

Study 5: An Assessment of the Expected Rate of Return from State Granted Lands Based On Separate Findings Contained In the Future of Washington Forests Report

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Introduction

The Washington Department of Natural Resources (DNR) is steward of more than 5 million acres: about 3 million acres considered as upland and 2.6 million aquatic acres. DNR manages over 2 million acres of forestlands. Forest resource assets are lands with tree cover that are managed for commercially marketable timber resources and other environmental and habitat attributes. The forestlands west of the Cascades are predominately highly productive timber forests containing well-stocked stands; the forestlands east of the Cascades typically are not as productive as western forestlands and may also be used for some grazing.

The majority of revenues produced by these acres come from timber sales, timber sales-related and land sales activities. Revenues produced are distributed to trust beneficiaries. The DNR must act prudently, solely in the interest of the trustees, and for the exclusive purpose of providing benefits to them; this principle

underlies the duties of good faith, loyalty, and care for both Granted lands and State Forest lands, although in the case of the latter, legislative recourse is available.¹

Although all people of Washington benefit from the state's Granted lands, it is the beneficiaries designated by law for which the return on asset approaches are of most interest and it is the beneficiaries' interest that is to be evaluated by the legislature and its designee in making management decisions. Goal setting and the trust management may be regarded as an aggregate activity across trusts, but must be balanced by fiduciary responsibility for each trust. So for example, implementing sustainable forest management is allowed and prudent under fiduciary responsibility, as well as landscape management approaches rather than parcel-by-parcel management schemes.

The term "Granted lands" refers specifically to those lands granted to the State by Congress in the Enabling Act of Washington for the support of named beneficiaries. The fiduciary beneficiaries associated with Granted lands include the following:

- Common School, Indemnity, and Escheat Grant
- University Grants (UW) Original and Transferred
- Charitable, Educational, Penal, and Reformatory Institutions Grant
- Capital Building Grant
- Normal School Grant (EWU, CWU, WWU and TESC)
- Scientific School Grant (WSU)
- Agricultural School Grant (WSU)

The term "State trust lands" commonly refers to all State lands managed by DNR as fiduciary trusts. This includes State Forest Transfer (formerly State Forest Board) Lands, State Forest Purchase Lands, as well as Federally Granted lands.

In addition there are three additional land categories with land holdings. These include aquatic lands, Natural Resource Conservation Areas and Natural Area Preserves, and the Community and Technical College Reserve Trust.

This report is a response to the Washington State Legislature's request to (i) provide an assessment of the expected rate of return from state granted lands based on the information derived from separate findings contained in the Future of Washington Forests Report and (ii) describes approaches available to calculate the expected rate of return. To complete it we reviewed (i) documents prepared by the Department over the past ten years that describe the investment returns from granted lands, and (ii) compared and critiqued the methodology and indicators used in those reports to measure investment returns.

Historical Account and Background Information

In this report we were primarily concerned with upland acres, and more specifically, granted lands. What the State can do with its granted lands is limited legislatively. Many issues regarding the management of these lands have been raised over the years since statehood. Then Attorney General Christine Gregoire released an opinion on August 11, 1996 (**AGO 1996 No. 11**) that addressed several key issues relevant to this assessment.

¹ For a definition of fiduciary responsibility see: Joseph F. Johnston. 2005. Natural Law and the Fiduciary Duties of Business Managers *Journal of Market and Morality* 8(1): 27-52

A summary of the opinions expressed by the then Attorney General are:

- The Enabling Act facilitating the admission of Washington into the union (25 Stat. 676) is a limitation on state legislative authority and requires that federal grant lands be held in trust; exercises of legislative authority over federal grant lands will be tested by fiduciary principles
- The management plans of the Department of Natural Resources for administration of federal trust lands need not treat each trust alike or benefit all trusts equally, so long as the Department acting consistently with its fiduciary duties and in the exercise of reasonable judgment determines that, on balance, the plan is in the economic interests of each trust.
- The management plans of the Department of Natural Resources for administration of federal trust lands may exceed minimum standards imposed by other laws (such as the Endangered Species Act) governing use of those lands, if the Department can show that any reduced short-term economic return reflects a reasonable balance of long-term and short-term interests.
- Forest board transfer lands are held in a trust established by state statute; although the Legislature is free to modify or repeal the laws creating the trust, common law principles governing the administration of private trusts will apply if these principles are not inconsistent with statutory directives.
- The forest board transfer lands constitute a single trust, and the Department of Natural Resources is authorized to manage them as an undifferentiated whole; the Department need not separately account for management of lands located in each county.

Table 5.1 delineates the trusts, how the asset was created, its designated beneficiary and the acres. We analyzed granted forestlands without regard to the specific beneficiary or trust.

Table 5.1: The Distribution Of Trust Acres, Their Original Source, And Designated Beneficiary.

Trust Category	Source	Designated Beneficiary	Current Acres
Common Schools, Indemnity, and Escheat Grant	Granted at statehood	Public schools (K-12)	1,746,020
University Grants	Granted at statehood	University of Washington	86,806
CEP&RI Grant	Granted at statehood	State charitable, educational, penal, and reformatory institutions	70,278
Agricultural and Scientific School Grants	Granted at statehood	Washington State University	70,733 80,455
Community and Technical College Reserve Trust	Purchased by Legislature	State community and technical colleges	3,312
Capitol Building Grant	Granted at statehood	State Capitol Campus	108,281
Normal School Grant	Granted at statehood	Western, Central, and Eastern Universities	64,304
State Forest Transfer Lands	Seized by counties from delinquent taxpayers in 1930s. Transferred to State by counties	Counties where located	625,178
State Forest Purchase Lands	Purchased by State Forest Board	Counties where located	

Source: WA DNR, Various publications and personal communications.

Forest Resources Asset Class

The total acreage of the forest resources asset class is approximately 2 million acres, of which 70% are Granted lands. The majority of revenues produced by these acres come from timber sales, timber sales-related and land sales activities. In addition, the Trust Land Transfer Program has produced around \$50 million per year (WA DNR, various annual reports). Timber-sales related activity range from contract extensions to default settlement payments.²

Table 5.2: Forest Acre by trust

<i>Trust</i>	<i>Forest Acres</i>
Common School Trust	1,103,452
University Trusts	56,954
CEP & RI Trust	40,141
Capitol Building Trust	100,290
Normal School Trust	57,005
Scientific School Trusts	68,549
Agricultural School Trust	56,783
State Forest Trust	595,241
Total	2,078,415

Source: DNR Annual Report 2001

While land is the asset held by the state, it is the use the land is given that produces value. The DNR is limited in changing land uses to higher and better uses by legislation. The DNR is not able to monetize trust assets to the extent that the private sector can. They are further constrained by law in transferring assets from one class to another. For example by law the proceeds from the sales of education trust lands must be deposited into the trust permanent fund and can only be invested in bonds and only the interest is transferred to the beneficiaries. For all other trusts the proceeds from land sales are distributed to the beneficiaries. The legislature has given the department a directive that it is to maintain its forest land base primarily intact, while limiting its ability to liquidate it.

Whether to liquidate the land asset or not was not the issue at hand here. Rather, we focused our research on appropriate performance measures that can be used to evaluate management of Granted lands.

Review of the Deloitte and Touche Report

To our knowledge only one report has analyze the asset value, income and returns for all DNR assets. Two Legislative Proviso reports (2003 and 2006) have been published but have had narrower scopes of work. Our review is focused on the Deloitte and Touche (1996) report.

General Overview

In June of 1996 Deloitte & Touche LLP published their economic analysis of assets managed by DNR. This report is the only in-depth analysis of DNR trust assets to date. It analyzed asset value, incomes and return in a methodical fashion for the fiscal year ending June 1995.

The analytical portion of the 1996 Deloitte & Touche report contained five primary components. The first two components described data collection and organization, and market values of land and resource assets. The last three components presented non-market benefits of land and resource assets, the economic impacts from activities on DNR-managed lands, and provided a discussion of portfolio management issues. The first two sections were of primary interest in our report.

² A full listing is contained in the explanatory notes for fiscal data tables contained in the annual reports.

The market value analysis relied primarily upon reported sales and value estimates of like properties maintained by the DNR. They considered the effect on value of the very large size of trust asset holdings. They considered the market-based retail value and it was adjusted to reflect constraints unique to trust lands to create the trust value. The report recognized that the trust value differs from market value since DNR trust management is constrained by law.

The Deloitte & Touche report extensively discussed distribution income reported by DNR for the year ending June 30, 1995 associated with each asset class with regards to asset value and returns. The trust value of the ten asset classes was estimated by Deloitte & Touche at \$6.97 billion for June 30, 1995. Estimated trust value of Forest Resources is \$5.9 billion, an average of \$2,783 per acre. Westside and Eastside Forest Resources were \$4,031 and \$501 per acre respectively. The estimated trust value reflects an adjustment of 40% from estimated trust retail value of \$9.8 billion for the Forest Resources asset. Total return on investment assessment (asset appreciation as well as revenue earned) was estimated to 8.5 percent for Forest Resources, with the majority share, 6 percent, attributed to land appreciation. This compared favorably with Communications, Mineral and Monetary assets total return on investment of 15.1 percent, 14.7 percent, 12.7 percent respectively, and agricultural and grazing assets total returns of 6.7 percent and 2.4 percent respectively.

Deloitte & Touche Asset Class Valuation Methodologies

The predominant approach utilized in the Deloitte & Touche report is the Sales Comparison Approach. This approach is also commonly referred to as the market approach. It calculates a market value for the asset based on values associated with recent sales of a comparable nature. The Deloitte & Touche Report also separates a Trust Retail value from a Trust value. The difference is an adjustment due to actually attempting to place the asset on the market, and the effect this action would have on its retail value due to size, transaction costs and expectations of buyers. The adjustment is supported by the notion that actual market information used to establish a retail value is biased since it does not contain many large sales of the size and scope of DNR trusts. The Trust Retail value reflects a pre-adjustment value and is based on market information. The Trust value is a post-adjustment value ranging from 60% to 80% of the retail value.

The Deloitte & Touche Report estimates total return to trust assets. Total return is the sum of net cash income and appreciation in a given period. Trust income is the cash revenue associated with ownership of the asset. The report also calculates "Capital Appreciation" benefits by calculating the difference between the trust value at the end of the reporting period (on June 30, 1995) and the trust value at the beginning of the reporting period (on June 30, 1994). In order to estimate the Capital Appreciation of these assets over the study period (FY 95), a backward adjustment factor was applied to the value at the end of the period. The 6% estimated annual appreciation for forest resources was derived from an analysis of the NCREIF Timberland Index.

Deloitte & Touche clarify that asset appreciation is not captured until the asset or some part of the asset is sold, transferred, or refinanced. DNR captures past appreciation of timber assets through timber sales and lease renewal. Standard DNR leases contain escalation clauses through which DNR is able to capture past appreciation. DNR also captures appreciation at the time of lease renewal or release. However, appreciation of the land resulting from a change in the highest and best use of the land cannot be captured unless the land is converted to that use or sold.

The Deloitte & Touche report first considered the timber resource and timberland separately via the Sales Comparison Approach. Timber resource values were determined using volume and price data. The product of both equaled the Trust Retail value estimate. Adjustments were then made assuming such a "sale" would impact the market to the extent that it would reduce its retail value through some bulk discount. While timber is sold by DNR, timberland is not generally sold except under special circumstances. The asset value is a book versus a real value. The Trust Retail and adjusted Trust values reflect an artificial situation where DNR would sell all the trust assets.

The Deloitte & Touche report based the final adjustment upon a number of different scenarios for the sale of the forest holding: sell-off times ranging from ten to fifteen years, with different assumptions of value growth during the sell-off period, and different financial rates of return. The indications of the final adjustment ranged from a low of 25% (implying a rapid sell-off, high value growth or a low rate of return requirement) to 60% (implying a slow sell-off, slow or no value growth, and a high rate of return requirement). Several of their scenarios indicated final adjustments ranging from 36% to about 43%, prompting them to select a final adjustment factor of 40% as the mid-point of the range.³

The Deloitte & Touche report assumed the values of timber and timberland would appreciate. They used an analysis of the NCREIF Timberland Index to estimate an appreciation of 6% for Forest Resources during the study period (FY 95).⁴ The NCREIF Timberland Index was first published in the late 1994 by two leading timberland property managers and “reliably represents the returns that have been possible from generally well-managed, industrial-grade timberlands in the U.S. South or the Pacific Northwest.”⁵ It includes two components: an income and an appreciation (depreciation) of asset. Figure 1 reproduces the rate of reported annually. Since 1995, both the income and asset appreciation has declined.

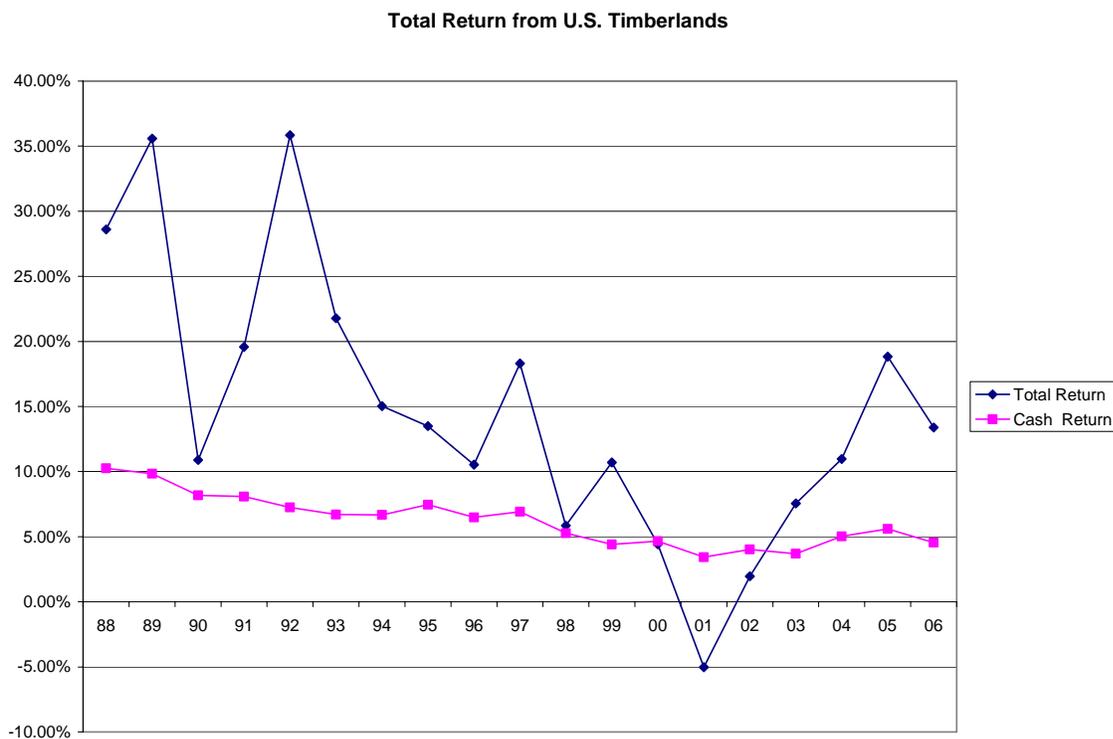


Figure 5.1: Total returns from timberlands.
(Source: NCREIF)

³ Taken directly from page 3-40 of the Deloitte & Touche report.

⁴ Page 3-87 of the Deloitte & Touche report.

⁵ See: Hancock Timber Resource Group. 2003. The NCREIF Timberland Property Index. Research Notes 2003. pg 2

The appreciation of the assets could (and does) include the changes in asset value from:

1. Changes in current timber prices
2. Changes in expected future timber prices
3. Changes of land from one use to higher and better use and changes in land values associated with that use.
4. Capital improvements to the asset, such as roads or bridges
5. Forest improvement activities, such as planting, thinning, etc.
6. Net change in timber inventory from harvest, loss, and growth
7. Changes in the assumed discount rate

On the other hand, not including changes in asset value can distort results. For example, when a land owner harvests more wood than the forest grows the total return would reflect an increase in cash income from the liquidation of inventory and a reduction in asset value by an equivalent amount. In this case just showing the cash return would overstate the true return. This is a liquidation of assets not a return on assets. How much to liquidate is a question forest managers have asked for centuries. We will discuss the answer in the section that follows.

Income Capitalization Approach

An alternative to the sales comparison approach is the income capitalization framework. Forest assets are complex since both principal and income are represented in standing trees. That is, one can create income at the expense of the principal, and vice versa, forego income by adding value to the principal. The decision to harvest trees is made considering its effect on the asset value. This rather unique characterization of forestland and timber, known for over 150 years, has led to the development of modified capitalization methods that explicitly consider the principal/income tradeoff.

It is important to calculate a total return even if managing the asset requires maintaining the principal intact. The cash income return measures the portion of total return attributable to each property's net cash income. The capital appreciation return measures the change in market value over the period including timber and land. The total return is computed by adding the cash income and asset appreciation.

The value of timberland can be determined using the expected cash flow from the property and discounting that to the present. The cash flow is derived from the value of products that are expected to be harvested from the property minus the cost of all services, materials and capital investment expenditures that will be made on the property. It depends on the date the timber is harvested, and the costs and revenues associated with growing and harvesting the trees. The resulting cash flow is then discounted to the present to determine the current value of the asset when viewed as an investment.

There are three important concepts used in income capitalization. Present value analysis and its counterpart of compounding value leads us to annuities and perpetual yields. Growth rates, continuous compounding and a discount rate are components in any time-dependant analysis. Lastly, inflation analysis considers the long nature of the investment; the cash flow is done in real terms and a real discount rate is used.

Equivalent perpetual yield is the income an investment will pay annually forever that has an equal PNV to the asset. Suppose a landowner has \$1,200 and decides to spend it on seedlings and planting costs. What opportunity has he foregone if he were instead to invest it in a bank? Assume that the banking option yields a nominal 5 percent (0.05) per year interest. The bank would pay \$60 ($\$1,200 \times 0.05$) at the end of each year in perpetuity. The \$1,200 would remain forever. The \$60 represents the income return referred to above.

Compounding value occurs if the \$60 payment at the end of each year was deferred and allowed to grow with the principal of \$1,200. If you wanted a payment in 5 years instead of every year you would receive \$332 ($\$1,200 \times (1 + 0.05)^5 - \$1,200$). The \$1,200 would remain after the 5th year. If you want to cash in the

total value consisting of principal and income, called an **annuity**, you would get \$1,532. The annuity represents the total return referred to above.

The perpetual yield method can provide important information to the manager. If we know the revenue stream, and assume a discount rate, we can calculate the present value of the asset. We employ this method below.

Present value is the amount that a payment in t years would be worth today. To calculate it we discount the payment using a discount rate. Let's say a landowner is expecting a one time payment of \$400,000 in 40 years. Using a 5% nominal discount rate what is the present value of \$400,000 is \$56,818 ($\$400,000 / 1.05^{40}$.) The present value of an annual yield of \$60 for 40 years is \$1,030. What is the present value of \$1,532, the value of \$1,200 compounded for 5 years in the example above? It's \$1,200. Note that **discounting** is the reverse of compounding.

Net present value of the investment is the present value of costs subtracted from the present value of revenues. Suppose the landowner undertakes the forestry operation himself and spends \$1,200 with the expectation of receiving \$400,000 in 40 years. The net present value at a nominal discount rate of 5 % is \$55,618 ($-\$1,200 + \$56,818$), and is easy to calculate in this case since both the cost and the revenue are already in present value terms. Any net present value greater than zero increases wealth; an investment with a higher net present value would increase wealth more than an investment with a lower net present value.

If land is the productive asset, a net present value analysis will calculate the value of land when used for forestry. The **soil expectation value** (SEV) is the approach used in forestry, and is a net revenue present value calculation. SEV represents the present value of the cash flow from a parcel of land remaining in forestry in perpetuity. It is traditionally used to determine how long to let trees grow before harvesting, and can establish a base line to compare alternative management investments decisions such as alternative species, using genetically improved planting stock, alternative land preparation schemes, fertilization, thinning regimes and harvesting options by selecting the alternative that maximizes SEV. Even if trees already exist on the ground the SEV method is useful as a baseline value to compare alternative management decisions.

Soil Expectation Values (SEV)

The DNR computes net present value frequently whenever it plans management and reforestation activities. The planting and management activity conducted by DNR on trust lands are capitalized (DNR captures appreciation of its assets) when timber is sold under contract and harvested, and its value is computed as a net present value by its planning unit. To illustrate the income capitalization approach consider the following examples.

Table 5.3: Assumptions for SEV Example 1 (All values are per acre.)

Discount rate: 5%	General inflation rate: 0%
Regeneration investment cost: \$250	Annual administration cost: \$15/acre
Pre commercial or early commercial thin: breakeven	Commercial thinning: none
Fertilization: none	Harvest volume age 50: 32 thousand board ft (mbf)/acre
Harvest value: \$400/mbf	Gross Revenue: \$12,800
Cost of sale prep: 10% or \$40/mbf or \$1280	Net Sale Revenue: \$11,520
Cumulative Administrative cost @ harvest @5%: \$3,297	Net income to land and investment at harvest: \$8,223
Regeneration investment valued at time of harvest less regeneration investment: \$2,867	Net return to land at time of harvest: \$5356
Net return 1 st rotation: \$467	
Net return 2 nd rotation: \$41	
Net return 3 rd rotation: \$4	
Net return 4 th rotation: \$0	
Total Net Return over all rotations: \$512	

The \$512 indicates the value of the investment when an acre of bare land is put into forestry production. Several investments or expenditures are made to realize this return. There is a \$250 investment in establishment/regeneration of the stand, annual administrative costs of \$15 yearly and, \$1,280 expenditure to prepare the timber sale. At the time of harvests net revenue is \$5,356. The investments are made in perpetuity and the present value of the net revenues earned after each harvest and at time of the initial investment is \$512.

A typical SEV or bare land value for Westside forest investments falls in the range of \$200 to \$2000 per acre depending upon the regeneration investment, site class, administration costs, and discount rate assumptions. Different management plans and site conditions will produce a range of SEVs across an ownership.

The SEV provides a conventional criterion for selecting among alternative management plans and justifying investments in forest operations. SEV is the asset value for an acre of bare land managed into perpetuity, usually with the same treatment plan replicated over time. When added to the value of timber that exists on the acre at the date of appraisal the SEV becomes a part of the total asset value. Since the SEV calculation assumes a volume produced, prices and costs, yet there will be uncertainty in these variables over time, a prudent investor may require a higher discount rate to undertake these other risks resulting in a reduction in the SEV and asset value of bare land.

The next issue is how this SEV relates to a Return On Assets (ROA) measure for a portfolio of stands, some of which contain immature timber with no market value. If each stand is managed for best economic performance it should produce the highest performance ROA for the portfolio of stands.

Return on forestland assets example

Considering a portfolio of timber stands with the same performance as our example #1 stand with one acre at each age class (i.e. a uniform harvest rotation 1 acre each year) we can compute the total bare land asset value directly from the net revenues.

For an example portfolio of identical stands such as example 1 with one acre of harvestable age each year and a 50 acre portfolio consider the following:

Table 5.4: Assumptions for ROA Example 2

Asset Value of 50 acres of Land: \$25,600 (\$512 x 50 acres)	Asset Value of 50 acre regeneration investment: \$12,500 (50 acres at \$250/ac.)
Total Asset Value (a book value): \$38,100 or \$762/acre	This asset value does not include any value for the immature timber crop since it would not be reflected on the books of an asset held for a long time.
	Annual Revenue for acre harvested: \$12,800
Annual net of sale cost Revenue: \$11,520	Annual admin cost for 50 acres: \$750
Total net period income \$10,770	Return on Asset Value: 28%

The return on asset value is larger than the return on invested capital since the value of standing timber is not included. While valuing the standing timber is what timber appraisers do, the process of estimating the market value for immature timber is only approximate. There will be a greater risk in the value of immature timber than mature timber as there are many uncertainties in stand and market performance not yet revealed.

If the timber were valued to the assumptions of growth used in estimating the SEV in example 1, then the return on the invested capital would be equal to the discount factor. With perfect information of the future i.e. ignoring market and other performance uncertainties, we can estimate the value of the standing timber using the assumption that the timber on each stand is on the growth profile as our single stand calculation but with the regeneration initiation year corresponding to 1 acre at each age from 0 to 49. We determine the value of timber when it will be harvested and discount the revenue and costs such that the stand about to be cut is fully valued and the 0 year old stand has that same value discounted over the 50 years until harvested. Each age class is essentially harvested at the optimal age and discounted by the number of years required to reach harvest age.

So the relationship between return on invested capital in land and regeneration for a single stand investment is essentially the same as ROA for a portfolio of like stands if the timber value is marked to a market value without any discount for uncertainty in volume, price and cost assumptions. It is worth noting that with an appraisal estimate of the asset value of the immature timber, the ROA will likely be inflated relative to the target rate of return used to evaluate the investment in a single stand performance such as example 1, since any market valuation of the risks associated with holding immature timber will decrease the asset value and as a consequence inflate the return on assets.

Impact of general inflation

With general inflation across the economy the tendency will be for timber market values to increase with inflation as well as costs even though prices may experience business cycle impacts much larger than costs. However the inflation impact on timber revenue is different than the impact on administrative costs since they reflect the average affect across the period which is less than the effect at the end of the period. This increases an SEV that includes inflation in the net revenue stream somewhat more than the general economy-wide inflation increase and slightly compounds the difficulty in valuing assets.

This suggests that in order to isolate management performance from general inflation or timber price appreciation, some adjustments may be required to separate out the impact of price movements. Adjusting revenues to an index reflecting timber market price and adjusting costs to a general inflation cost index provides a performance metric that separates out the impact of timber market price cycles and general inflation from other performance impacts. These may be important adjustments to make in order to reflect only those things that are within management's control.

An Assessment of The Expected Rate of Return on asset value from State Granted Lands

A quantitative measure of the expected rate of return requires knowledge of the asset value. And, as discussed above, finding the appropriate asset value may not be a straightforward task. Total asset values for both land and timber are lacking except for the estimate provided by the Deloitte & Touche report for FY 1994/1995. Using an assumed perpetual net revenue stream of \$97 million for Granted lands (the average of net revenues from Granted lands from 1994 to 2006) we determine the rate of cash return to be 2.3 percent. The rate of return is based on an asset worth \$4,166 million. We have limited confidence with this expected rate of return since the asset value and rate of return are interconnected and largely unknowns. A higher asset value lowers the rate; using the trust value of \$6,943 million (the asset value without the Deloitte & Touche 40 percent discount) leads to a rate of cash return of 1.4 percent.

There is little evidence to assume the asset value remains constant over time. In fact, both the land and timber values change over time (see Figure 5.1). Combined with the changes associated with timber markets and harvest level volume, these factors will require periodic assessments that calculate the changes in asset values in forestland and timber to establish a meaningful rate of return.

One can also relate per acre asset values to values of similar landholdings such as those published periodically by timberland investor organizations to gauge management performance. Deloitte & Touche estimated the Westside per acre value to be \$4,031 (includes the 40 percent discount) in 1995. Industrial-grade timber land values were \$3,021 per acre with some unknown discount for tract size for the same year⁶. There are two issues of importance with these numbers.

One might expect similar DNR acres with industry to have higher values since management objectives incorporate longer rotations, and hence there will be more timber (and value if the timber is marketable which is generally assumed incorrectly) on the acre. At the same time, the higher values per acre necessarily lead to a lower rate of return. Cash revenues might increase due to greater volumes harvested, even with a constant log price, but only after a transition period that lengthens the rotation age. The standing timber portion of the asset value increases more and lowers the rate of return.

Second, one may calculate per acre values using SEV and perpetual yields. The argument is that DNR per acre asset values should be lower since often the timber volumes on these public acres have restrictions that do not permit 100 percent harvests. Using the SEV approach, projected revenues per year for DNR forestlands of \$165 million based on the sustainable harvest levels and 1.4 million acres result in a per acre value of \$2,379 (Timber Supply Study, this volume). This lower asset value is calculated using net revenue data that reflect harvestable timber volumes, rather than standing timber volumes and an implicit discount factor of 5 percent.

The discount factor (and SEV approach) can be related better to management performance than rate of return. If the primary DNR objective is to restore a share of old forest structures in its forestland portfolio, the performance question then becomes how to do this at the least cost to the beneficiary. A rate of return will be low if (i) asset values include standing timber volumes with the assumption that the timber is all marketable and (ii) the time to management increases but only because timber volumes (and values) increase. Using SEV, with an appropriate discount factor, will lower the asset value to reflect harvestable timber volumes rather than standing timber. The per-acre values will be lower assuming a competitive discount factor of, say, 5 percent.

Public managers are generally not interested in the sale value of the timberland asset and are committed to long-term sustainable management. They are interested in measuring economic returns and also ecological returns that are not normally measured by monetary benefits. Given a lack of market mechanisms to value ecological benefit, the problem is frequently defined as finding a proper balance between economic,

⁶ See Hancock Timberland Investor (various issues) published by Hancock Timber Resource Group

ecological and social objectives. Asset performance must deal with non-market objectives efficiently. Holding timber past its economic maturity leads to larger standing timber volumes, and if this timber is assumed to be marketable will lead to high asset values for land and timber and a low rate of return. Instead of maximizing economic return to the timber asset, the measurement problem becomes defining the ecological and social metrics that can be used to measure the success at meeting those objectives and determining management pathways that maximize the metric of success per unit of lost revenue. In effect, timber asset value will be lost to create non-market asset values since the increase in the standing timber volume is not marketable to timber markets, but maybe marketable to ecosystem markets, were they to exist. The lost value is the cost basis value for creating the non-market asset, and can be approximated in the example above by subtracting the asset value with standing timber volumes \$5,079 (\$4,031 in 2006 dollars) from the SEV based on harvestable timber of \$2,379. There is a growing body of literature on how to determine monetary values for these non-market assets and they may be useful in determining how to establish target levels for non-market objectives. If the benefits don't exceed the opportunity loss or cost to produce them, the non-market objective may be set too high.

Conclusions

Public managers are generally not interested in the sale value of the timberland asset and are committed to long-term sustainable management. They are interested in measuring economic returns and also ecological returns that are not normally measured by monetary benefits. State land management is impacted by the perceived notion that these public lands are managed for the public good. Seventy percent of the state forestlands were granted at statehood with a fiduciary responsibility to manage these lands in the best interest of trust beneficiaries. These lands return lower rates than industrial acres since they are managed differently with multiple objectives including timber. As such, rotation age is longer and more standing volume per acre exists on state lands. Instead of maximizing economic return to the timber asset in the purely financial sense, the measurement problem faced by the State Lands Commissioner and DNR is defining the ecological and social criteria that can be used to measure the success in meeting these complex and seemingly-conflicting land management objectives.

Calculating state granted land returns, the effects that management alternatives have on returns, and criteria that better measure state land management performance would be useful to trusts and DNR. Non-timber ecological and amenity valuations should be integral to such measurements. One available approach suggested is to determine management pathways that maximize the criterion of success per unit of lost revenue by establishing monetary values for the environmental or social gains that would be in excess of those gained by a similar private forest land owner.

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Appendix A: Other Asset Classes Managed by WA DNR.

Agricultural Resources Asset Class

The Agricultural Resources asset class consists of DNR-managed trust lands leased for the production of agricultural commodities. DNR can manage agricultural lands through a variety of rental arrangements such as⁷:

1. Percentage rent—sharing in the gross receipts of sold commodities.
2. Sharecropping—receiving a share of the crop in-kind.
3. Cash rent.
4. A hybrid combination of the first three.

The current emphasis is on lease arrangements. Agricultural lands are classified into three revenue producing categories: irrigated perennials and annuals, dry lands, and grazing lands.

DNR manages 255,770 acres of land for agricultural production, (not including grazing which is described below).

Table A-1: Agricultural Acre Distributions Among Granted Lands

<i>Trust</i>	<i>Agricultural Acres</i>
Common School Trust	142,509
University Trusts	11,001
CEP & RI Trust	18,012
Capitol Building Trust	3,761
Normal School Trust	3,271
Scientific School Trusts	6,196
Agricultural School Trust	70,733
Forest Board Trust	287
Total	255,770

Source: DNR Annual Report 2001

Grazing Lands Asset Class

The grazing lands asset class consists of DNR-managed trust land managed for the purpose of grazing livestock and their revenues are reported under agricultural leases in the DNR annual reports. Grazing lands are typically located in areas that do not adequately support agriculture or timber production due to low to moderate levels of precipitation and soil conditions shallower and sandier than those of the more productive lands. The livestock industry is the major user of grazing land. Almost all DNR-managed grazing lands are located east of the Cascades.

DNR manages 448,328 acres of grazing lands. Generally, long-term grazing leases are issued for typical grazing lands, and shorter-term and somewhat use-restrictive grazing permits are issued for grazeable woodland areas.

⁷ As described in Deloitte & Touche 1996

Table A-2: Grazing Acre Distributions Among Granted Lands

<i>Trust</i>	<i>Grazing Acres</i>
Common School Trust	408,951
University Trusts	17,135
CEP & RI Trust	9,723
Capitol Building Trust	1,106
Normal School Trust	2,796
Scientific School Trusts	3,965
Agricultural School Trust	4,557
Forest Board Trust	95
Total	448,328

Source: DNR Annual Report 2001

Commercial Real Estate Asset Class

Commercial real estate assets consist of urban and rural lands that have an existing commercial use or a commercial highest and best use. Though the state's holding is small in acreage, this asset produces higher per acre revenues given its highest and best use characterization. A high proportion of these lands are not leased since they are transitional in nature.

Table A-3: Commercial Real Estate Acre Distributions Among Granted Lands

<i>Trust</i>	<i>Commercial Real Estate Acres</i>
Common School Trust	40,940
University Trusts	1,094
CEP & RI Trust	1,296
Capitol Building Trust	667
Normal School Trust	93
Scientific School Trusts	502
Agricultural School Trust	819
Forest Board Trust	13,408
Total	58,819

Source: DNR Annual Report 2001

Deloitte & Touche (1996) identified five sub-groups in the real estate asset class:

1. leased land
2. leased land and buildings
3. undeveloped urban enhanced land
4. undeveloped urban unimproved land
5. undeveloped rural "transitional" land

DNR manages approximately 48,100 acres of commercial real estate.

Other Asset Classifications

Communication Resources Asset Class

Communication resources assets are sites on mountain tops, prominent ridges, or hills and transportation corridors used as locations for communications antennas. Communication resource sites are leased to private parties for transmission towers.

Mineral Resources Asset Class

The mineral resources asset class comprises land not contained in the other asset classes that is owned and managed for its mineral production or mineral potential, and subsurface mineral rights retained from prior sales of land. There are significant mineral potential in the other land-based asset classes. One should note that revenues are listed by type and not by land classification. Timber revenues can come from transition lands. Grazing revenues can come from timber lands.

Potential mineral assets include:

- Sand, gravel, and rock;
- Metallic minerals (gold, silver, lead, zinc, copper, etc.);
- Non-metallic minerals (clay, talc, coal, limestone, dolomite, etc.); and
- Oil and gas.

There are approximately 25 active mining operations on DNR-managed land that mine sand, gravel, rock, clay, and dolomite. Of the approximately 682,000 acres in this asset class, less than 2,000 acres (0.2%) has any information about whether there are minerals of any value present.

Special forest products and right-of way leases complete the land asset descriptions that produce revenues from the Granted land asset. The size managed by DNR is 73,600 acres when mineral, communication and other leases, are taken together.

Table A-4: Miscellaneous Acre Distributions Among Granted Lands

<i>Trust</i>	<i>Miscellaneous Acres</i>
Common School Trust	50,168
University Trusts	622
CEP & RI Trust	1,106
Capitol Building Trust	2,457
Normal School Trust	1,139
Scientific School Trusts	1,243
Agricultural School Trust	718
Forest Board Trust	16,147
Total	73,600

Source: DNR Annual Report 2001

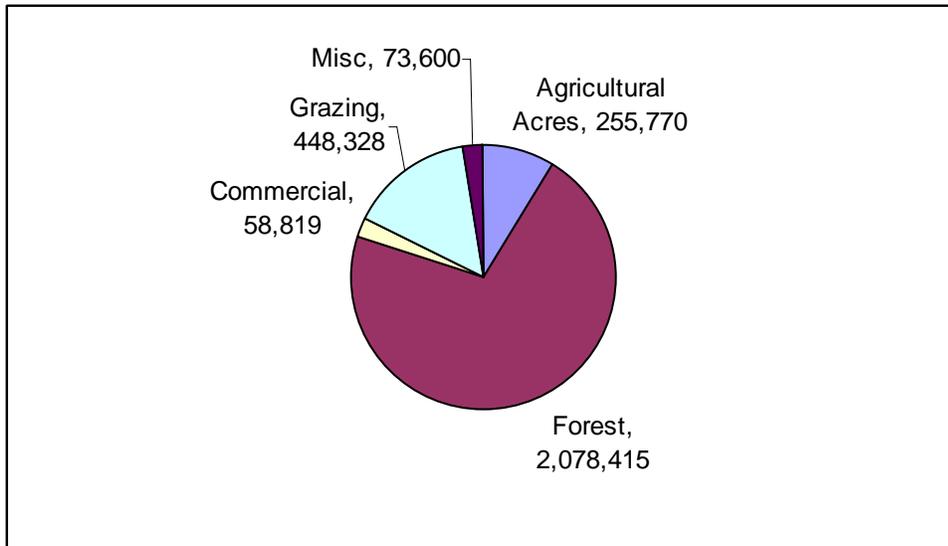


Figure A-1: Distribution of Granted Lands

Aquatic Resources Asset Class

At statehood, Washington became steward of approximately 2.6 million acres of aquatic resources.⁸ The aquatic resources are not, however, part of the granted lands. Aquatic lands are those that lie below ordinary high tide along rivers, lakes, and tidally influenced areas of the state. Aquatic lands are managed for income through commercial geoduck and shellfish beds, leased harbor areas, and leased non-harbor areas.

Natural Areas/Conservation Areas Asset Class

A Natural Area Preserve (NAP) is an area of land and/or water predominately in its natural state, largely undisturbed by human activity, and designated under the Natural Area Preserve Act of 1972 (RCW 79.70). The NAP program’s purposes are to: 1) protect examples of undisturbed terrestrial and aquatic ecosystems, rare plant and animal species and unique geologic features; 2) serve as gene pool reserves; 3) serve as baselines against which the influences of human activities in similar, disturbed ecosystems may be compared; and 4) provide outdoor laboratories for scientific research and education.

A Natural Resources Conservation Area (NRCA) is an area of land and/or water designated under the Natural Resources Conservation Act of 1987 (RCW 79.71). The NRCA program’s purposes are to: 1) protect lands identified as having high priority for conservation, natural systems, wildlife, and dispersed recreational values; 2) protect prime natural features of the Washington landscape, inland or coastal wetlands, significant littoral, estuarine, or aquatic sites, or important geologic features; 3) protect examples of native ecological communities; and 4) protect environmentally significant sites threatened with conversion to incompatible or ecologically irreversible uses.

DNR manages approximately 70,000 acres of NAP and NRCA land. The land was acquired through nearly 200 acquisitions and donations since 1972 at a cost of about \$220 million. NRCAs and NAPs are not part of DNR-managed granted lands.

Monetary Asset Class

The Monetary Assets Class related to upland trust management includes five permanent trust funds managed by the Washington State Investment Board and seven funds managed by DNR.

⁸ Source: Major Public Lands of Washington, 2000. Map produced by Washington DNR. April, 2000.

In addition DNR administers twelve other funds for carrying out government activities including fire fighting, aquatic land management, and regulatory responsibilities. A portion of these administered funds utilize revenue collected from various licenses, fees and charges and federal Grants-in-Aid to fund operational expenditures, such as forest fire suppression, property acquisition for environmental protection, and environmental education⁹.

DNR-administered funds are used for operational activities and responsibilities. These funds are used for cash management, and are not held for investment purposes.

Permanent funds consist of five irreducible funds invested for the support of the Beneficiaries (common and normal schools and selected colleges and universities).

Upland Trust Monetary Assets

The upland trust monetary assets consist of three types:

- The permanent funds managed by the Washington State Investment Board (WSIB)
- Trust management fund managed by DNR
- Revolving funds managed by DNR.

The permanent funds are a three-quarter-billion dollar investment portfolio consisting of five permanent trust funds managed by the Washington State Investment Board (WSIB). The five irreducible permanent trust funds managed by the WSIB are:

- Fund 601, Agricultural School.
- Fund 604, Normal School.
- Fund 605, Common School.
- Fund 606, Scientific School.
- Fund 607, State University.

These funds are limited to a narrow range of conservative securities investments such as bonds and other fixed income investments. They are mandated to emphasize stability of income to support the beneficiaries of the irreducible trusts, and are to be actively managed to exceed the return of the Lehman Brothers Aggregate Bond Index.

The DNR management funds are used for land management activities and responsibilities on behalf of the trust beneficiaries. They are not held for investment purposes. The three trust management funds managed by the DNR are:

- Resource management (RMCA)
- Agricultural college (ACTMA)
- Forest development (FDA)

These funds had a total fund balance of \$74.8 million as of 6/30/06.

The RMCA is used to track revenues and expenditures from three subsidiary accounts:

- State aquatic land management,
- Granted trust uplands management (other than the Agricultural Grant)
- The land bank

⁹ For a list of DNR administered funds see page 28 of the “DNR Annual Report FY 2006”. The Report is available at: <http://www.dnr.wa.gov/base/publications/list.html>

As of June 30, 2006, the Aquatic lands portion of the RMCA fund balance was \$2.6 million, the upland management portion was \$14.5 million, and the land bank was \$26.3 million. Land bank funds are from the previous sale of upland trust properties and are dedicated by law (RCW 79.19) to purchases of replacement property.

ACTMA funds are limited to paying expenses on Agricultural Grant lands and are funded through transfers from the state general fund. There is no management deduction from Agricultural Grant lands and 100 percent of the revenue generated from these lands is transferred to the beneficiaries.

The FDA is used to track management fund revenues from and expenditures on State Forest lands. The management fund deduction from State Forest purchase lands is 50 percent. The maximum deduction from State Forest transfer lands is 25 percent and is currently set by the Board of Natural Resources at 22 percent.

The four trust revolving funds managed by the DNR are:

- Contract harvesting revolving
- Park land trust revolving
- Real property replacement
- School construction revolving

As of 7/1/06 these revolving funds have a combined fund balance of \$24.0 million, \$23.1 million of which is dedicated by law to the purchase of replacement trust lands and related administrative expenditures, the remaining \$0.9 million is in the contract harvest revolving fund and is used primarily to pay contract harvesters.