

Economics of Intensively Managed Forest Plantations in the Pacific Northwest

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ABSTRACT

Lower risks and higher returns favor investment in intensively managed forest plantations in the Pacific Northwest (PNW) for industrial landowners. Intensive forest plantation management is necessary if PNW industrial landowners are to compete effectively in world markets. However, not all landowner classes have the same set of management objectives, investment streams, and performance measures. For a variety of reasons, intensive forest plantation management may not be appropriate for some nonindustrial and public lands.

Keywords: global competition; investment risk; liquidity; timberland value

On average, the world's six billion people each use about 1.5 kg of wood per day. The United States uses wood at a higher rate than the world average and has long been a net importer of wood products. This situation is likely to continue. As wood is one of the few renewable, sustainable, and environmentally friendly raw materials in the world, more wood will be required to replace energy-consuming and polluting metals, concrete, and plastic. Increased demand for wood will require more tree harvesting, not less.

Yet each year more forest land is made unavailable for timber production in favor of other uses, including conservation, conversion to agriculture, and urban development. Since 1983, harvest levels in the Pacific Northwest (PNW) have dropped by 88 percent on Federal land and by 47 percent overall (Warren 1995, 2003).

A decrease in supply from Federal lands could be compensated for by importing wood products from external sources (e.g.,

radiata pine (*Pinus radiata*) imports from New Zealand to replace ponderosa pine (*Pinus ponderosa*) lumber) or by increasing the amount of wood that comes from non-Federal land.

Nonindustrial and industrial lands now provide ~80 percent of the PNW timber supply (Warren 2003) and are doing so in an increasingly competitive global marketplace. A significant proportion of the increased demand for wood from non-Federal land—both to replace less environmentally friendly materials and to fill the gap created by the reduced harvest levels from Federal lands—is likely to come from intensively managed forest plantations (IMFP).

Forestry in general, and plantation forestry in particular, is very capital intensive. Growing trees is more capital intensive than processing the wood (Fenton 1970, C. R. McKenzie, personal communication 2004). Private and institutional investors will increasingly be needed to finance these plantations, and such investment is likely to go

where it will achieve the greatest return with the lowest risk. Investors will increasingly be attracted to tree species that grow fast on a wide range of sites, have a wide range of end uses, and are amenable to intensive plantation culture.

In this article, we look at the roles of IMFPs in an investor's portfolio, the drivers affecting silviculture strategy, and the effect on timberland value of intensively managing plantations. We also comment on whether the benefits differ by landownership class and whether the PNW needs to adopt IMFP practices to be globally competitive. We briefly discuss alternative economic viewpoints.

What Roles Do IMFPs Play in an Investment Portfolio?

Determining the strategic economic role of intensive plantation forests in a company's or individual's portfolio of investments must start with addressing the entity's diverse set of objectives for the forest assets it owns and determining how these compare with other potential investments. Historically, timberland has outperformed both the S&P 500 and many other asset classes in which both individuals and institutions regularly participate (Anonymous 2001) (Fig. 1). Not all timberland is equal, however.

Investor preferences for risk and return drive the design and construction of a timberland investment portfolio. When most institutional investors select their invest-

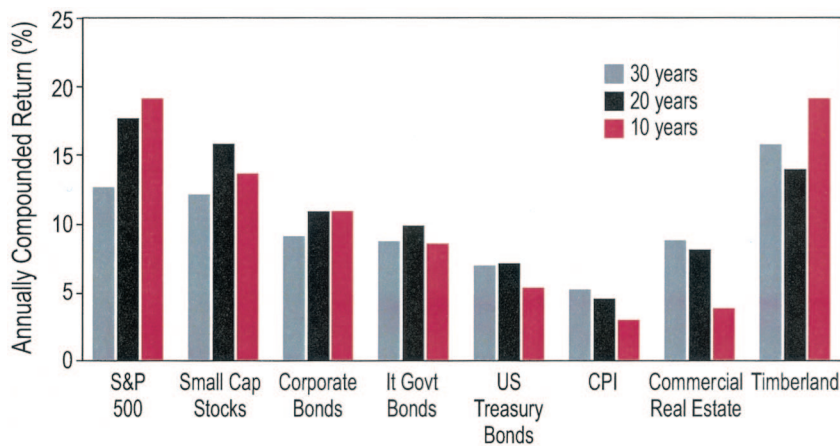


Figure 1. Timberland relative to other asset classes over three time horizons. (Source: James R. Sewall Company, Old Town, ME. Used with permission).

ment policies they look beyond aggregate measures of risk at the underlying factors creating the risk—timber price volatility, timber volume uncertainty, and uncertain asset values at exit. A market-neutral timberland investment portfolio, where risk was not an issue, would include perhaps a 1/3 to 1/2 weighting to plantations, but consideration of these underlying factors drives higher weightings for plantations. In particular, plantations generally suffer less exposure to timber price volatility, less uncertainty about the amount of timber that may be harvested over the life of the investment, and less risk around exit values (Table 1).

As a result of these factors, virtually all of the portfolios managed by Hancock Timber Resources Group, the world's largest timberland manager for institutional investors, are weighted far more heavily toward plantations than a market-neutral portfolio would be. In contrast, Hampton Affiliates, the second largest lumber manufacturer in the PNW, ranks tracts it would potentially purchase by their percentage of value in merchantable timber. A tract that has timber that would readily fit into the raw material needs for their mills ranks higher than land with young plantations. Once the land is owned by the company, however, planta-

tions are highly valued and groomed for future timber production. With improved technology in their mills, Hampton believes they can generate more revenue out of each acre, reduce the period of investment, and facilitate intensive management in their young stands, as well as those of their suppliers.

What Are Some of the Drivers Affecting a Silviculture Strategy?

From an economic perspective, some of the key drivers affecting a silviculture strategy in the PNW are (1) future markets, (2) liquidity concerns, (3) loss prevention, (4) operational issues, and (5) knowledge of the impacts of alternative strategies on tree growth and quality.

Future Markets. Determining what products we should grow today for the markets of tomorrow requires consensus on how the products will be valued in the future. Will different logs have different values, or will log values be relatively flat over a range of qualities? In one anticipated scenario, "high-quality" logs bring increased value (Fig. 2), as in the mid-1990s, when export markets commanded high premiums for large, clear logs. A contrasting situation would be a market in which little or no premium exists, represented by the flatter curve, more like markets of today.

Are today's products relevant for future markets or will they become obsolete? Technological innovation is changing how market needs can be satisfied and the types of products that should be grown for the future. For example, 2 × 10 dimension lumber is being replaced by engineered I-joists from small trees (Hancock Timber Resource

Group, personal communication 2004) (Fig. 3). Will large trees be required in the future?

Some forest managers are concerned about producing plantation conditions that are significantly different from those in the "greater market," since there might be a value penalty for such plantations. There is also concern about having too much of one type of plantation. Some measure of diversity, in terms of management regimes, rotation ages etc., is viewed as positive, allowing a greater "portfolio of choices" to bring into the future, whatever markets may hold dear.

Experience in New Zealand, which has invested considerably in IMFPs in the past 100 years, suggests that, provided there is a large and continuous supply of a "new" product (e.g., pruned logs), it is possible to develop a viable and profitable market for the logs. When New Zealand began pruning on a large scale in the 1960s, there was no established market for pruned logs.

Liquidity Concerns. A silviculture strategy should consider not only the value realized at time of harvest, but value at intermediate points in time, to ensure value is captured across the duration of the investment. If future markets are incorrectly predicted and the "wrong" type of stand is grown, when will that penalty be realized? Or, put another way, if a plantation is sold halfway to its maturity, how would others value its management to that point in time?

To help answer this, The Campbell Group, the largest timberland manager for institutional investors in the PNW, contacted other industry players to "benchmark" their current and proposed practices. They compared key plantation management topics such as planting density and stock type, herbicide practices, precommercial thinning densities, commercial thinning strategies, fertilization regimes, and rotation age. These comparisons allowed them to evaluate the "liquidity" of such investment decisions in their attempt to understand if the "market" recognizes value in a similar way. This knowledge is important to timberland investment because earnings from a particular plantation may not accrue until the time of harvest. Thus, investors will need to be confident that investments in management practices do indeed pay for themselves in enhanced value. In addition, to the extent to which potential buyers recognize plantations as well managed, the likely return in terms of investment gain is greater. The Campbell Group then focused on how the

Table 1. Risk of timberland investments.

Risk factor	Plantations	Natural forests
Timber price volatility	Moderate	High
Timber volume uncertainty	Low to high	Moderate to high
Asset value uncertainty	Moderate	High

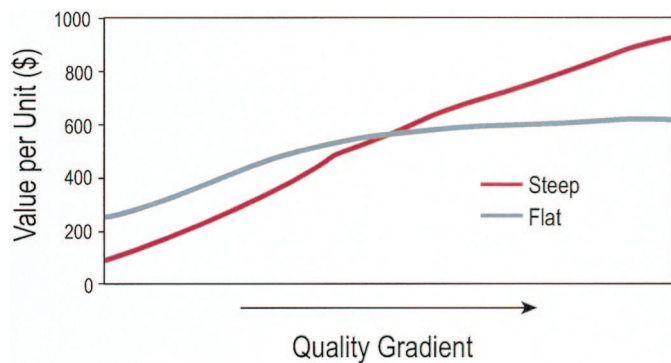


Figure 2. Conceptual log value curves for a range of log qualities.

various plantation investments are realized and whether these investments were observable within the forest inventory or only on harvest.

A concern is that some plantation investments are only realized at the time of harvest and might not be recognized in the market at intermediate points in time. A good example of this is pruning. Although the potential value of a pruned stand is recognized prior to harvest, that added value is only realized when the logs are actually sold to a buyer that pays a premium for them. Until that point, the added value is largely theoretical and dependent on future market conditions. A purchaser may not explicitly recognize the value added to these stands.

In contrast, fertilization is an investment that adds value in a widely recognized manner that is aimed directly at the bottom line—bole volume. To the extent that the fertilization has actually increased standing inventory, its value may be recognized in the sales price of the asset itself. Such an investment is more likely to add value to the plantation investment, regardless of future log quality preferences.

Between these two examples are investments that blend the above considerations.

Depending on the situation, the principle of risk-adjusted return can be used to equate investment alternatives in forest management. The less sure landowners are of realizing an investment return, the greater the discount rate they require in adopting the practice. The longer the time return of an investment, the higher the discount rate.

Loss Prevention. A silviculture strategy should allow professional judgment on site, but also provide financial discipline in keeping the investment in line with investment objectives. Loss prevention is defined as any combination of treatments that may be applied to avert loss beyond “normal mortality.” Foresters can use several tools to limit or eliminate potential mortality or tree damage: manual slashing of brush, chemical spraying of herbaceous competition, bud-capping to prevent deer and elk browse, or even feeding bears to limit the girdling of young trees. Taken together, a forester can use these tools to limit or eliminate potential mortality or tree damage.

Guidance can be provided to the forester by indicating the maximum dollars-per-acre that would be available to “prevent loss” in the event that there is some damaging agent on site. These loss prevention bud-

gets are related to the wood volume that a site can produce, in combination with its expected future value. The loss prevention concept allows flexibility while providing guidance in the management choices that make intensively managed plantations a good investment.

Operational Issues. Current forest practices require that recently harvested areas “green-up” (i.e., trees are free to grow and are 4 ft high) before an adjacent stand can be harvested, implying a potentially large opportunity cost for each year of delay in reaching the green-up objective. This requires that something other than the plantation itself be evaluated in the economic assessment, effectively linking the choice of investment intensity with a nonplantation issue. Generally, where these green-up situations exist, added plantation investment can be justified on the basis of reducing or allowing reasonable time delays in the green-up waiting period. The magnitude of this added increment can, in some cases, be quite high.

Understanding the Impacts of Alternative Management Strategies. Growing trees is a complex business. No matter how confident or experienced the forester or the supporting science, very rarely does a major change in some aspect of management result in exactly the improvement expected. Although this observation holds for many management aspects, it is especially true for silviculture. When one aspect of management changes, there can be unexpected interactions with tree growth and the corresponding products. New Zealand, which is internationally recognized for its expertise in plantation forestry, is in the equivalent of its fifth rotation of radiata pine, yet only now is there enough confidence and experience in evaluating alternative management strategies that investors are comfortable with intensively managed plantation forest regimes (Figure 4). Many of the regimes used for other plantation species have not been fully tested over at least one rotation.

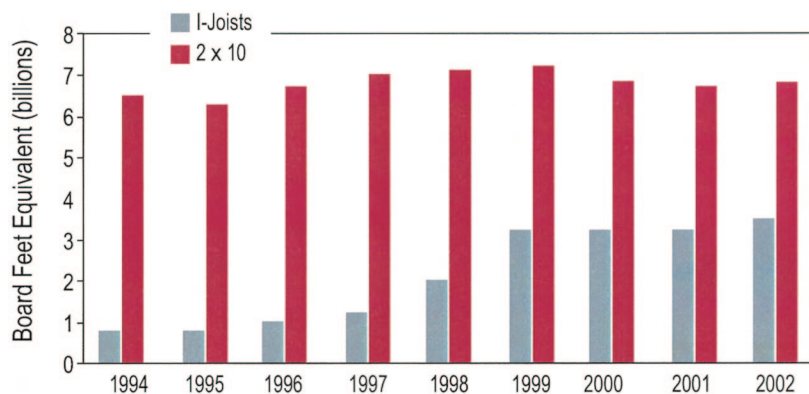


Figure 3. Relative annual production (1994–2002) of 2 × 10 in dimension lumber versus I-joists. (Source: Hancock Timber Resource Group. Used with permission.)

Using IMFPs to Maximize Timberland Value

Private and institutional companies in the PNW are faced with competitors that can have significantly lower wood growing costs. In addition, mean annual increments for tree growth can be four or more times greater than PNW growth rates, and the costs of such key factors as land and labor may be much lower (Schuler 2004).

Industrial landowners manage intensively because, based on past evidence, it is a good investment. As land has been taken out of timber production because of riparian buffers, leave tree areas and other set-asides, the remaining land needs to be managed for as much productivity and value as possible with methods that are reasonably affordable, considering the overall picture and time frame of the investment. Landowners' experience and research have led to a better understanding of the role of seedling technology, density management, herbicides, fertilizers, and genetics in improving overall land productivity while maintaining a broad genetic base. The lowest cost raw material is produced under the highest productivity programs. Some landowners are therefore aiming at achieving the maximum productivity over the shortest time scale consistent with environmental protection and the sustainability of their land resource. Changing product and processing trends also encourages the adoption of intensive management regimes and shorter rotations.

Do All Classes of Land Ownership Benefit?

There is little doubt that forest land value is greater in intensively managed forest plantations than under less intensive silvicultural regimes. Industrial landowners in the PNW manage their lands intensively for this reason.

Small, nonindustrial private landowners provide about one-fifth of the PNW timber supply (RTI 2003, Anonymous 2004). They operate under a multitude of management philosophies. The great majority of small woodland owners are passive managers and base management decisions primarily on factors other than strict financial criteria to guide their plantation investments (C. Chambers, personal communication 2004). In part, this may be because many nonindustrial landowners underestimate the potential financial returns from investments in plantation forestry. What makes economic sense for the large industrial owner, however, is not always good for small owners. Both industrial and nonindustrial owners have access to the same set of tools for intensive management, and productivity of their soils may be similar. The big difference is the overall scale of operations. Intensive management comes with high fixed costs for some activities (e.g., moving equipment in for stand treatment), which, when spread across small areas, make it less attractive than

passive management for small landowners. Another key difference is the higher cost of capital borrowing typically faced by a non-industrial owner.

Public forestland owners have a different set of management objectives, investment streams, and performance measures than do industrial and nonindustrial timberland owners. Maximizing timberland value is unlikely to rate as highly in importance for public landowners as it does for industrial landowners. Adopting IMFP practices may not meet the full set of management objectives on these lands.

The PNW Must Adopt IMFP Practices to be Globally Competitive

Few would disagree that intensive forest plantation management is necessary if industrial landowners in the PNW are to compete effectively in world wood markets. Globalization has led to increased competition from fast-growing, subtropical plantation regions in both international and domestic markets. The PNW industry today is focused, economically tough, and fully aware of the critical importance of improving productivity per acre to both improve returns per acre and reduce final product costs.

Keeping a global and risk-adjusted perspective of global plantation economics is critical to forest investment decisionmaking. Based on internal rate of return criteria, a recent survey ranked intensively managed Douglas-fir (*Pseudotsuga menziesii*) in the Coastal Pacific Northwest 47th out of the 96 countries for which benchmark growth and cost data were collected (Nielson and Manners 2003). Without intensive management, the Coastal Pacific Northwest would rank in the bottom half of benchmarked countries.

In addition to timber producers in other regions, global competition comes from producers of other nonwood raw materials. As the PNW industry transitions to raw material primarily from younger trees in plantations, it will be important to employ technology and intensive management practices (genetics, silviculture, harvesting, manufacturing) that maintain or improve its wood products. Otherwise, the PNW can expect accelerating erosion of its markets to competing materials such as steel and non-wood composites.

Yet another source of competition, both global and domestic, comes from alter-

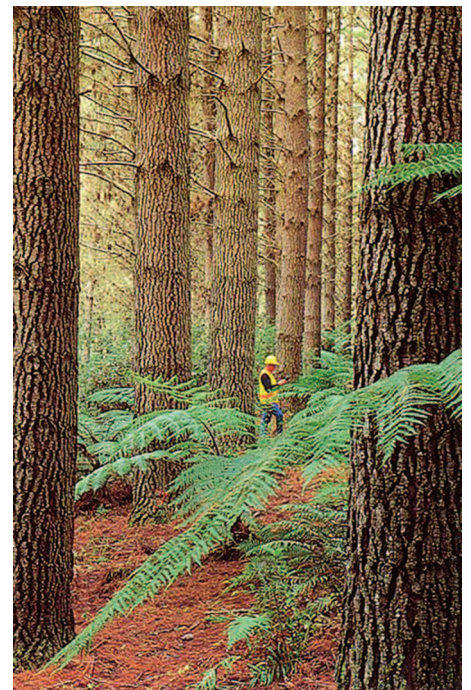


Figure 4. Plantation forest management is a complex business. Multiple rotations can pass before investors are comfortable with intensively managed forest plantation regimes. Photo of this radiata pine plantation is courtesy of Forest Research, Rotorua, New Zealand.

native uses of the investor's dollars. If risk-adjusted returns from forestry do not match other investments, land may be taken out of forest production completely and put to alternative uses. The PNW has seen non-Federal forestland converted to other land uses, presumably with higher returns, at the rate of 100,000 acres per year over the past three and a half decades (Alig et al. 2003). In New Zealand, there has been an opposite trend. Because the profitability of radiata pine plantations has been significantly improved through the development of intensive management practices over the years, plantation forestry is now competitive with ranching. In the last 15 to 20 years, most new plantations in New Zealand have been established on land that was previously used for ranching (grazing). This has resulted in increased private investment and an expansion of the plantation resource onto productive sites that once would never have been used for plantation forestry.

A Broader Economic View

No sensible person doubts that forests can and should provide a wide and diverse range of outputs, including timber, of course, but also clean water, beautiful land-

scapes, biological diversity, recreation, and spiritual values. Learned debate centers on the best way to accommodate this array of values across the forest landscape as a whole. Two archetypes have emerged. One, calling for land-use specialization, strongly supports the development of environmentally acceptable IMFPs in some areas to relieve industrial pressure for timber production on other areas. The second argues for mixed forest uses across the entire landscape, producing low levels of timber on a wide area, but also producing nominally higher levels of ecological outputs across this same wide area. Although theoretical arguments generally support the former approach, the empirical evidence is mixed (Vincent and Binkley 1993, Potts and Vincent, in revision). Indeed, like most aspects of forestry, the greatest societal benefit is likely to be found through a combination of these more extreme approaches.

Conclusions

Public lands now provide less than a fifth of the PNW timber harvest. Nonindustrial and industrial lands supply the bulk of the timber harvest and are doing so in an increasingly competitive global marketplace. Few nonindustrial owners manage their forests intensively, and many are unaware of the economic potential of their forests if they were intensively managed.

Industrial timberland owners maximize their returns and reduce their risk by invest-

ing in intensively managed plantation forests. Concerns about future markets, liquidity, and certainty of timber productivity are some of the drivers that favor intensively managed plantation forestry.

Intensive forest plantation management is necessary if the PNW industrial landowners are to compete effectively in global markets. Competition comes from other timber-producing regions, from suppliers of nonwood substitutes, and from alternative uses of the investor's dollars.

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