the value and quality of the property, both in current terms and upon resale.

The most important assumptions that affect timberland investment values are the discount rate, base log prices, price forecasts, harvest schedules (particularly in the first ten years), logging costs, haul costs, road maintenance and construction costs.

Pricing has become more competitive over the last ten years, due to the following factors:

• Timberland evaluation is more sophisticated than in the past.

• Industrial landowners are more reliant on private, non-governmental supply. As a result, the value of direct timberland ownership and supply agreements has increased.

• Increasing numbers of bidders per sale.

• Declining average tract size as the supply of large-scale timberland tracts has diminished with reduced vertical integration within the forest products industry and increased substitution of large tracts into smaller ones.

• Timberland is more widely recognized as an investment asset class. Therefore, both industrial and non-industrial owners are interested in investing in timberland.

• Acceptance of new tax-exempt investment vehicles has further increased the competitiveness of timberland pricing.
Timberland Ownership Changes

U.S. Timberland Marketplace

Traditionally, a large percentage of non-government timberlands have been owned by large, publicly traded, integrated forest products companies, or smaller family-owned forest products companies. The timber on these lands has been used in company mills to produce paper, cardboard, panels, boards, beams and structural lumber for home and building construction, as well as a host of other consumer and industrial products.

In the early to mid-2000s, a fundamental change occurred in the ownership of a significant part of these commercial timberlands. Institutional investors, such as public and private pension funds, endowments, foundations and high net-worth individuals purchased large tracts of timberland from these forest products companies, and began selling the logs harvested from these lands on the open market.

These institutional timberland investments have generally been made through private equity limited liability partnerships, closed-end commingled funds and separate accounts utilizing a limited liability company structure. These investments vehicles are now well established within the industry.
Timberland Transactions

Structural changes in the ownership of private timberlands created opportunities for investors to purchase timberlands. Forest product companies were motivated to sell as a result of mergers and acquisitions, to raise capital for expansion, or to reduce debt. Some large forest product companies sold non-strategic timberlands to focus on timber processing rather than on resource management. Individuals also have sought to realize profits on appreciating timberlands.

Since 1995, the rise in acreage of timberland transaction has been significant. During this time, over 70 million acres has changed hands.

Large-scale transactions have declined in recent years as the number of vertically integrated companies declined. However, many of the tracts originally sold by these companies are expected to return to the market shortly as the durations of the underlying investment vehicles mature.

Hedging

With respect to currency considerations, “hedging” a fully equitized timber investment may not be economically justified, given the relatively high cost of hedging and the fact that timber prices, especially in Canada, Australia and New Zealand, are heavily influenced by the U.S. market (which is always priced in U.S. dollars). In the case of a levered investment, an investor may consider hedging all or part of a debt position that was not denominated in U.S. dollars, provided the cost/benefit was favorable to the investment.

Note: Excludes REIT conversions
Source: Campbell Global
Tax Considerations
With respect to tax considerations, an investor should be committed to taking prudent steps to mitigate the overall tax burden on global timber investments and may need to rely on professional tax and legal advisors for guidance in this area. Based on prior knowledge and experience, most investments can be structured so that minimal withholding tax is paid with respect to ongoing operations (i.e., distributions), although a one-time capital gains tax is almost always due upon exiting investments. A basic approach to minimizing tax may include: creation of a levered “in-country” capital structure; creation of an offshore holding company (e.g., Netherlands or Bermuda pass-through company); use of “hedged” in-country debt; optimizing “in-country” tax accounting rules (e.g., expensing versus capitalizing various forestry costs); and optimization of the benefits of tax treaties between the countries in which the timberland investor(s) and investment(s) are domiciled.
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