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Chapter 5
Timber Asset Class

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Executive Summary

The Timber Asset Class consists of approximately 2.1 million gross acres of timberlands. The majority of acres are grown and tended to maximize growth and revenue. Nearly 60 percent (approximately 1.2 million) of the acres are projected as harvestable under existing regulations and are stocked with commercial species. The table below provides a brief summary of the Trust Value for the Timber Asset Class. We have provided this valuation subject to the following Extraordinary Assumptions:

We assume that all timberlands adhere to the proper zoning regulations outlined in regional plans. If not fully compliant, we assume that each property is legally nonconforming to the proper zoning standards. For the purpose of this analysis, we assume that the ownership interest is non-transferable resulting in the land not being able to be sold. We relied on information provided by the Trust Manager for all specific data regarding age, species, totals, and other forest inventory metrics. We assume that the information provided is accurate and sufficient for the purpose of this valuation.

Timber Asset Class – Reconciliation	
Valuation Approach	**Value (Rounded)**
Gross acres	2,056,510
Net acres	1,240,163
Whole Property Value Method Conclusion	$2,569,200,000
Income Approach Conclusion	$2,060,000,000
Reconciled Trust Value	**$2,136,000,000**
Value per gross acre	**$1,039**
Value per net acre	**$1,722**

Introduction

The Timber Asset Class is the largest asset class. It spreads across the State of Washington, although the majority of the gross land area lies west of the Cascades.

INTRODUCTION

The Timber Asset Class is the most significant real estate investment from a land size and economic perspective. There are approximately 2.9 million[1] acres of Upland State Trust Lands; however, this chapter will primarily focus on approximately 2.1 million gross acres in the Timber Asset Class related to timber revenue and timber-related activities. Approximately 850,000 acres of Upland State Trust Lands are excluded from the Timber Asset Class, and include Agricultural lands, open water bodies, and non-forested lands that are mostly used for roads.

The Timber Asset Class consists of land (i.e., timberland) with tree cover (i.e., timber) managed for its commercially marketable timber. The tree cover, or timber, comprises various types of tree species and a wide range of ages.

Typically, the Timber Asset Class includes timberland, timber, and other products contained within the geographic areas west of the Cascade mountain range crest ("western Washington") and east of the Cascade mountain range crest ("eastern Washington"). Western Washington forest land predominately comprises highly productive timber forests that contain well-stocked stands of timber. Eastern Washington forest land is not nearly as productive or high quality as the land to the west, and in addition to producing timber, it may also be used for various levels of grazing.

Per data provided by the Washington State Department of Natural Resources ("Trust Manager" or "Trust Management"), the FY 2018 combined total gross revenue related to the Timber Asset Class was approximately $174.4 million The gross revenue from this land is reduced by a specific operating cost percentage deduction to account for management and operating expenses, with the net cash flow distributed to the trust beneficiaries.

As a general note, all dollar amounts reported in this chapter are nominal and have not been adjusted for inflation. Additionally, the years referenced herein are not calendar years; instead, they refer to fiscal years that begin on July 1 of the year prior and end on June 30 for each year.

Timber Asset Class

This asset class consists of approximately 2.1 million gross acres of forests that are grown and tended to maximize growth and revenue. In some areas, forest trust lands comprise the middle ground between lowland rural/urban areas and mid- to high-elevation national forests. Forest landscapes are under a tremendous amount of public scrutiny. Many private working lands restrict public access or provide no public access at all, while others are implementing an access fee model.

[1] The 2.9 million gross acres excludes approximately 224,000 acres attributable to Tidelands Second Class, Shorelands Second Class, Milwaukee Road Corridor, Natural Area Preserve, Natural Resources Conservation Areas, Administrative Sites, Water Pollution Control Division Trust Land, and the Community Forest Trust.

It is helpful to keep in mind that land areas can be moved from one asset class to another asset class over time. These are called Transition Lands and are defined as lands currently being managed for natural resource production that have characteristics indicating an opportunity for more efficient management to obtain a higher economic return by conversation of the land to another use. For example, an area of the Timber Asset Class that is currently being used for timber production may be reclassified in the future to the Commercial Real Estate Asset Class as its planned use changes to accommodate market conditions and opportunities.

Timber Asset Class Ownership. The Trust Manager manages and operates state trust lands owned by the State of Washington for the benefit of designated trust beneficiaries. To be concise, this report uses the term "ownership" or "ownership interests" to describe the amount or percentage of gross revenue or land managed by the Trust Manager on behalf of specific trust beneficiaries, even though the land is owned by the State of Washington and not the trust beneficiaries.

The trust with the largest land base is the Common School and Indemnity Trust, which supports public statewide school construction and other designated programs. Beneficiary interests in these lands are the result of federal land grants to Washington at the time statehood was granted. This trust represents approximately 53 percent of the total gross acres in the Timber Asset Class.

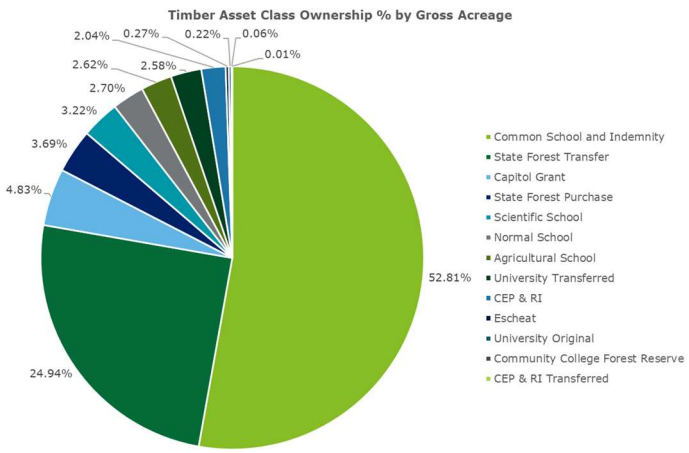
The trust with the second largest land base is the State Forest Transfer Trust. These lands were acquired by counties in the State of Washington through property tax delinquencies or purchases and later deeded by the counties to the State of Washington to be managed and operated by the Trust Manager for timber production to generate income for local services in the counties in which the lands are located. While the counties deeded their ownership interests to the State of Washington, the counties retain the right to revenue generated from timber sales and timber-related activities, net of a specific operating cost percentage deduction (defined further in the expenses section of the next page) to account for management and operating expenses related to these lands. This trust represents approximately 24.94 percent of the total gross acres in the Timber Asset Class.

The following table and chart present the trust ownership percentages based on gross acres held in the Timber Asset Class.

FIGURE 1

Trust Name	Gross Acres	%
Common School and Indemnity	1,086,060	52.81%
State Forest Transfer	512,905	24.94%
Capitol Grant	99,361	4.83%
State Forest Purchase	75,981	3.69%
Scientific School	66,193	3.22%
Normal School	55,628	2.70%
Agricultural School	53,840	2.62%
University Transferred	53,142	2.58%
CEP & RI	41,921	2.04%
Escheat	5,525	0.27%
University Original	4,471	0.22%
Community College Forest Reserve	1,277	0.06%
CEP & RI Transferred	203	0.01%
Total	**2,056,510**	**100%**

FIGURE 2



Timber Revenue. Gross revenue for the Timber Asset Class is mostly generated by selling (through public auction) the rights to harvest timber on specifically identified stands. Timber stands are offered and sold to the public for short contract periods of two to three years to harvest the timber; generally, the typical term is two years. Payment for the standing timber is paid at the time the timber is removed and harvested,[2] or at the expiration of the term if the harvest is not completed (a rare occurrence). Prior to the auction, the Trust Manager estimates the value of the standing timber to establish a minimum bid price. In some cases, there are no bids, which results in a no sale outcome. Timber stand pricing is based upon the species, quality of logs, and estimated quantity of timber available, as well as the costs related to harvesting the timber and distance to market (i.e., sawmills). Among the most important indicators of value for a timber stand are the price for the timber "on the stump," the "stumpage price" for the species type, and the corresponding volume of timber within a stand.

Expenses. Beneficiary trusts incur expenses related to operating the Timber Asset Class. The expense amount is based on a fixed percentage of revenue collected, and the fixed percentage varies by trust ownership (i.e., trust revenue is tracked by ownership and charged the appropriate rate). In this report, expenses are referred to as "operating cost percentage deduction." This is the contractual rate the beneficiary trusts must pay. This rate accounts for expenses related to trust lands in the current operating year and costs related to future revenue. For example, tree replanting in areas that have been harvested will benefit the beneficiaries in the future and produce new harvestable timber. Hence, these costs are both operating expenses and capital investment expenditures. The operating cost percentage deduction is paid to the Trust Manager, in its managerial role, to pay for operating expenses and capital expenditures.

Net Cash Flow. The net cash flow, after the operating cost percentage deduction[3], is distributed to trust beneficiaries based upon their percentage of revenue.

[2] Per RCW 79.15.100, an initial deposit may be collected on the day of the sale and held for the purposes of performance security. Once all contract obligations are satisfied, the deposit may be applied towards the final timber invoice.
[3] Per RCW 79.38.030, the Trust Manager may charge purchasers of timber for use and associated maintenance and construction of access roads. This has the potential to impact bid prices.

Valuation Factors. The Timber Asset Class is a very large and complex real estate portfolio. In the planning and scoping of this valuation analysis for this asset class, the following items were noted and evaluated.

- **Trust Ownership.** The Washington State Constitution restricts the liquidation of large areas of federal grant lands to 160 acres at a time. In compliance with the Washington State law, state forestlands are reserved from sale except under specific conditions outlined in RCW 79.22.060. The intent of both restrictions is to preserve the corpus of the trust estate. Compared to traditional real estate ownership interests, this restriction impacts the property interest definition and corresponding valuation analysis.
- **Commodity.** Timber is a commodity that is often described as a raw material or primary agricultural product that can be bought and sold. There is little difference between a commodity that comes from one producer versus another producer. The wide availability of commodities typically leads to small profit margins and diminishes the importance of factors other than price.
- **Gross to Net Acreage Adjustments.** While the total acreage size of the Timber Asset Class is large (2,056,510 gross acres), the portion that can be harvested is much smaller. In this report, the process to determine this portion is referred to as the "gross to net acreage adjustment."

There are various reasons why some acres within the Timber Asset Class are restricted from harvest[4] and generate less or no revenue for the trusts. For example, the land may contribute to the ecological goals of the 1997 *State Trusts Habitat Conservation Plan* (HCP), which was written to comply with federal laws, or may be required for forest practices rules (Title 222 WAC). Descriptions of these restrictions follow:

- *Long-Term Deferrals:* Long-term deferrals are areas that are not available for harvest. Examples include but are not limited to areas such as permanent research plots, timber gene pool reserves, or habitats that meet the ecological commitments to protect threatened and endangered species under the 1997 HCP, including nest patches for the Northern Spotted Owl (NSO) and occupied Marbled Murrelet (MM) habitat.
- *Non-Commercial:* Non-commercial acres that contain tree species with little to no commercial value, including but not limited to Cherry, Crabapple, Pacific Madrone, and Willow trees. These acres are dispersed throughout the Timber Asset Class acres. These areas fall outside the typical long-term deferral areas and, as such, are not included in the long-term deferral totals. Non-commercial acres are not considered as part of the harvest program.

[4] All restrictions are current as of the 20180629 Large Data Overlay, a Geographic Information System (GIS) database that combines and classifies a variety of GIS and tabular databases into a single large GIS layer that encompasses all surface and timber lands managed by the Trust Manager. These restrictions are not permanent designations. The Trust Manager may change classification as specific forest stands or sites are re-evaluated. Acreage updates and changes can occur over time due to technological refinements in data gathering and analysis.

- *Riparian Management Zones (RMZs):* These areas are only partially available for harvest and are generally limited to thinning only. Management activities that occur on state trust lands near streams must comply with one of three rule sets: (1) the 1997 HCP riparian conservation strategy for state trust lands within the Olympic Experimental State Forest (OESF), (2) the 1997 HCP riparian conservation strategy for all other state trust lands managed under the 1997 HCP in western Washington, and (3) the forest practice rules (Title 222 WAC) for state trust lands in eastern Washington. Each rule set establishes RMZs on all fish-bearing and perennial streams and have varying levels of protection depending on the size or "Type" of the stream. These rules specify the silvicultural treatments that can be used (e.g., stand thinning) to speed the development of structurally complex forests without sacrificing short-term ecosystem function.

  Based on the Riparian Forest Restoration Strategy published in 2006, the "management goal for RMZs is the restoration of high-quality aquatic habitat to aid in federally listed salmon species recovery efforts, and to contribute to the conservation of other aquatic and riparian obligate (i.e., dependent) species. To achieve this goal, the department will use a combination of various types of active management through stand manipulation, and also the natural development of unmanaged stands. This will result in the restoration of structurally complex riparian forests that provide the ecological functions to meet the conservation objectives."

  For this analysis, nearly 20,000 miles of stream area estimates were provided by the Trust Manager using existing recognized data systems (FP_Hydro). A transition to a new LiDAR stream mapping system is underway by the Trust Manager. On-the-ground validation of identified streams still needs to take place. Buffer zones need to be established around the streams, which further reduces the acreage available in the harvest base. Buffer zones adjacent to identified streams are mapped out as follows:

  Type 5 streams. These streams have a defined channel and very little water part of the year. They do not require a harvest buffer.

  Type 4 streams. These streams are small (i.e., under two feet), but have water. They require a 100-foot buffer.

  Type 3 streams. These streams range from small to large (i.e., more than two feet) and have either a presumed or verified fish presence. On average, they require a 170-foot site index buffer on the westside.

  Types 1-2 streams. These streams contain large, navigable bodies of water. On average, they require a 170-foot to 200-foot site index buffer.

  Note: If unencumbered by an HCP, Washington state regulations in WAC 222-30 prescribe RMZs with somewhat different no-cut buffer requirements.

- *General Ecological Management (GEM) Lands*: These lands are managed for economic rotational harvest with leave trees or patches and are subject to the 1997 HCP, The Policy for Sustainable Forests, and all relevant laws including forest practices, but otherwise are available for harvest.

- *Uplands:* These are areas where landscape and/or site-specific objectives extend harvests beyond an economic rotation. They are subject to the 1997 HCP, The Policy for Sustainable Forests, and all relevant laws including forest practices. These lands must also comply with specific ecological objectives that constrain (but do not preclude) harvest. Examples include areas managed for northern spotted owl conservation or for hydrologic maturity.

  In this report, the gross acres within the Timber Asset Class are reduced to reflect these restrictions and limitations. This reduction is referred to as the "gross to net acreage adjustment."

  The gross to net acreage adjustment methodology accounts for two issues. First, it determines which acres are available for harvest. Second, of the acres available for harvest, it accounts for the intensity of management that can be practiced.

- *Sustainable Yield.* "Sustained yield plans," as defined in RCW 79.10.310 , means management of the forest on a continuing basis without major prolonged curtailment or cessation of harvest. The sustainable harvest level is the volume of timber to be scheduled for sale during a planning decade from all state trust lands located in Washington. The Trust Manager determines the level of timber harvest for present and future trust beneficiaries that considers revenue production as well as ecological values, such as healthy forest ecosystems and habitats for threatened and endangered species. The sustainable harvest level is a policy decision that requires approval by the Board of Natural Resources.

  The mean annual timber volume that can be sold and harvested from year-to-year in the planning decade may only change plus or minus 25% and must be consistent in the near term to the decade's harvest plan.

- *Portfolio Size and Location:* Compared to other timber real estate holdings situated elsewhere in the United States, the large size of the Timber Asset Class coupled with its superior location (i.e., western Washington) is truly unique. As a result, the availability of meaningful comparable data is limited. These characteristics combined with the trust ownership and restriction issues highlighted above affect the valuation approaches selected and the execution of those approaches.

- *Expenses:* Trust expenses are defined as a fixed percentage of revenue based on the trust ownership.[5] The actual expenses utilized to manage the timber and harvesting process may not align with the percentage deducted from gross revenue.

[5] Different rates apply based on the management account associated with each trust ownership.

A summary of the Timber Asset Class follows:

- The Timber Asset Class is a real estate interest (i.e., trust value) that for the purposes of this analysis, the ownership interest in non-transferable, which results in the land not being able to be sold.
- A large portion of the gross acreage is removed from the revenue-generating harvestable land due to restrictions and deferrals; these are real estate areas that cannot be sold and cannot generate timber revenue
- All revenue is the result of harvesting a commodity (i.e., timber and other valuable materials), and commodities typically have low margins and fluctuating market prices
- Operating costs are defined as a fixed percentage of revenue, regardless of profitability
- Sustainable harvesting requirements limit any changes in the timber volume harvested in any given year

Given these valuation factors and issues summarized above, there is a low expectation of value growth for the Timber Asset Class from the trust beneficiary's perspective, as well as minimal expectations that the net cash flow will grow in the near term.

Timber Acreage

The land areas in the Timber Asset Class are located throughout the State of Washington, but are generally evaluated on a geographic basis (i.e., western Washington versus eastern Washington)

INTRODUCTION

The Trust Manager operates and manages the Timber Asset Class holdings for the beneficiary trusts in the following six managerial regions:

- Western Washington
  - Northwest Region
  - Olympic Region
  - Pacific Cascade Region
  - South Puget Sound Region
- Eastern Washington
  - Northeast Region
  - Southeast Region

The Timber Asset Class land areas in western Washington are characterized by the Douglas Fir and western hemlock species that are the dominant products that supply dimensional lumber mills in the market. western red cedar is a secondary product that commands a high price due to its limited supply. Timber Asset Class locations in western Washington are considered some of the most productive and valuable harvesting areas not only in Washington State, but anywhere in the United States.

Forest trust lands in western Washington are located in a temperate wet climate that provides ample precipitation to productive soils. Trees in the region grow at a much faster pace relative to other areas in the country. Additionally, the timber infrastructure in the west includes several new, highly efficient mills built at new and former mill sites resulting in a strong and readily accessible marketplace.

The Timber Asset Class land areas in eastern Washington are constrained by where moisture is most available. Precipitation drives where forests are able to grow in eastern Washington. Timber Asset Class locations in the east are considered much less productive and valuable.

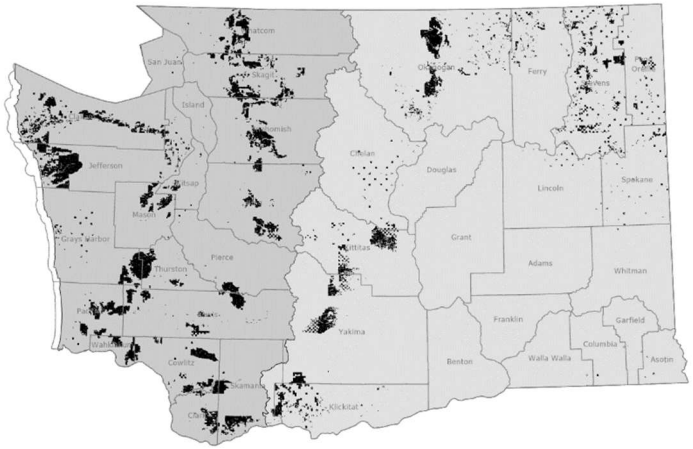
In eastern Washington, the most productive areas are found near Colville where sufficient moisture allows for higher productivity. However, moisture and productive soils are generally lacking in the region. As such, growth rates for stands of timber lag behind the growing conditions in western Washington and require longer or multiple harvest rotations. Additionally, the milling infrastructure has become significantly more limited over the past 20 years.

IMAGE SHOWS A DOUGLAS-FIR TREE
SOURCE: TREESEEDONLINE.COM

GROSS ACREAGE

The reported total gross acreage of the Timber Asset Class is 2,056,510 forested acres. The following map highlights the location of the forested gross acreage in the Timber Asset Class and provides general demarcations of the boundary between western and eastern Washington.

FIGURE 3



The following charts present the total gross acreage and the allocation between western and eastern Washington. On a gross acreage basis, western Washington comprise a large majority of the Timber Asset Class, and as mentioned earlier, western Washington contains the most productive land in this asset class. The following exhibits highlight the gross acreage allocation between western and eastern Washington.

FIGURE 4

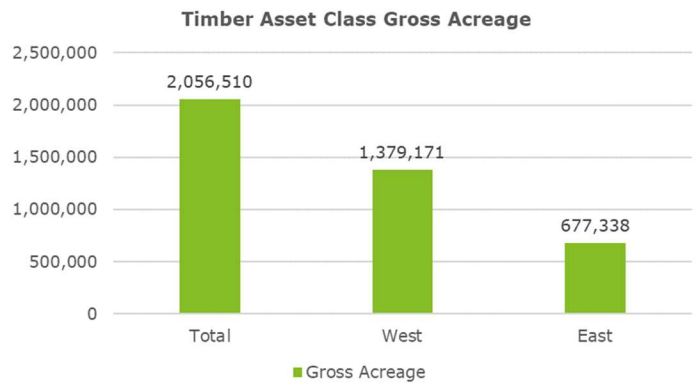
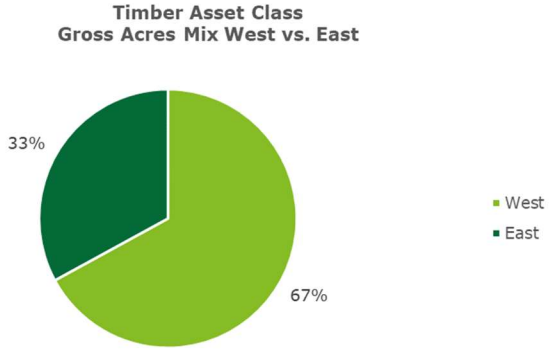


FIGURE 5



Gross Acreage. It is important to distinguish gross acreage of the Timber Asset Class from net acreage. While the beneficiary trusts own all of the gross acreage, a substantial portion is excluded or restricted from the commercial harvestable base that generates revenue (i.e., net acreage). At the same time, the Trust Manager is responsible for managing all of the gross acreage, including monitoring, maintaining, and protecting the land and determining whether or not the acreage is able to generate revenue for the beneficiary trusts.

As a result, there are unavoidable operating costs and capital expenditures related to managing areas of the gross acreage that will not generate revenue. Additional details are provided later regarding the operating expenses and capital expenditures incurred to manage, maintain, and operate the Timber Asset Class.

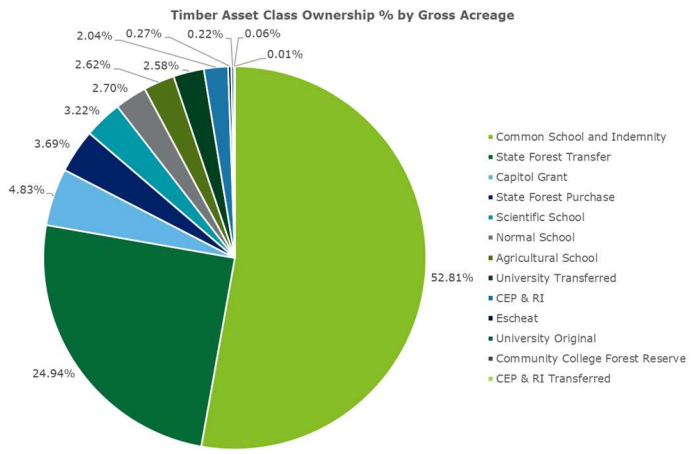
Trust Beneficiary – Gross Acreage. The trust beneficiary ownership interests in the gross acreage of the Timber Asset Class are presented in the following table and chart.

FIGURE 6

Trust Name	Gross Acres	%
Common School and Indemnity	1,086,060	52.81%
State Forest Transfer	512,905	24.94%
Capitol Grant	99,361	4.83%
State Forest Purchase	75,981	3.69%
Scientific School	66,193	3.22%
Normal School	55,628	2.70%
Agricultural School	53,840	2.62%
University Transferred	53,142	2.58%
CEP & RI	41,921	2.04%
Escheat	5,525	0.27%
University Original	4,471	0.22%
Community College Forest Reserve	1,277	0.06%
CEP & RI Transferred	203	0.01%
Total	**2,056,510**	**100%**

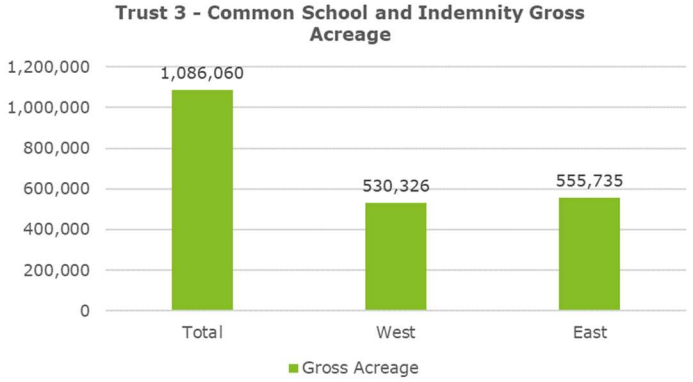
The two largest trusts are the Common School and Indemnity Trust and the State Forest Transfer Trust, which have a combined 77.75 percent beneficiary interest.

FIGURE 7



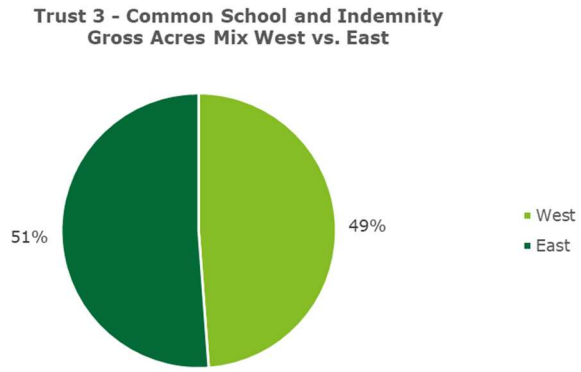
Common School and Indemnity Trust – Gross Acreage. The following table and chart display the gross acreage for the largest trust.

FIGURE 8



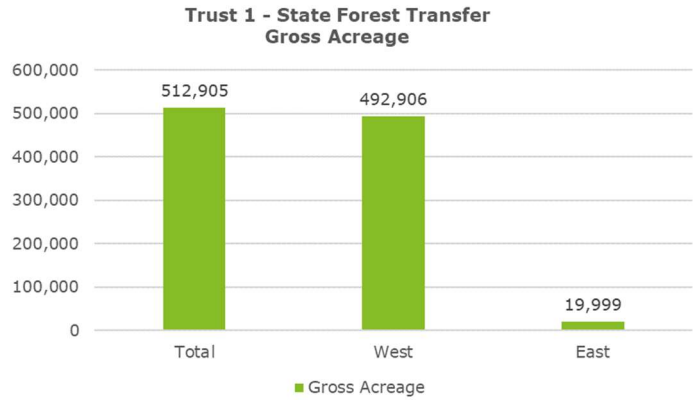
The acreage is split nearly equally between western and eastern Washington.

FIGURE 9



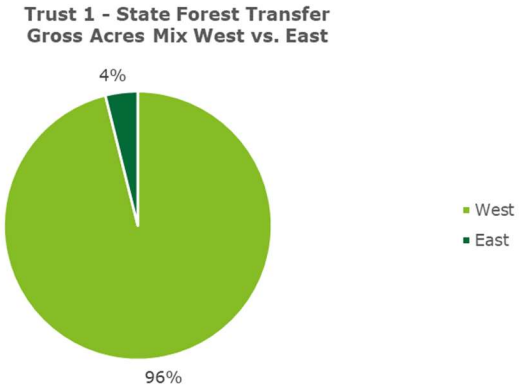
State Forest Transfer Trust – Gross Acreage. The following table and chart display the gross acreage for the second largest trust.

FIGURE 10



For the State Forest Transfer Trust, nearly all of the gross acreage is in western Washington. During the 1920s and 1930s, most of this acreage was harvested, abandoned, and foreclosed upon for back taxes.

FIGURE 11



The discussion continues below with the net acreage analysis.

NET ACREAGE

The Timber Asset Class consists of a total gross area of 2,056,510 acres. However, certain restrictions and limitations are in place that prohibit or prevent the harvesting of timber on all of these acres. These factors vary from location to location but are generally categorized as statutory, regulatory, policy, and operational.

The result is that the net acreage available to generate timber sales revenue and timber-related activity revenue is significantly less than the total gross acreage of the Timber Asset Class.

The following highlights the reported adjustments to the gross acreage that derive the net acreage available for timber harvest, which in turn generates the resource revenue for the trust beneficiaries.

Adjustments. As a reminder, the reader is directed to the detailed discussion of the gross to net acreage adjustments provided earlier in this chapter.

Described previously, the gross to net acreage adjustment methodology must account for the fact that many restricted areas overlap and that a limited amount of harvest is allowed in some restricted areas. To address the restrictions, acres that are *unavailable for harvest* were subtracted in the order shown in this section: all long-term deferrals were subtracted first and then non-commercial lands. *Each acre was subtracted only once.* For example, if a long-term deferral has non-commercial species, the area was subtracted as a long-term deferral and was not be subtracted again as non-commercial land.

To address the limitations on harvest, acres of RMZs, GEM lands, and Uplands were multiplied by a weighting factor that represented the expected level of harvest.

The RMZ net acreage was weighted at 2 percent[6] of its area based on an analysis of the actual harvest level in these areas over the past 10 years. This weighting factor reflects the fact that RMZs produced 2 percent of the net harvestable volume per acre in comparison to GEM lands.

The net acreage for GEM lands was weighted equal to its area in acres (100 percent).[7]

The Uplands net acreage was weighted at 55 percent[8] of its area based on an analysis of the actual harvest level in these areas over the past 10 years.

The weighting factor was used to determine the equivalent acres of land in each category that are available for revenue generating activities. For example, 100 acres of RMZ land multiplied by 2 percent is 2 acres; the equivalent acreage for revenue generating activities.

- **Long-Term Deferrals.** Includes approximately 331,923 acres (16.14 percent of the total gross acreage for the Timber Asset Class). Since these acres are not available for harvest, all of these acres have been subtracted from the total gross acreage.

- **Non-Commercial Land.** Includes approximately 6,778 acres (0.33 percent of the total gross acreage for the Timber Asset Class). Since these acres do not have commercial value, all of these acres have been subtracted from the total gross acreage.

- **RMZs.** Include approximately 246,249 gross acres. An operable weighting factor of 2 percent was applied to RMZ acres to estimate the total net acres available for harvest in this category. The effect of this weighting is that 241,324 acres (or 11.73 percent of the total gross acreage of the Timber Asset Class) have been subtracted from the total gross acreage, resulting in 4,925 net acres available for harvest.[9]

[6] Trust Manager estimate
[7] Trust Manager estimate
[8] Trust Manager estimate
[9] RMZ category also accounts for wetlands and their associated buffers within the Timber Asset Class acreage.

- **Uplands.** Includes approximately 525,160 gross acres. An operable weighting factor of 55 percent has been applied to these acres to estimate the total net acres available for harvest in this category. The effect of this weighting is that 236,322 acres (or 11.49 percent of the total gross acres in the Timber Asset Class) has been subtracted from the gross acres, resulting in 288,838 net acres available for harvest within this category.

- **GEMS lands.** These lands encompass approximately 946,400 acres (or 46 percent of the total gross acreage for the Timber Asset Class).

The following table illustrates the gross to net acreage adjustment for the Timber Asset Class.

FIGURE 12 – GROSS TO NET ACREAGE ADJUSTMENT

Category	Gross Acres	Operable Weighting	Net Acres restricted from Harvest	Net Acres available for Harvest
Long-term Deferrals	331,923	0%	331,923	0
Non-Commercial	6,778	0%	6,778	0
Riparian Management Zones	246,249	2%	241,324	4,925
Uplands	525,160	55%	236,322	288,838
General Ecological Management (GEM) Lands	946,400	100%	0	946,400
Total	**2,056,510**		**816,347**	**1,240,163**

Net Acreage Example. Using data for a specific area provided by the Trust Manager, the following figures highlight graphically the areas with restrictions which determine the estimated net acreage available for harvest. The following images are for illustrative purposes only are intended to highlight how legal and policy requirement impact harvestable acres.

FIGURE 13 – LONG-TERM DEFERRAL ADJUSTMENTS

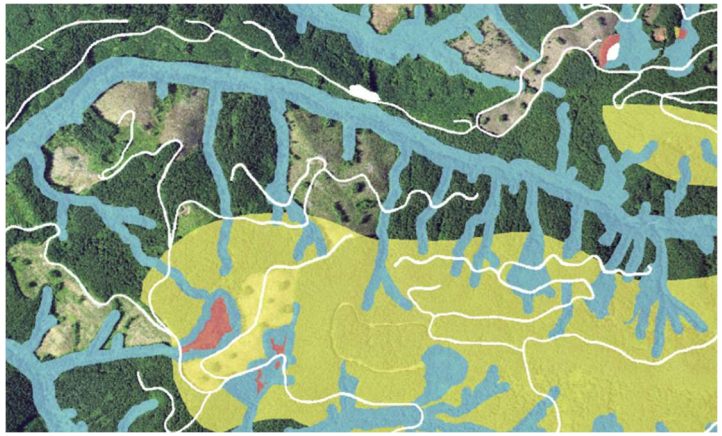
The prior figure and the figures that follow highlight the areas with legal and policy restrictions that result in the calculated net acreage amount.

The prior figure is an aerial image of timber areas. Roads and other non-forested areas are presented with white shading, while long-term deferral lands are presented with red shading illustrating areas unavailable for harvest.

FIGURE 14 – RIPARIAN ADJUSTMENTS

In the prior figure, blue shading identifies restricted areas in the RMZ category, which further reduces the available timber area for harvest.

FIGURE 15 – HABITAT CONSERVATION PLAN ADJUSTMENTS



In the prior figure, yellow shading represents areas in the Uplands category where harvesting is restricted.

FIGURE 16 – NET HARVESTABLE AREAS

The final figure adds green shading to represent where harvesting is not restricted (i.e. GEM lands).[10] The figure displays to the reader the multiple areas where legal and policy requirements restrict harvestable acres.

Net Acreage. The following two maps highlight the difference between the gross and net acreages. Again, these images are provided for illustrative purposes.

The first map is identical to a map presented earlier in this chapter and shows the gross acreage locations in black.

[10] In this example, the green shading represents only GEM lands. However, we note that net harvestable areas can also include RMZ and Uplands lands deemed operable.

FIGURE 17 GROSS ACREAGE

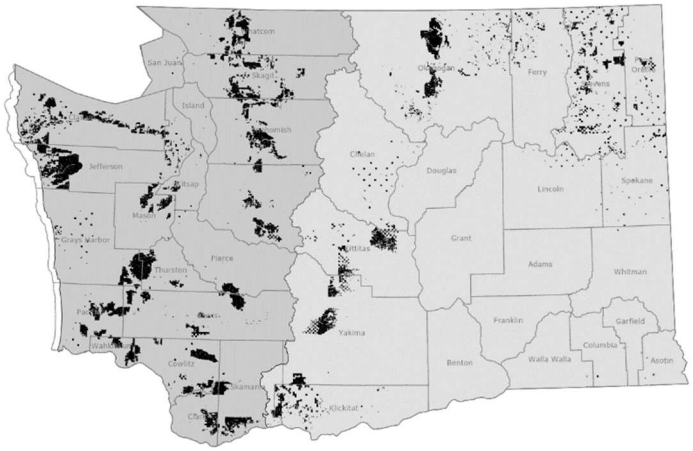
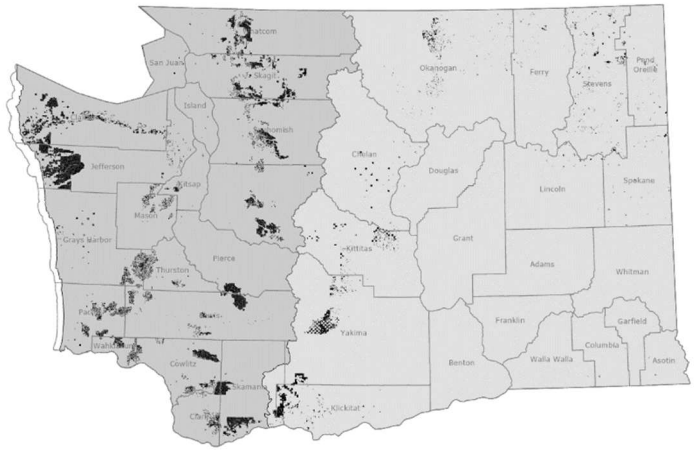


FIGURE 18 NET ACREAGE



The next map only shows the location the net acreage in black, after all restricted lands are removed. Again, the map provides the general demarcation of the boundary between western and eastern Washington. Note that the acres and boundaries highlighted in the following map are not exactly to scale because displaying a high-level view of the state complicates the image.

The following table and chart highlight the reported impact of the restrictions and limitations detailed earlier on the Timber Asset Class. Due to the weighting factor associated with different categories of the Timber Asset Class, the equivalent of 816,347 acres or 40 percent of the total gross acreage has restrictions or limitations on revenue generating activities.

FIGURE 19

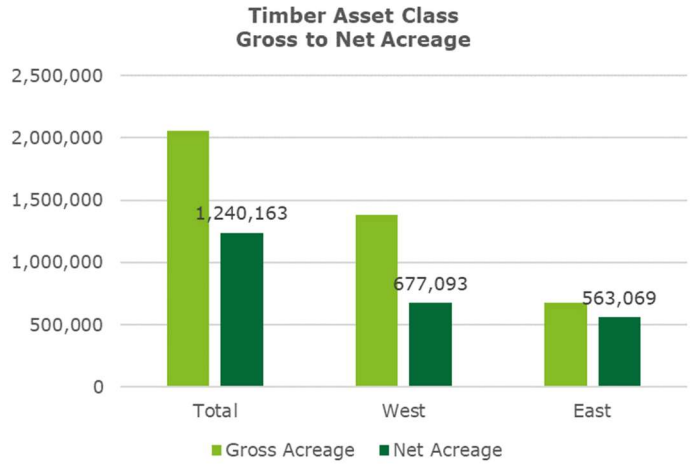
Timber Asset Class Net Acreage Impact	Total	West	East
Gross Acreage	**2,056,510**	**1,379,171**	**677,338**
Less: Long Term Deferral	331,923	296,229	35,693
Less: Non-Commercial	6,778	1,363	5,415
Less: Riparian Management Zone	241,324	218,589	22,734
Less: Uplands	236,322	185,896	50,426
Less: GEMs	0	0	0
Less: Adjustments	**-816,347**	**-702,078**	**-114,269**
Less: Adjustment % of Gross Acres	**-40%**	**-51%**	**-17%**
Net Acreage	**1,240,163**	**677,093**	**563,069**
Net Acreage % of Gross Acres	**60%**	**49%**	**83%**

Clearly, the restrictions and limitations affect western Washington acreage the most. The total adjustments to the western Washington gross acreage included 702,078 acres or 51 percent of the total gross acreage.

Since western Washington includes the most productive and valuable acreage in the Timber Asset Class, the restrictions and limitations have a large impact on revenue potential for the trust beneficiaries.

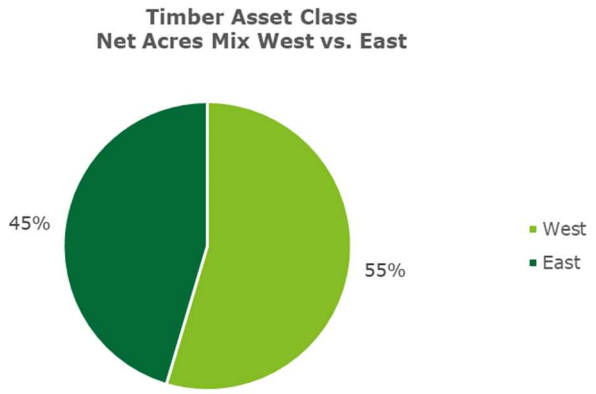
The following chart highlights the impact of the gross acreage adjustment in the western and eastern Washington.

FIGURE 20



Compared to the gross acreage mix whereby western Washington accounts for 67 percent of the total gross acreage, the western Washington percentage decreased to 55 percent of the total net acreage after adjustments. The factors (i.e., water, soil, species, climate) that contribute to the high quality and productivity of western Washington also leads to the limitations and restrictions discussed previously.

FIGURE 21



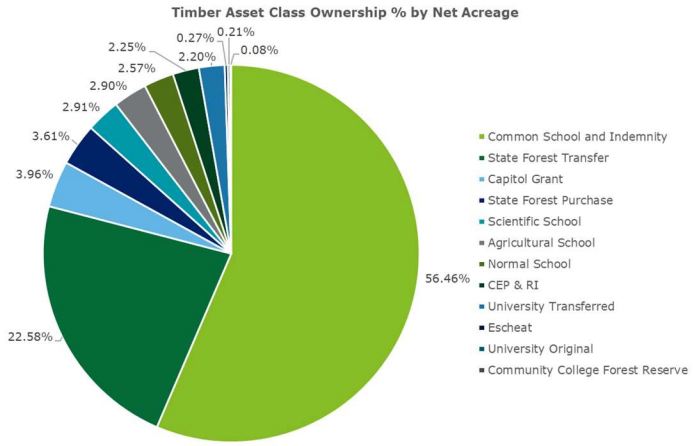
The discussion of the net acreage adjustment continues with an overview of the impact on the two largest trust beneficiary interests in the Timber Asset Class.

Trust Beneficiary – Net Acreage. The trust beneficiary interests in the net acreage of the Timber Asset Class are presented in the following table and chart.

FIGURE 22

Trust Name	Net Acres	%
Common School and Indemnity	700,201	56.46%
State Forest Transfer	280,010	22.58%
Capitol Grant	49,146	3.96%
State Forest Purchase	44,720	3.61%
Scientific School	36,048	2.91%
Agricultural School	36,009	2.90%
Normal School	31,926	2.57%
CEP & RI	27,875	2.25%
University Transferred	27,330	2.20%
Escheat	3,340	0.27%
University Original	2,572	0.21%
Community College Forest Reserve	986	0.08%
CEP & RI Transferred	0	0.00%
Total	**1,240,163**	**100.00%**

FIGURE 23



The following is an overview of the two largest beneficiary interests in the Timber Asset Class.

Common School and Indemnity Trust – Net Acreage. The following table and charts highlight the impact of the net acreage adjustment on the largest trust beneficiary interest. This trust comprises 52.81 percent of the gross acreage, but the net acreage adjustment is approximately 385,859 acres, or -36 percent of the trust's beneficiary interest in the Timber Asset Class.

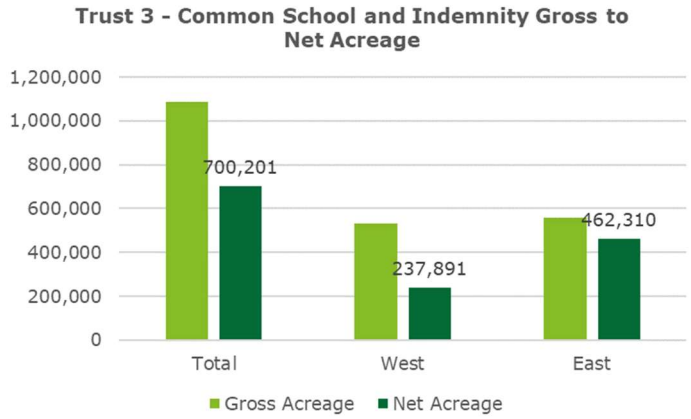
FIGURE 24

Common School and Indemnity Net Acreage Impact	Total	West	East
Gross Acreage	**1,086,060**	**530,326**	**555,735**
Less: Long Term Deferral	158,975	128,598	30,377
Less: Non-Commercial	4,961	600	4,361
Less: Riparian Management Zone	103,461	84,595	18,866
Less: Uplands	118,463	78,643	39,820
Less: GEMs	0	0	0
Less: Adjustments	**-385,859**	**-292,435**	**-93,424**
Less: Adjustment % of Gross Acres	**-36%**	**-55%**	**-17%**
Net Acreage	**700,201**	**237,891**	**462,310**
Net Acreage % of Gross Acres	**64%**	**45%**	**83%**

Additionally, most of the trusts restricted acreage is located in western Washington, which in turn results in a decrease adjustment of 292,435 acres, or -55 percent of the most productive acreage for the Common School and Indemnity Trust.

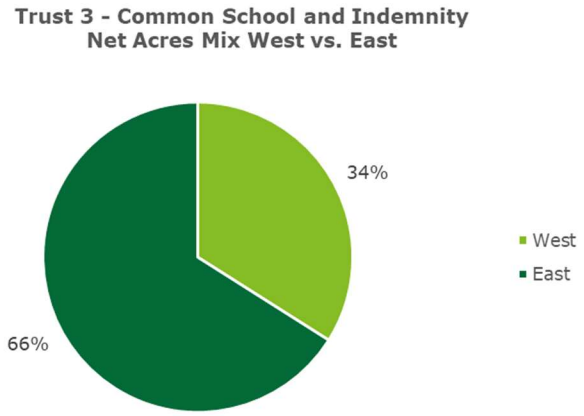
The following charts highlight the impact of the net acreage adjustment on the Common School and Indemnity Trust.

FIGURE 25



Compared to the gross acreage mix whereby the Common School and Indemnity Trust lands in western Washington comprise 49 percent of the total gross acreage, the percentage of total net acres found in western Washington decreases to 34 percent.

FIGURE 26



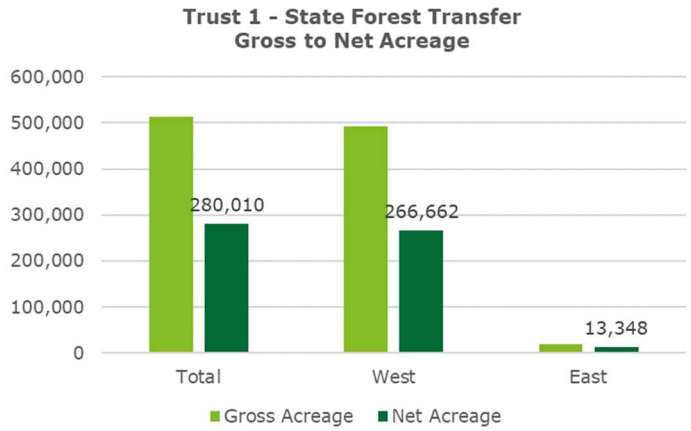
State Forest Transfer Trust – Net Acreage. The following table and charts highlight the impact of the net acreage adjustment on the second largest trust beneficiary interest. This trust comprises 24.94 percent of the gross acreage, but the net acreage adjustment is approximately 232,895 acres, or -45 percent of the trust's beneficiary interest in the Timber Asset Class.

FIGURE 27

State Forest Transfer Net Acreage Impact	Total	West	East
Gross Acreage	**512,905**	**492,906**	**19,999**
Less: Long Term Deferral	96,273	96,054	219
Less: Non-Commercial	1,440	469	971
Less: Riparian Management Zone	72,816	72,274	542
Less: Uplands	62,366	57,446	4,919
Less: GEMs	0	0	0
Less: Adjustments	**-232,895**	**-226,243**	**-6,652**
Less: Adjustment % of Gross Acres	**-45%**	**-46%**	**-33%**
Net Acreage	**280,010**	**266,662**	**13,348**
Net Acreage % of Gross Acres	**55%**	**54%**	**67%**

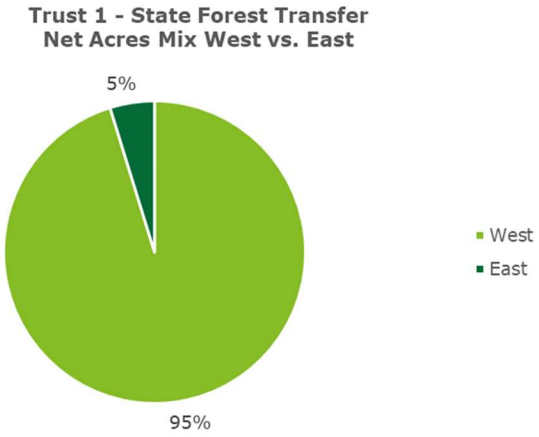
Additionally, nearly all of the net acreage is located in western Washington, which in turn results in a net acreage (decrease) adjustment of 226,243 acres, or -46 percent, to the most productive acreage in this asset class for the State Forest Transfer Trust.

FIGURE 28



Given the small acreage size in eastern Washington, nearly all of the impact of the adjustments occurs in western Washington.

FIGURE 29



The analysis and discussion continue on the following page with timber volume.

Timber Volume

The gross timber volume and density are substantially higher in western Washington than in eastern Washington.

GROSS TIMBER VOLUME

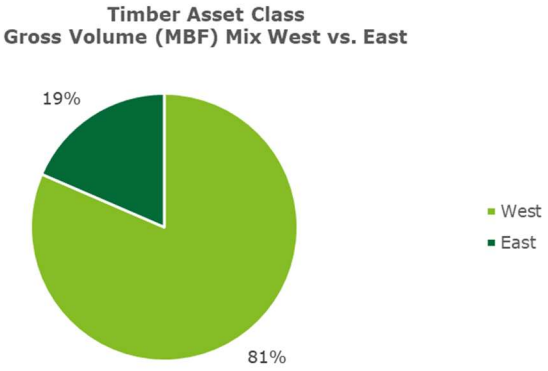
The reported total gross timber volume of the Timber Asset Class is 41,773,197 MBF (1,000 board feet).[11] The reader is reminded that this estimate is gross volume, which captures all timber associated with the gross acreage. This includes timber associated with the acres that are restricted or limited as described earlier when listing the net adjustment to arrive at a net acreage that is harvestable. Further discussion is provided later for the net timber volume that reflects adjustments similar to those made to find the net acreage harvestable.

The following charts present the reported total gross timber volume and the allocation between western and eastern Washington.

As can be expected, the highly productive western Washington holds substantially more gross timber volume than Eastern Washington.

FIGURE 30

FIGURE 31



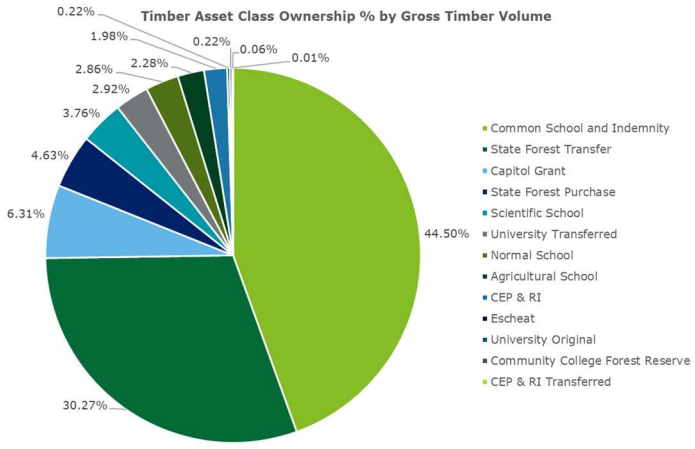
[11] MBF is a forestry term that means "1,000 board feet." M = Roman Numeral = 1,000 and BF = board feet. It is common to report timber and log prices in $/MBF. The Trust Manager uses "Board Feet, Scribner Scale".

Trust Beneficiaries– Gross Timber Volume. The trust beneficiary interests in the gross volume of the Timber Asset Class are presented in the following table and chart.

FIGURE 32

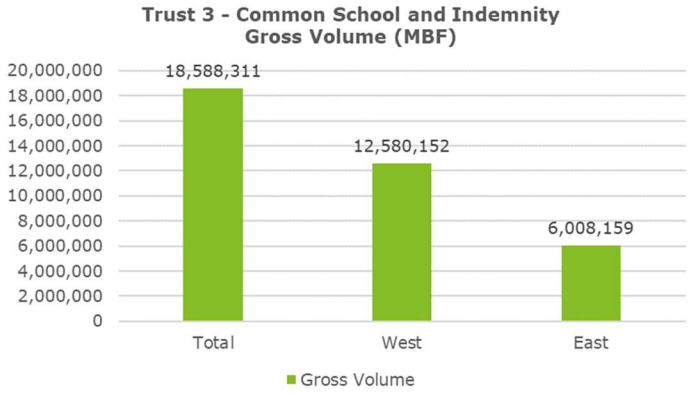
Trust Name	Gross Volume (MBF)	%
Common School and Indemnity	18,588,311	44.50%
State Forest Transfer	12,642,816	30.27%
Capitol Grant	2,635,171	6.31%
State Forest Purchase	1,932,122	4.63%
Scientific School	1,571,982	3.76%
University Transferred	1,218,786	2.92%
Normal School	1,194,634	2.86%
Agricultural School	950,555	2.28%
CEP & RI	827,083	1.98%
Escheat	92,701	0.22%
University Original	90,673	0.22%
Community College Forest Reserve	23,829	0.06%
CEP & RI Transferred	4,533	0.01%
Total	**41,773,197**	**100.00%**

FIGURE 33



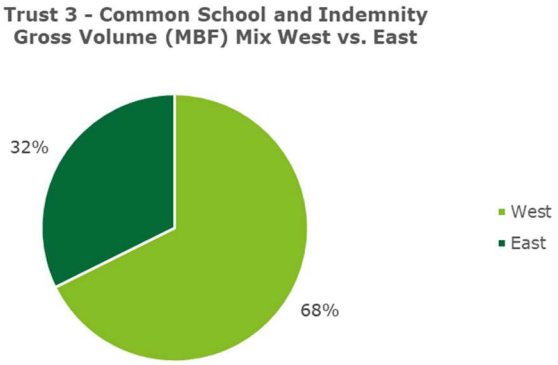
Common School and Indemnity Trust – Gross Timber Volume. The following table and chart display the gross timber volume between western and eastern Washington for the largest trust—the Common School and Indemnity Trust.

FIGURE 34



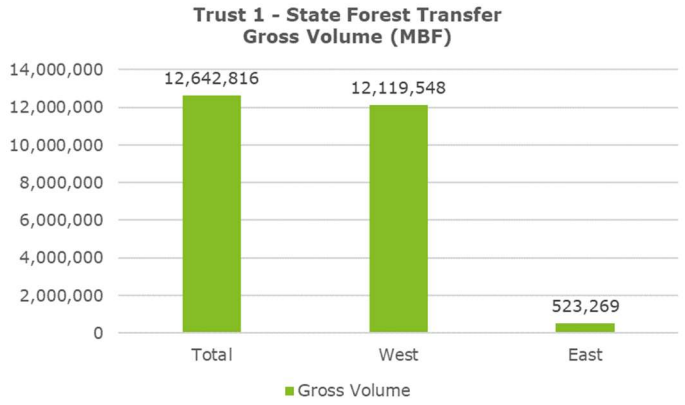
Most of the gross timber volume is in western Washington.

FIGURE 35



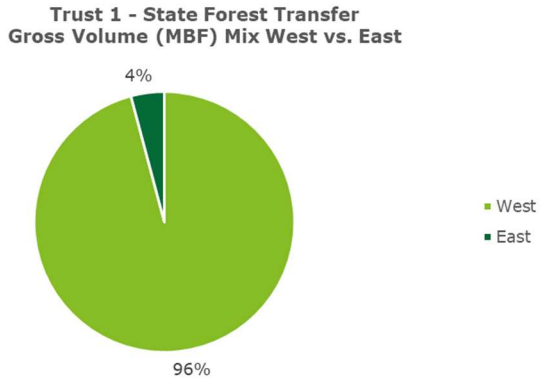
State Forest Transfer Trust – Gross Timber Volume. The following table and chart display the gross timber volume between western and eastern Washington for the second largest trust—the State Forest Transfer Trust.

FIGURE 36



Nearly all of the gross timber volume is in western Washington.

FIGURE 37



The discussion continues in the following section with the net timber volume.

NET TIMBER VOLUME

Consistent with the net acreage discussion provided earlier, the available net timber volume is limited to the net acreage that can be harvested.

The result is a net timber volume amount available to generate timber sales revenue and timber-related activity revenue that is significantly lower than the total gross timber volume amount in the Timber Asset Class.

The following categories highlight the impacts of the net acreage adjustments to the gross timber volume amounts that derive the net timber volume available for timber harvest, which in turn generates the resource revenue for the trust beneficiaries. In general, the adjustments as a percentage of the gross timber volume tend to be higher than the percentage adjustment to the acreage given the species type and average age of the timber stands in these restricted and limited acres. Since the acreage is not harvested, the total volume will continue to age and grow[12].

Long-Term Deferral. Includes approximately 331,923 restricted acres that have an estimated restricted timber volume of 11,505,913 MBF or approximately 27.5 percent of the gross timber volume in the asset class.

Non-Commercial Land. Include approximately 6,778 restricted acres that have an estimated restricted timber volume of 37,585 MBF or approximately 0.1 percent of the gross timber volume in the asset class.

[12] Natural disturbances such as wind throw, landslides, wildfire, etc. may affect growth.

RMZ. Include approximately 241,324 restricted acres that have an estimated restricted timber volume of 6,375,530 MBF or approximately 15.3 percent of the gross timber volume in the asset class. This results in 4,925 net acres that have an estimated 122,238,535 MBF of net harvestable timber.

Uplands. Include approximately 236,322 acres that have an estimated restricted timber volume of 5,578,426 MBF or approximately 13.4 percent of the gross timber volume in the asset class. This results in 288,838 net acres that have an estimated 6,004,952 MBF of net harvestable timber.

GEMs. Include no restricted acres yet certain trees are still restricted to harvest as GEMs lands are still subject to the 1997 HCP and all relevant laws including forest practices. The restricted timber volume is estimated to be 871,564 MBF or approximately 2.1 percent of the gross timber volume in the asset class. This results in an estimated timber volume of 11,276,987 MBF of net harvestable timber.

Net Timber Volume. The following table and charts highlight the impact on the reported gross timber volume in the Timber Asset Class due to the restrictions and limitations detailed earlier. In total, 24,369,019 MBF or 58 percent of gross timber value is limited or restricted based on the weightings of each category. The result leaves a net timber volume of 17,404,178 MBF or 42 percent of the gross timber volume.

FIGURE 38

Timber Asset Class Net Volume Impact (MBF)	Total	West	East
Gross Volume	**41,773,197**	**34,038,116**	**7,735,082**
Less: Long Term Deferral	11,505,913	11,124,118	381,795
Less: Non-Commercial	37,585	11,314	26,271
Less: Riparian Management Zone	6,375,530	6,050,013	325,518
Less: Uplands	5,578,426	4,581,340	997,086
Less: GEMs	871,564	548,205	323,360
Less: Adjustments	**-24,369,019**	**-22,314,989**	**-2,054,030**
Less: Adjustment % of Gross Volume	**-58%**	**-66%**	**-27%**
Net Volume	**17,404,178**	**11,723,127**	**5,681,051**
Net Volume % of Gross Volume	**42%**	**34%**	**73%**
Gross Volume Average MBF Per Acre	20.3	24.7	11.4
Net Volume Average MBF Per Acre	14.0	17.3	10.1

Before the net adjustment, the reported western Washington gross timber volume exceeded eastern Washington by nearly a factor of five. After adjustment, the net timber volume for western Washington dropped substantially to a factor of approximately two. This is a result of the number of acres impacted and the corresponding higher density of volume on that acreage.

FIGURE 39

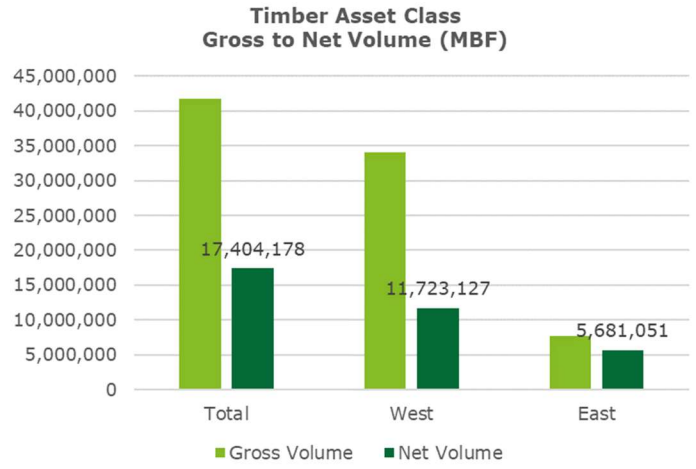
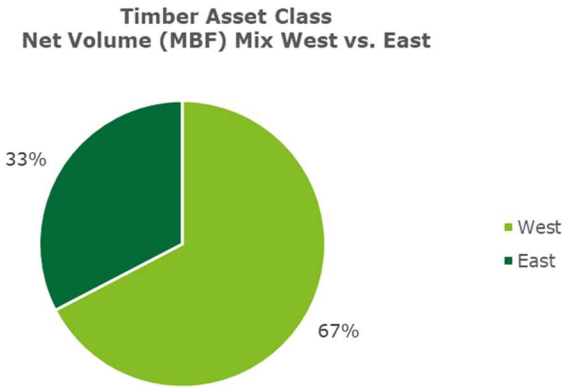


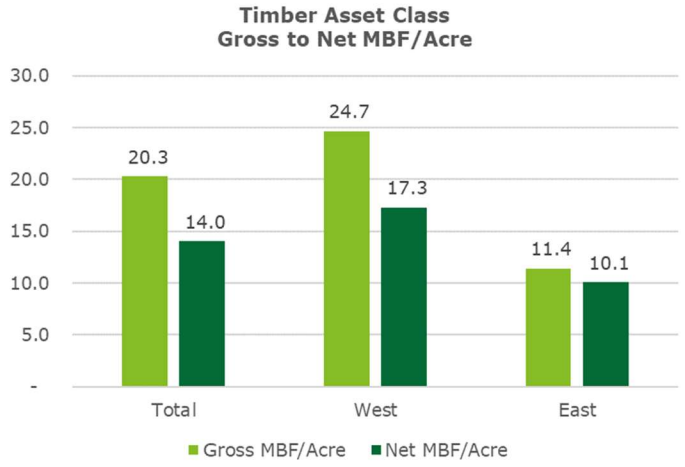
FIGURE 40



Average MBF Per Acre. The table above also highlights the quality and productivity variances between western and eastern Washington. Specifically, the average gross volume per acre (based on gross acreage) in western Washington is 24.7 MBF versus 11.4 MBF for eastern Washington.

After the net acreage adjustment, the average net volume per acre (based on net acreage) decreases substantially to 17.3 MBF for western Washington and slightly downward to 10.1 MBF for eastern Washington. The average volume per acre clearly shows the acreage in western Washington has the most productive and older stands in the Timber Asset Class.

FIGURE 41



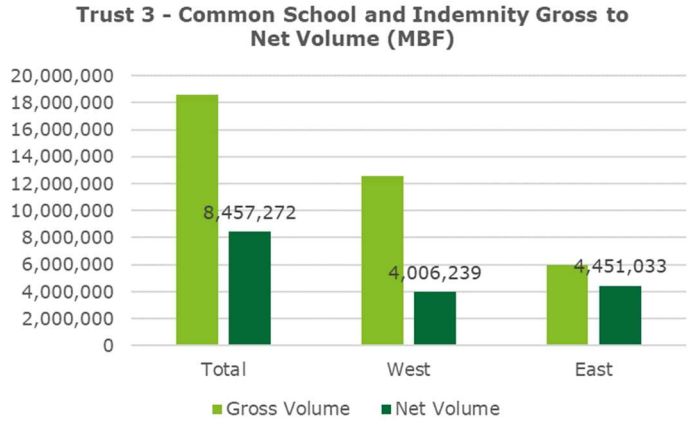
Common School and Indemnity Trust – Net Timber Volume. The following table and charts highlight the impact of the net volume adjustment on the timber volume for the largest trust ownership interest.

FIGURE 42

Common School and Indemnity Net Volume Impact (MBF)	Total	West	East
Gross Volume	**18,588,311**	**12,580,152**	**6,008,159**
Less: Long Term Deferral	4,895,266	4,584,485	310,781
Less: Non-Commercial	24,239	4,237	20,002
Less: Riparian Management Zone	2,301,395	2,043,472	257,923
Less: Uplands	2,489,018	1,788,392	700,626
Less: GEMs	421,122	153,327	267,795
Less: Adjustments	**-10,131,040**	**-8,573,913**	**-1,557,126**
Less: Adjustment % of Gross Volume	**-55%**	**-68%**	**-26%**
Net Volume	**8,457,272**	**4,006,239**	**4,451,033**
Net Volume % of Gross Volume	**45%**	**32%**	**74%**
Gross Volume Average MBF Per Acre	17.1	23.7	10.8
Net Volume Average MBF Per Acre	12.1	16.8	9.6

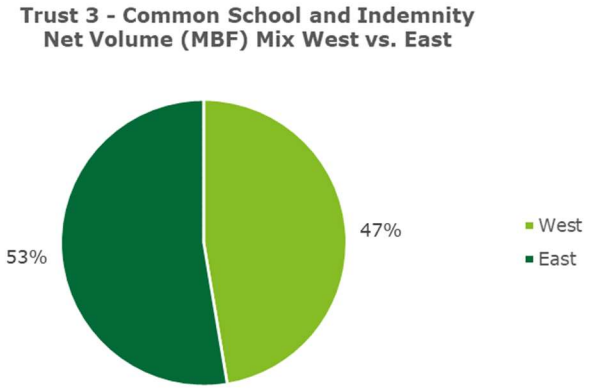
The impact on the timber volume for the highly productive western Washington stands was a substantial decrease of 8,573,913 MBF or 68 percent[13] of the gross volume and resulted in only 4,006,239 MBF or 32 percent[14] of the gross volume available for harvest.

FIGURE 43



The net effect is a reduction in the western Washington percentage of total gross volume from a large majority of the timber volume down to 47 percent of the total net volume (4,006,239 MBF / 8,457,272 MBF).

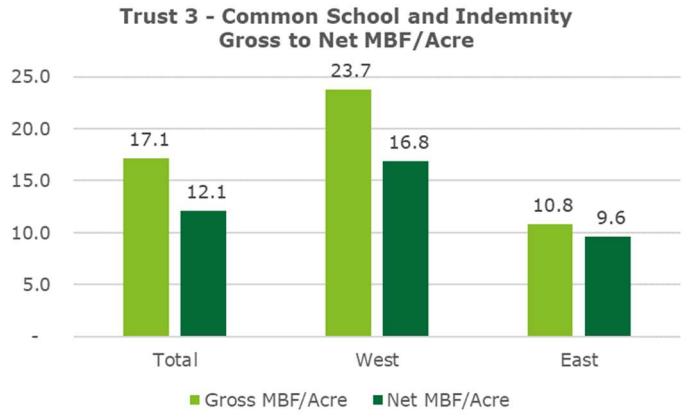
FIGURE 44



Average MBF Per Acre – Common School and Indemnity Trust. The Common School and Indemnity Trust table above also highlights the quality and productivity variances between western and eastern Washington. Specifically, the average gross volume for western Washington is 23.7 MBF per acre (i.e., gross volume / gross acreage) versus 10.8 MBF per acre for eastern Washington.

[13] (8,573,913 MBF / 12,580,152 MBF)
[14] (4,006,239 MBF /12,580,152 MBF)

FIGURE 45



After the net acreage adjustment, the average net volume (i.e., net volume / net acreage) decreased substantially to 16.8 MBF per acre for western Washington and slightly downward to 9.6 MBF per acre for eastern Washington. The average volume per acre clearly shows the acreage in western Washington has the most productive and oldest stands in the Timber Asset Class.

State Forest Transfer Trust – Net Timber Volume. The following table and charts highlight the impact of the net volume adjustment on the second largest trust ownership interest. This trust owns 30.27 percent of the gross volume (12,642,816 MBF / 41,773,197 MBF), but the net volume adjustment was approximately 7,794,520 acres or 62 percent of its Timber Asset Class ownership interest (7,794,520 MBF / 12,642,816 MBF).

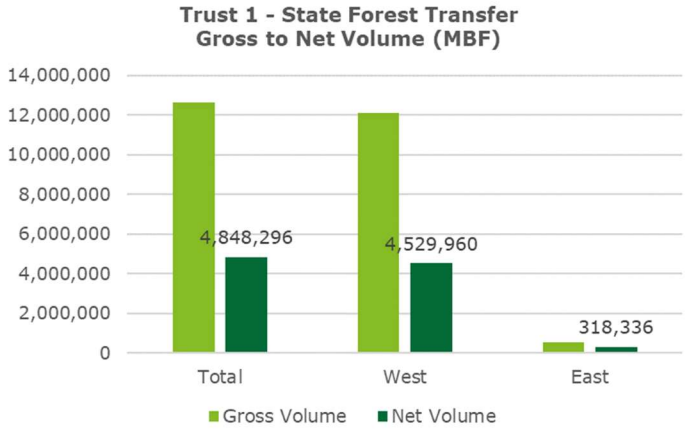
FIGURE 46

State Forest Transfer

Net Volume Impact (MBF)	Total	West	East
Gross Volume	**12,642,816**	**12,119,548**	**523,269**
Less: Long Term Deferral	3,646,171	3,636,957	9,214
Less: Non-Commercial	8,013	2,552	5,461
Less: Riparian Management Zone	2,207,926	2,192,886	15,040
Less: Uplands	1,666,159	1,505,950	160,209
Less: GEMs	266,250	251,242	15,008
Less: Adjustments	**-7,794,520**	**-7,589,588**	**-204,932**
Less: Adjustment % of Gross Volume	**-62%**	**-63%**	**-39%**
Net Volume	**4,848,296**	**4,529,960**	**318,336**
Net Volume % of Gross Volume	**38%**	**37%**	**61%**
Gross Volume Average MBF Per Acre	24.6	24.6	26.2
Net Volume Average MBF Per Acre	17.3	17.0	23.8

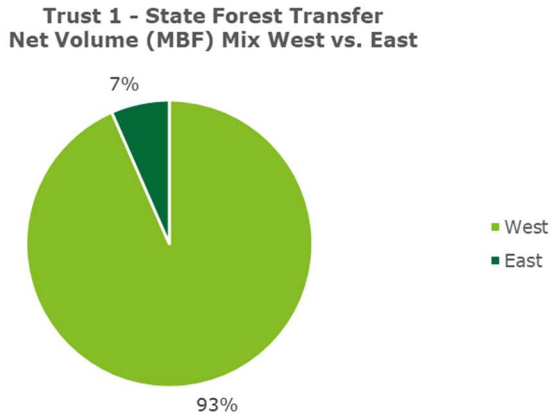
The impact on the timber volume for eastern Washington stands was a decrease of 204,932 MBF of timber volume, or 39 percent of the gross volume (204,932 MBF / 523,269 MBF) and results in only 318,336 MBF or 61 percent (318,336 MBF / 523,269 MBF) available for harvest.

FIGURE 47



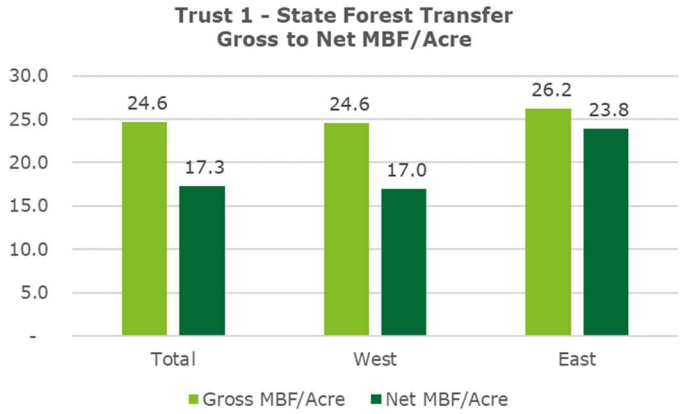
93 percent of the total net timber volume for this trust was on the side of western Washington.

FIGURE 48



Average MBF Per Acre – State Forest Transfer Trust. At first glance, the State Forest Transfer Trust table appears to indicate this trust's timber volume in eastern Washington has timber densities superior to western Washington on both a gross volume and net volume basis.

FIGURE 49



However, the entire eastern Washington land holding for the State Forest Transfer Trust only comprises approximately 19,999 gross acres and 13,348 net acres. The gross acreage to net acreage calculation table from earlier in this chapter is provided again in the following table.

FIGURE 50

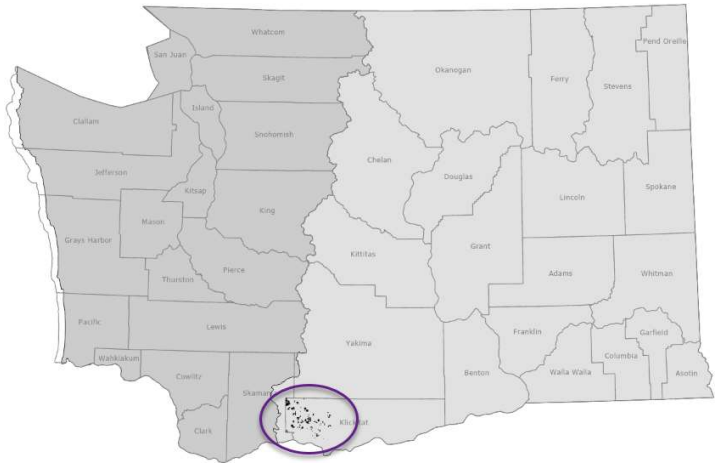
State Forest Transfer

Net Acreage Impact	Total	West	East
Gross Acreage	**512,905**	**492,906**	**19,999**
Less: Long Term Deferral	96,273	96,054	219
Less: Non-Commercial	1,440	469	971
Less: Riparian Management Zone	72,816	72,274	542
Less: Uplands	62,366	57,446	4,919
Less: GEMs	0	0	0
Less: Adjustments	**-232,895**	**-226,243**	**-6,652**
Less: Adjustment % of Gross Acres	**-45%**	**-46%**	**-33%**
Net Acreage	**280,010**	**266,662**	**13,348**
Net Acreage % of Gross Acres	**55%**	**54%**	**67%**

This trust's high-density timber volume in eastern Washington was related to its specific location within the eastern Washington classification. In this case, a reported 17,870 (89 percent) gross acres out of the 19,999 gross acres is located along the western and southern borders of Klickitat County on the north side of the Columbia River. This acreage is detailed in the following map.

FIGURE 51

State Forest Transfer – Eastern Washington Location



At this location, the Cascade mountain range is tapering down to the state border at the Columbia River and creates an environment similar to western Washington. As a result, the timber volume densities are similar to the western Washington timber volume densities. Later in the valuation analysis, the unique location of this acreage was taken into consideration and refinements were made to account for the quality of the land and timber volume for this trust's eastern Washington ownership.

TIMBER SPECIES SUBGROUPS

Timber is a sustainable natural resource and a commodity. The demand for and related value of timber varies by species and quality.

For the purposes of analyses, the Timber Asset Class was further divided into various subgroups (as appropriate) for analysis. The subgroups selected were based on either asset management criteria, asset valuation criteria, or the availability of asset data needed for the purpose of the analyses. We find the segregation of the Timber Asset Class into the relevant subgroups is appropriate given the overall scope of the engagement.

Timber stands vary in when they were established. Individual stands located in western Washington are typically of a uniform or consistent age; while stands located in eastern Washington are less uniform and are called uneven-aged stands.

Access to most of the forest lands is provided by nearly 9,000 miles of state-owned roads that vary in quality and condition; some stands have no legal or road access.

The Timber Asset Class is broken out into subgroups based on multiple factors including age, soil productivity, topography, region, and species type.

Within the Timber Asset Class, four species type groups were selected for analytical purposes.

Species Type Groups. The four species type groups and their definitions are as follows:

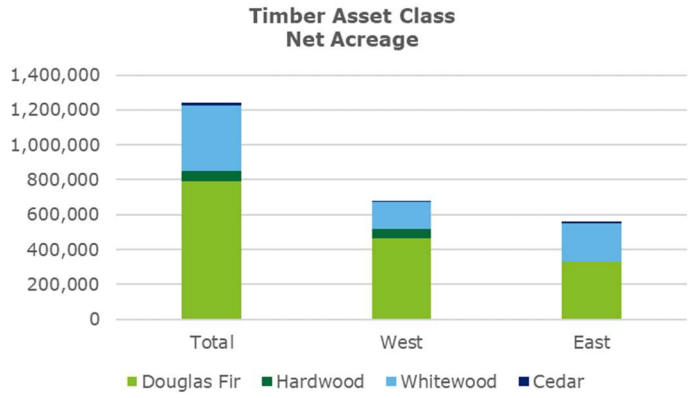
1. **Douglas Fir:** Species include Douglas Fir and western Larch
2. **Hardwood:** Species include Aspen, Bigleaf Maple, Birch, Black Cottonwood, Mixed Hardwood, Oregon Ash, Paper Birch, and Red Alder

3. **Whitewood:** Species include Engelmann Spruce, Grand Fir, Lodgepole Pine, Mountain Hemlock, Noble Fir, Pacific Silver Fir, Ponderosa Pine, Sitka Spruce, Subalpine Fir, True Firs, Western Hemlock, Western White Pine, and Whitebark Pine
4. **Cedar:** Species include Alaska Yellow Cedar and Western Red Cedar

Other species of trees are found on state trust lands but have no commercial value. These include but are not limited to Cherry, Crabapple, Pacific Madrone, and Willow trees. All non-commercial species have been excluded from the net harvestable acreage and volume totals.

Species Group by Net Acreage. The following table presents the reported net acreage compiled by species type group.

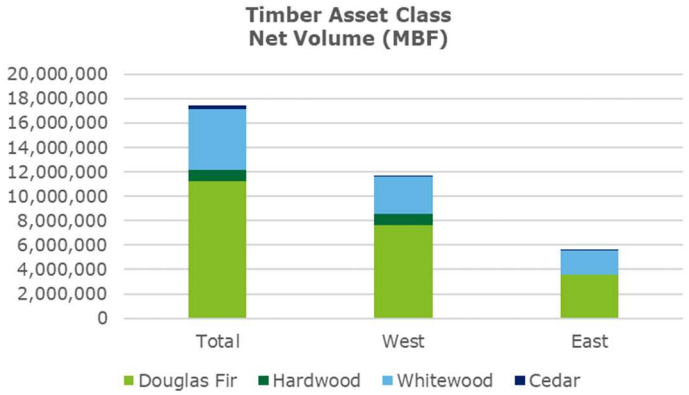
FIGURE 52



The previous figure indicates most of the net acreage has been predominately Douglas Fir timber. Douglas Fir lumber is considered one of the best woods for home building due to its ability to withstand more extreme weather and last longer than other wood types. From the marketplace's perspective, Douglas Fir is more desirable (i.e., higher demand) as it is stronger, more durable, and can handle higher impacts and weight loads than other wood types. As a result, its market demand is tied closely to the national housing market.

Species Volume. The following table presents timber volume (MBF) on the reported net acreage compiled by species type group.

FIGURE 53



Timber as a Commodity

The value of timber (trees) is related to the value and demand for the products that can be made from timber. This is dictated by size (height and diameter), species, and quality of the timber trees.

Timber, like any other commodity, experiences price fluctuation according to the laws of supply and demand; prices may vary significantly from one part of the state to another. Implicit in the timber price is the cost to harvest the timber and deliver it to the market.

Timber has a built-in hedge against price fluctuations. If log prices drop, owners can postpone harvesting trees. During this time, the trees grow more valuable as they grow larger and thicker, creating more timber volume. However, as a timber tree reaches maturity, the rate of growth slows.

Operational History

Timber Asset Class operations produce a large majority of revenue generated by the asset classes.

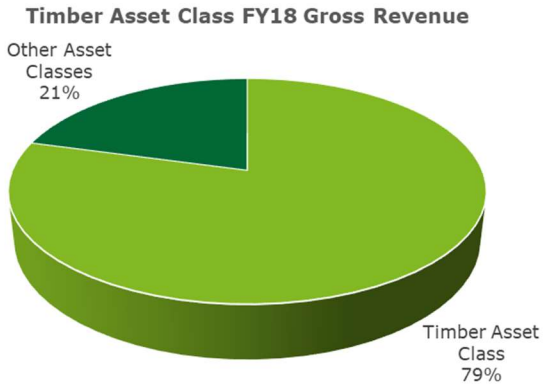
OPERATIONS

From the perspective of the beneficiary trusts, Timber Asset Class operations comprises three components:

1. **Timber Revenue**—Set by market price for the timber commodity via a public auction bidding process
2. **Operating Cost Percentage Deduction**—A fixed percentage of revenue paid for all operating expenses and capital expenditures
3. **Net Cash Flow**—Revenue minus the operating cost percentage deduction[15]

The Timber Asset Class generates approximately 79 percent of all revenue generated by all of the asset classes and as a result pays the largest amount of the operating cost percentage deduction that funds all operating expenses and capital expenditures.

FIGURE 54



TIMBER ASSET CLASS REVENUE FROM 2007 TO 2018

The following table displays the total reported gross revenue (before the operating cost percentage deduction) received from annual timber-related activities from 2007 to 2018.

The revenue is from:

- All contract harvest sales
- Forest health and forest improvement sales
- Stumpage scale sales
- Stumpage lump-sum sales

[15] Purchasers of timber contracts also pay a charge for the use of roads maintained by DNR in addition to stumpage amount bid at the auction, authorized under RCW 79.38.030. This charge is paid separately but may impact the stumpage bid.

Contract Harvest Sales. Timber operations occurring on state trust forests in which the department contracts with a firm or individual to perform all necessary harvesting work to process trees into logs sorted by department specifications. The department then auctions the individual log sorts.

Forest Health and Forest Improvement Sales. Sales authorized by The Forest Health Program[16], which are not necessarily profitable, but are needed to set stands on a healthy trajectory.

Stumpage Scale Sales. Any sale offered with per unit prices to be applied to the material conveyed. Units can refer to the weight or MBF volume of valuable materials being removed.

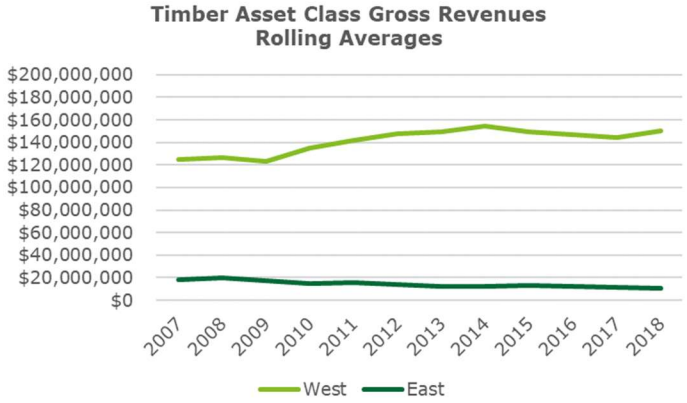
Stumpage Lump-Sum Sales. Any sale offered with a single total price applying to all the material conveyed.

The reported annual gross revenue in the following chart has been divided to show portions attributed to areas in western and eastern Washington. Revenue amounts were not adjusted for inflation and are presented in this report in nominal values, not real values.

FIGURE 55

The following chart shows the rolling five-year average gross revenue for the western and eastern Washington regions.

FIGURE 56



[16] In 2018, the Forest Health program started to be used in lieu of the Forest Improvement Treatment Program

Payments that comprise gross revenues are paid right before the physical removal of the timber takes place. (e.g. If a buyer desires to remove 30 percent of timber from a timber stand won at an auction, the buyer must pay 30 percent of the agreed upon payment before the timber can be removed.) The following chart highlights the purchased timber volume removed to source the revenue generated by the West and East regions. Note that the volume removed does not include volume from Forest Health and Forest Improvement Treatments.

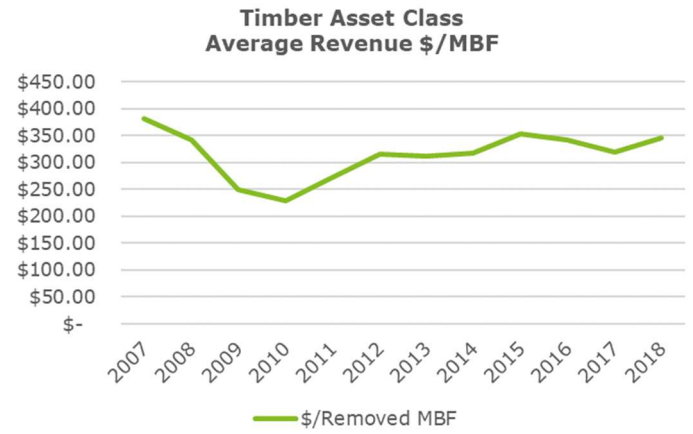
Forest Health and Forest Improvement Treatment timber sales operate through legislatively designated revolving accounts that allow the Trust Manager to capture all costs from the proceeds of the timber sale. The volume from these sales are not reflected in the Trust Manager's revenue system. This volume is reported separately to the legislature. As such, gross revenues received from Forest Health and Forest Improvement sales are included when presenting total gross revenues, but they are excluded when presenting revenue-per-MBF measurements.

FIGURE 57

The following chart shows the average revenue per MBF removed for the Timber Asset Class. Note that the gross revenue and removed volume do not include revenue or volume from Forest Improvement Health and Treatment sales.[17]

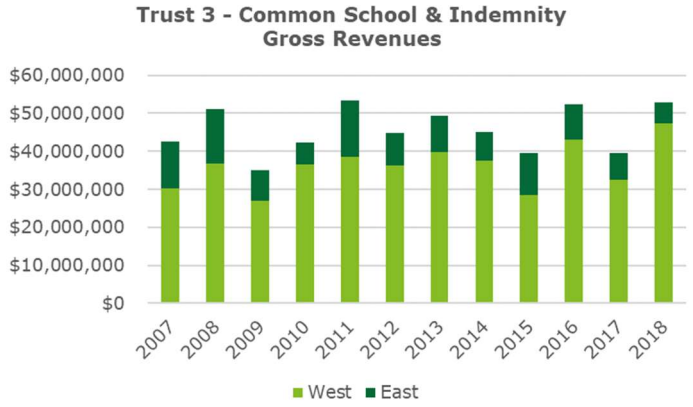
[17] These types of timber sales operate through legislatively designated revolving accounts that allow the department to capture all costs from the proceeds of the timber sale. The volume from these sales are not reflected in the Trust Manager's revenue system. This volume is reported separately to the legislature.

FIGURE 58



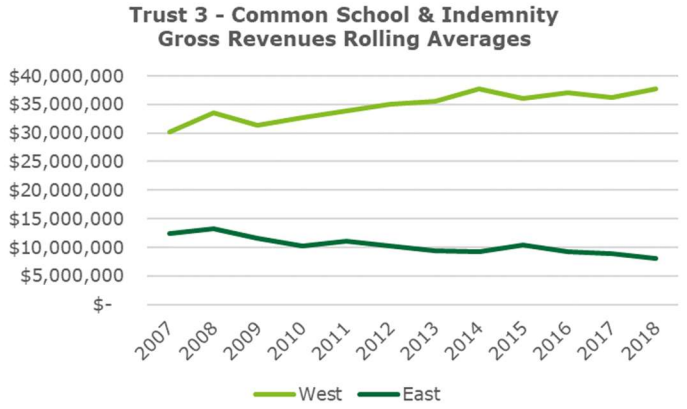
Common School and Indemnity Trust. The following chart displays the total reported gross revenue for the Common School and Indemnity Trust (before the operating cost percentage deduction) received from annual timber-related activities from 2007 to 2018.

FIGURE 59



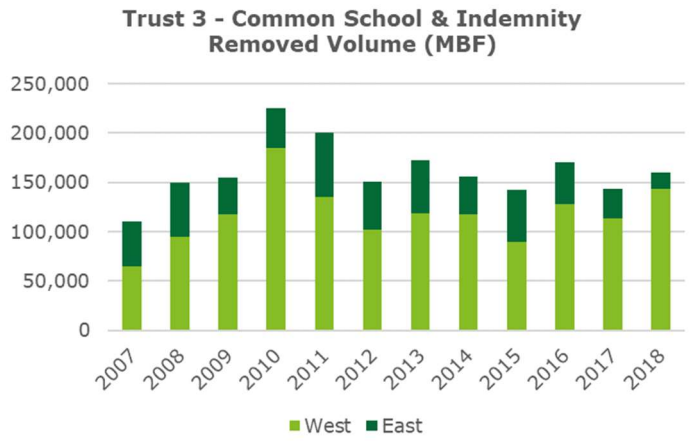
The following chart shows the rolling five-year average gross revenue for the West and East regions.

FIGURE 60



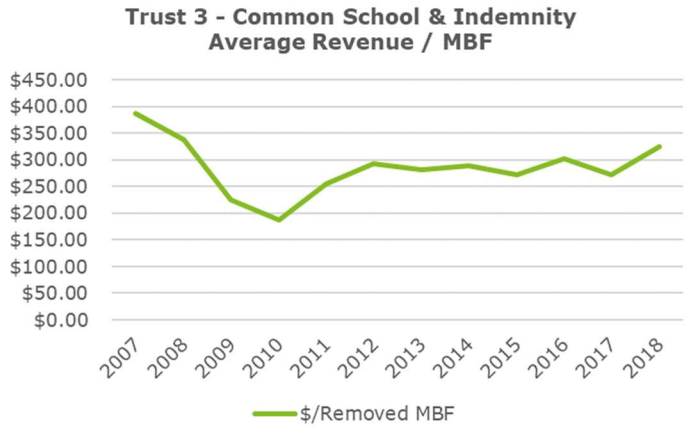
The next chart highlights the timber volume purchased and removed to source the revenue generated by the Common School and Indemnity Trust in the West and East regions. Note that the volume removed does not include volume from Forest Health and Forest Improvement Treatments.

FIGURE 61



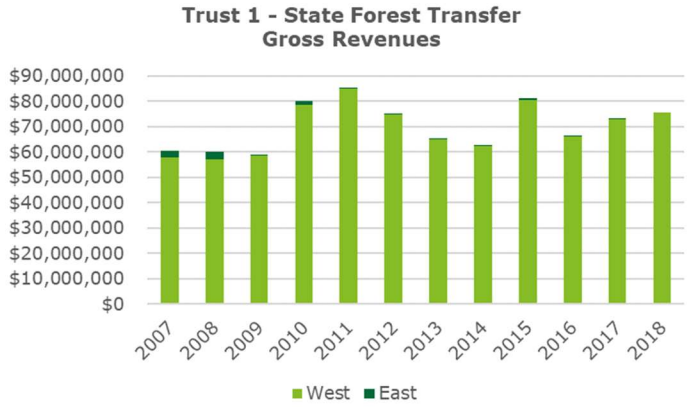
An additional chart displays the average revenue per MBF removed for the Common School and Indemnity Trust. Note that the gross revenue and removed volume do not include revenue or volume from Forest Health and Forest Improvement Treatment sales.

FIGURE 62



State Forest Transfer Trust. The following chart displays the total reported gross revenue for the State Forest Transfer Trust (before the operating cost percentage deduction) received from annual timber-related activities from 2007 to 2018.

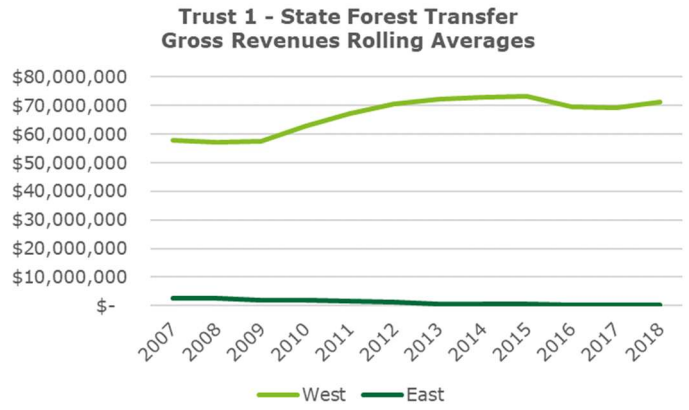
FIGURE 63



The reported annual gross revenue above has been divided to show portions attributed to areas in the West and East regions. As shown above, the majority of lands owned by the State Forest Transfer Trust are located in western Washington.

The following chart shows the rolling five-year average gross revenue for the West and East regions.

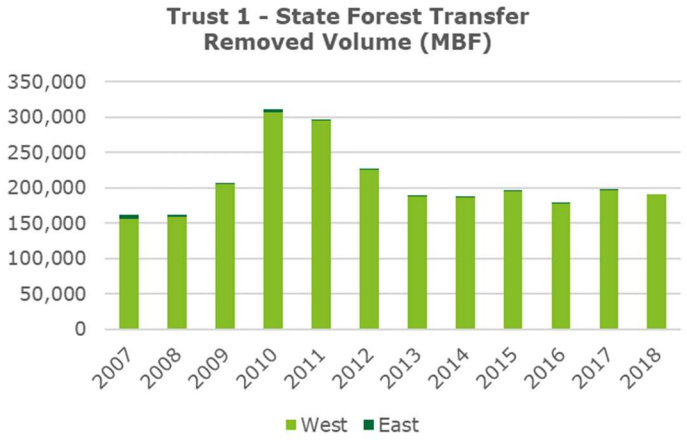
FIGURE 64



The bulk of timberland for the State Forest Transfer Trust is located in the West region. The gross revenue for the East has declined from over $2 million to nearly $200,000 over the past 12 fiscal years.

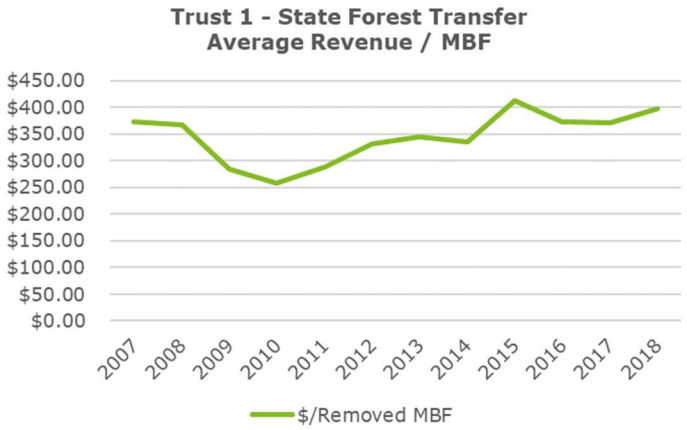
The following chart highlights the timber volume purchased and removed to source the revenue generated by the State Forest Transfers Trust between the West and East regions. Note that the volume removed does not include volume from Forest Health and Forest Improvement Treatments.

FIGURE 65



The following chart shows the average total revenue per MBF removed for the State Forest Transfers Trust. Note that the gross revenue and removed volume do not include revenue or volume from Forest Health and Forest Improvement Treatment sales.

FIGURE 66



OPERATING COST PERCENTAGE DEDUCTION

In the Timber Asset Class, all costs are paid from annual revenue. As gross proceeds are received, an operating cost percentage deduction is applied and paid to the Trust Manager. From the trust beneficiary's ownership position, there are no additional outflows of funds beyond the operating cost percentage deduction to operate and maintain the Timber Asset Class. The Trust Manager budgets for the actual costs and capital expenditures to maintain the Timber Asset Class and pays for these directly from the operating cost percentage deduction received during the year.

The operating cost percentage deduction is legislatively set and typically ranges between 25 percent and 31 percent of total gross revenues, depending on the management account associated with each trust ownership. Historical data reported in this analysis reflects actual blended rates deducted. We have used an estimated assumption of 28 percent for the operating cost percentage deduction of this asset class which has been applied in the direct capitalization method.

The actual costs incurred by the Trust Manager include direct operating costs to generate revenue in the current year, capital expenditures to generate revenue in future years, and costs required or necessary that will not directly generate revenue.

Operating Cost Percentage Deduction versus Direct Operating Expenses. The operating cost percentage deduction can be, and often is, different than actual operating expenses and capital expenditures incurred to operate and manage the Timber Asset Class. The operating cost percentage deduction may be less or greater than the actual operating expenses and capital expenditures for any one year.

When the total operating cost percentage deduction for all asset classes exceeds actual operating costs and capital expenditures for all asset classes, the excess is held in reserve for future years when the operating cost percentage deduction does not cover the actual costs. The reserve balances are reported by funds held in separate accounts—the Resource Management Cost Account, the Forest Development Account, and the Agriculture College Trust Management Account.

The Resource Management Cost Account in the state treasury is created and used solely for the purpose of defraying the costs and expenses incurred by the department in managing and administering state trust lands, state-owned aquatic lands, and the making and administering of leases, sales, contracts, licenses, permits, easements, and rights-of-way as authorized (RCW 79.64.020).

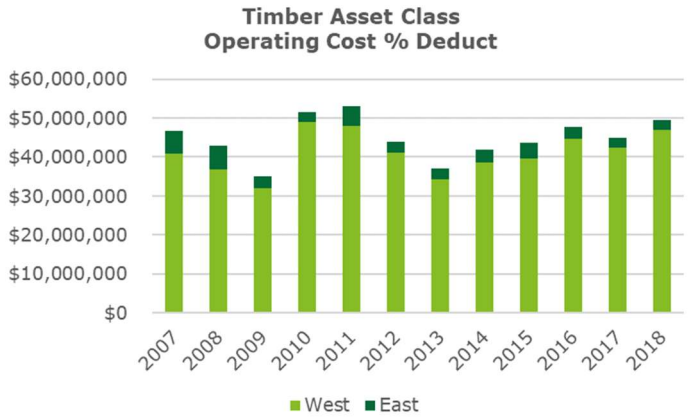
The Forest Development Account was created in the state treasury (RCW 79.64.100). Money placed in this account is first used for paying interest and principals on specific bonds issued by the department. Appropriations made by the legislature from the Forest Development Account to the department are for carrying out forest management activities on state forestlands and for reimbursements of expenditures from the Resource Management Cost Account in the management of state forestlands.

The Timber Asset Class has a third account, the Agriculture College Trust Management Account. This account does not retain an operating cost percentage deduction, but the Trust Manager receives a direct appropriation from the legislature to conduct management work. The Trust Beneficiary retains all gross revenue. Expenditures in the Timber Asset Class include funds provided by the Agriculture College Trust Management Account.

The reserve balances for all asset classes as of June 30, 2018 were approximately $12.6 million (Resource Management Cost Account) and nearly $4 million (Forest Development Account). Over the last 10 years, the Resource Management Cost Account reserves reached a high of more than $17 million at the end of FY 2014 and a low of $800,000 at the end of FY 2009. The Forest Development Account reserves reached a high of $24 million at the end of FY 2011 and a low of just under $4 million at the end of 2018. However, note that these are snapshots as of the end of fiscal years. In reality, the balances of the funds are constantly changing throughout each year with a much wider range. Reserves have been known to dip down to only a couple weeks of operating costs on a few occasions.

The following chart presents the dollar amounts of the historical operating cost percentage deductions from 2007 to 2018.[18] The operating cost percentage deduction is proportionate to the gross revenues produced by the asset class each year—it rises and falls as earnings for trusts rise and fall and may not reflect increases or decreases in the Trust Manager's actual costs.

FIGURE 67



ACTUAL COSTS

The following is a discussion of the actual costs incurred by the beneficiary trusts and paid by the Trust Manager from the funds received from the operating cost percentage deduction.

Direct Expenses. Currently, direct expenses include all costs directly related to managing the Timber Asset Class, including:

- Silviculture
- Seed orchards and planting
- Timber sale layout
- Projects and planning
- Administration of sold sales

Direct costs also include allocations of other costs for:

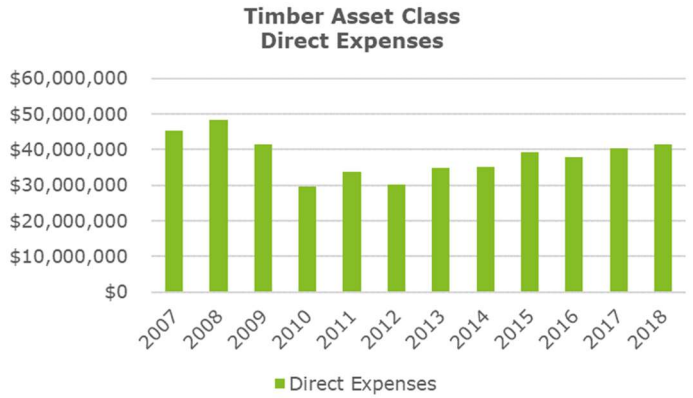
- Engineering support services
- Environmental analysis
- Training
- State lands infrastructure

[18] Data from the Trust Manager's DataMart MR12C report

The majority of total engineering support services costs incurred (80 percent) are allocated to the Timber Asset Class.

The table below shows that direct expenses are generally around $40 million per year for the Timber Asset Class.

FIGURE 68

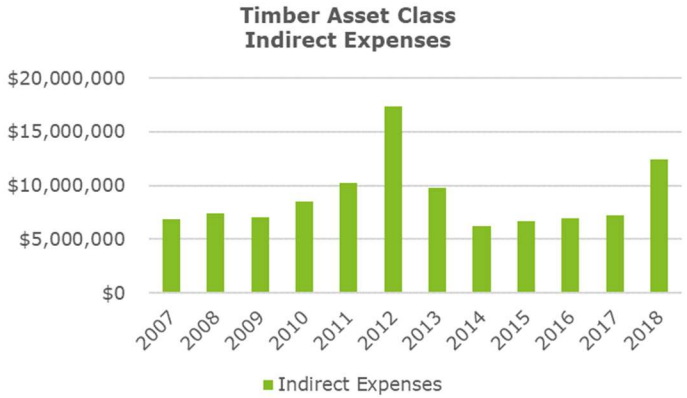


Indirect Expenses. Indirect expenses include all allocated agency overhead costs for:

- Administrative and agency support
- Adjustments
- Legal services
- Strategic investments
- Other administrative payments

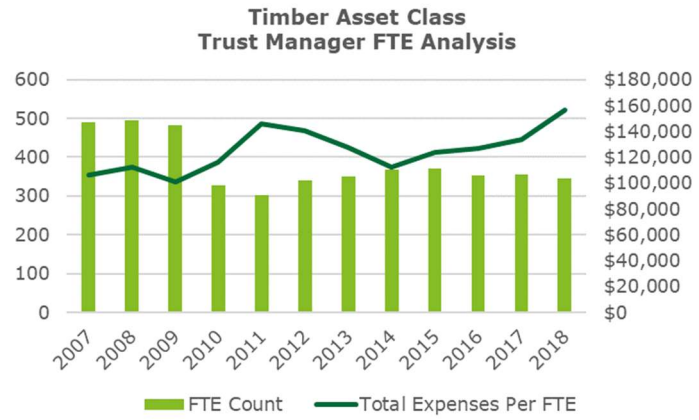
Total indirect expenses have been allocated to the different asset classes based on the amount of full-time employee (FTE) time logged toward each asset class. The Timber Asset Class receives the majority of allocated administrative costs (86 percent) due to the higher number of FTEs utilized in forestry. Indirect expenses can range from $7 million to $12 million each year. However, the amount reported in FY 2012 was much higher at approximately $17 million due to a large agency overhead expense made for strategic investments. The Trust Manager's accounting system does not account for indirect expenses in the East and West regions.

FIGURE 69



As seen in the following FTE analysis chart, the Trust Manager has averaged between 300 to 400 FTEs for the Timber Asset Class in recent years, with the lowest FTE counts following the initial years of the Great Recession. Total allocated expenses incurred by the Trust Manager have increased from $120,000 per FTE to nearly $160,000 per FTE in the past five years. These costs include all actual costs for the asset class—direct and indirect expenses which include not just salaries but benefits, overhead, etc.

FIGURE 70



Non-Net Acreage Expenses. As detailed previously, the Timber Asset Class acreage is described as gross acreage and net acreage, with the net acreage generating all of the revenue for the beneficiary trusts. However, the beneficiary trusts also incur expenses for the acreage that are restricted or limited from the net harvestable acreage. Examples of these expenses include costs for security, road maintenance and construction, easements, and access permits.

The Trust Manager's accounting system does not record costs to the level of detail required to distinguish between harvestable and restricted acres. The Trust Manager estimates that roughly 10 percent of total expenses are attributable to lands excluded from the net harvestable acreage.

NET CASH FLOW FROM 2014 TO 2018

Trust beneficiaries pay a portion of the gross revenue (i.e., operating cost percentage deduction) to the Trust Manager for operating expenses and capital expenditures. These costs include direct and indirect expenses. The cash flows net of the operating cost percentage deduction are then distributed to the appropriate funds by ownership.

The following table summarizes the net cash flows received from the Timber Asset Class and distributed to trust beneficiaries over the past five fiscal years. As can be seen, gross revenue for the trust beneficiaries ranged from $150 million to $174 million in the past five years, and the net cash flow received has ranged from $109 million to $125 million

FIGURE 71

Net Cash Flow to Trust Beneficiaries

	2014	2015	2016	2017	2018
Timber Asset Class Gross Revenues	$151,531,280	$161,186,660	$165,542,543	$154,088,758	$174,383,083
Less: Operating Cost Percentage Deduction	(42,082,937)	(43,741,383)	(47,910,451)	(45,166,312)	(49,633,129)
(Blended Rate based on revenue sources)	-27.77%	-27.14%	-28.94%	-29.31%	-28.46%
Net Revenue Distributed	**$109,448,344**	**$117,445,277**	**$117,632,092**	**$108,922,446**	**$124,749,955**
(Distribution Percentage)	72.23%	72.86%	71.06%	70.69%	71.54%

The net cash flows have also been presented for the Common School and Indemnity Trust and the State Forest Transfer Trust as these two trusts hold the largest ownerships in the Timber Asset Class.

Common School and Indemnity Trust. The following table summarizes the net cash flows for the beneficiaries of the Common School and Indemnity Trust.

FIGURE 72

Net Cash Flow to Common School & Indemnity Trust

	2014	2015	2016	2017	2018
Common School & Indemnity Gross Revenues	$45,091,737	$39,628,859	$52,236,326	$39,629,423	$52,936,191
Less: Operating Cost Percentage Deduction	(13,978,438)	(12,284,946)	(16,193,261)	(12,285,121)	(16,410,219)
	-31.00%	-31.00%	-31.00%	-31.00%	-31.00%
Net Revenue Distributed	**$31,113,298**	**$27,343,913**	**$36,043,065**	**$27,344,302**	**$36,525,972**
(Distribution Percentage)	69.00%	69.00%	69.00%	69.00%	69.00%

State Forest Transfer Trust. The following table summarizes the net cash flows for the beneficiaries of the State Forest Transfer Trust.

FIGURE 73

Net Cash Flow to State Forest Transfer Trust

	2014	2015	2016	2017	2018
State Forest Transfer Trust Gross Revenues	$62,663,804	$81,040,766	$65,959,407	$72,916,771	$75,454,587
Less: Operating Cost Percentage Deduction	(15,665,951)	(20,260,192)	(16,489,852)	(18,229,193)	(18,863,647)
	-25.00%	-25.00%	-25.00%	-25.00%	-25.00%
Net Revenue Distributed	**$46,997,853**	**$60,780,575**	**$49,469,555**	**$54,687,578**	**$56,590,940**
(Distribution Percentage)	75.00%	75.00%	75.00%	75.00%	75.00%

Property Taxes and Zoning

The State of Washington is exempt from paying forest taxes.

FOREST TAXES

Forest tax is an excise tax that has existed for nearly 50 years. In 1971, the tax began when the state legislature excluded timber from ad valorem property taxation. Private timber owners are required to pay a 5 percent excise tax on the stumpage value of their timber when it is harvested, instead of paying annual property taxes on the trees.

As state municipalities are exempt from paying property taxes, forest taxes are not required to be paid for timber on state trust lands. However, in 1982, forest taxes were extended to timber harvested from state and federal lands, not only private lands. For timber harvested from public lands, owners are defined as the first person (other than the public entity) to acquire title or possessory interest in the timber. As such, buyers of beneficiary trust timber are required to pay taxes on the timber purchased.

Taxed amounts are usually split between the counties and the state general fund. Timber is taxed at 5 percent, with 4 percent retained by counties where the harvest occurred and 1 percent retained by the state general fund. For harvests that include riparian protection, the landowner is granted a total rate of 4.2 percent, with 4 percent retained by the county where the harvest occurred.[19]

ZONING

It is assumed that all timberlands adhere to the proper forest zoning regulations outlined in local general plans. If not fully compliant, it is assumed that each property is legally non-conforming to the proper zoning standards.

[19] Department of Revenue Washington State. (n.d.). Retrieved February 1, 2020, from https://dor.wa.gov/find-taxes-rates/other-taxes/forest-tax

Market Analysis

Prices for timber as a commodity are volatile and can swing greatly from year to year.

INDUSTRY OVERVIEW

The Timber Services Industry manages tracts of timberland and sells the commodity of standing timber to downstream paper, wood, and pulp product manufacturing industries. The majority of timber is utilized in residential construction markets downstream in the supply chain. As such, the robust growth in the US housing market has benefited the industry over the last five years. The increase in residential construction is largely due to mortgage rates remaining low and falling unemployment rates. Rises in housing starts have helped offset decreases in other markets currently challenged by importing competition or technological advancements, such as the wood product and paper manufacturing markets. From 2014 to 2019, industry revenue increased at an annual rate of 5.5 percent. Total revenue in the industry increased by approximately $2 billion in 2019.[20]

DELIVERED LOG PRICES

Log market conditions have fluctuated in the past decade. Average delivered log prices as reported by the Trust Manager have shown volatility. The following table shows average prices of delivered log prices each December since 2013 on a per million board feet basis. The table also shows the year-over-year (YoY) percent change in price.

FIGURE 74

Year	Avg $/MBF	YoY % change
Dec-13	$510	---
Dec-14	$591	16%
Dec-15	$446	-25%
Dec-16	$537	20%
Dec-17	$666	24%
Dec-18	$491	-26%

As seen above, strong swings in log prices ranging between 20 percent and 30 percent have occurred in different directions in any given year.[21]

IMAGE SHOWS A WESTERN HEMLOCK TREE
SOURCE: FOR.GOV.BC.CA

[20] McGinley, D. December 2018. Timber Services in the US. IBISWorld Industry Report 11311.
[21] Retrieved from https://www.dnr.wa.gov/programs-and-services/product-sales-and-leasing/timber-sales/timber-sale-querylog-prices

INDUSTRY SECTOR PERFORMANCE (NATIONAL OVERVIEW)

The rest of the market analysis section is based on information and data sourced from IBISWorld, a trusted industry research firm. IBISWorld defines the timber services industry as managing timber tracts for the purpose of selling standing timber. A timber tract is a parcel of land used for growing timber for harvesting on a long rotation cycle (more than 10 years). The industry sector is a national overview in the United States that includes the state of Washington.

According to the IBISWorld Industry Report published in the December 2018, the Timber Services Industry has a moderate level of capital intensity in line with the rest of the US forestry sector. The sector incorporates a significant degree of capital investment to improve employee productivity and reduce operating expenses.

The industry report does not include many details regarding operating expenses; however, it does provide revenue and operating income for Rayonier Inc., a real estate investment trust that is considered the nation's largest seller of raw timber. The following table highlights the revenue, operating income, and implied operating expenses for Rayonier Inc. over the last several years.

FIGURE 75

Year	Revenue ($ million)	Operating Income ($ million)	% Rev	Implied Expenses ($ million)	% Rev
2013	173.3	28.6	17%	144.7	83%
2014	181.8	29.6	16%	152.2	84%
2015	154.5	21.1	14%	133.4	86%
2016	147.8	46.3	31%	101.5	69%
2017	155.1	40.8	26%	114.3	74%
2018	186.7	44.6	24%	142.1	76%

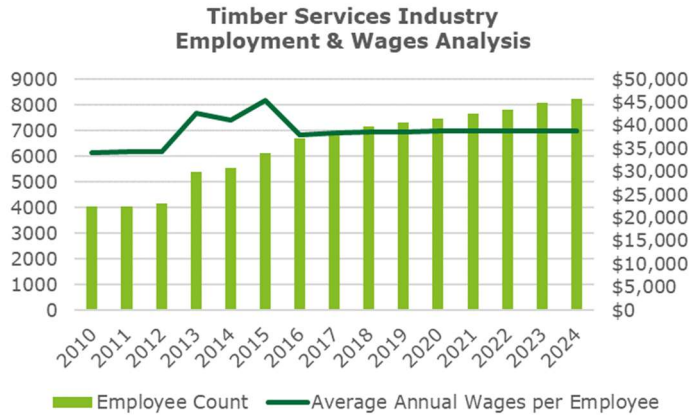
While these financials are not representative of industry averages, Rayonier Inc. competes with many larger companies and has a significant market share in the Timber Services Industry. The company returns operating income between 15 percent to 30 percent of revenue. This implies that operating expenses make up approximately 70 percent to 85 percent of revenue for the company.[22]

The industry report provides key data regarding employment and wages for the industry. Employment consists of the number of permanent, part-time, temporary, and seasonal employees, as well as working proprietors, partners, managers, and executives within the industry. Wages consist of the gross total wages and salaries of all employees in the industry, inclusive of the cost of benefits.

The chart below highlights the historical total employee counts in the Timber Services Industry and the amount of wages paid to those employees. The chart also displays the projected totals over the next five years. This figure is not to be compared to the FTE analysis presented in the Operating History section. This chart reflects only wages, salaries, and benefits per employee in the Timber Services Industry while the FTE analysis takes all costs for the asset class into consideration.

[22] McGinley, D. December 2018. Timber Services in the US. IBISWorld Industry Report 11311.

FIGURE 76



The number of employees in the industry increased substantially from approximately 4,058 in 2011 to 7,134 in 2018, implying a compound annual growth rate of 7.3 percent. The compound annual growth rate is defined as the annual rate of growth required for the beginning balance to grow to its ending balance. Annual average wages paid to employees have risen from approximately $34,000 in 2011 to nearly $39,000 in 2018.

Nationwide employment is forecasted to continue growing between 2 percent to 3 percent each year over the next five years. Total wages are anticipated to grow around the same rate over this time period.[23]

[23] McGinley, D. December 2018. Timber Services in the US. IBISWorld Industry Report 11311.

Methodology

The valuation methodology incorporates a combination of the income approach and the whole property value method inclusive of on-site timber.

METHODOLOGY OVERVIEW

Both the income approach (IA) and the whole property value method inclusive of on-site timber (WPV) are used to value the Timber Asset Class. The IA is the primary basis for the valuation of the asset class, while the WPV method is used as a secondary method.

Additionally, in the value reconciliation discussion, reported timber transactions (asset and enterprise transactions) are presented as a reasonableness test for comparison to the final value conclusion.

Definitions

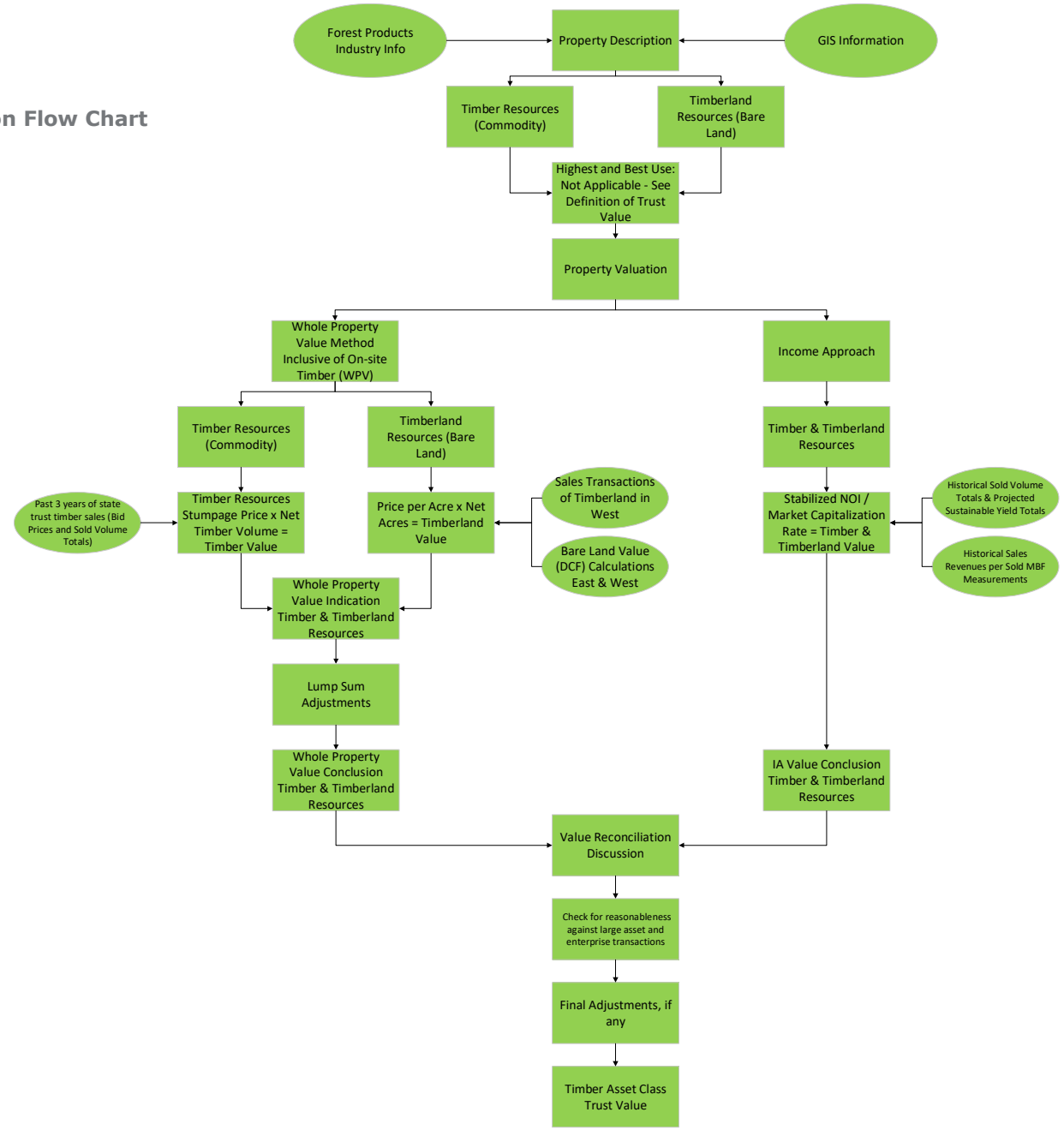
Many terms in the Timber Services Industry have different uses and meanings. It is imperative for readers of this report to understand the meanings associated with the terms used in the valuation analysis in this chapter. A list of terms and their meanings used in this chapter follows:

- **Delivered Log Price:** The value of the log when it arrives at the mill inclusive of all costs for timber (stumpage) harvesting. Specifically, the price captures costs for road construction, transportation, profit and risk.
- **Timber Asset Class:** The asset class of trust-owned lands that include the real property of both timber resources and timberland resources.
- **MBF:** MBF is a forestry term that means "1,000 board feet." M = Roman Numeral = 1000 and BF = board feet. It is common to report timber and log prices in $/MBF. The Trust Manager uses 'Board Feet, Scribner Scale'.
- **Stumpage Price:** The price of commercially valuable standing trees "on the stump." This is the value that the landowner/manager receives for selling the uncut trees.
- **Timber Resources:** Commercially valuable standing trees (commodity), regardless of age or condition. Also called "stumpage." In this study, references to timber or timber value are not intended to include the value of land on which the timber is situated.
- **Timberland Resources:** The land upon which timber or stumpage sits. Also referred to as bare land. In this study, references to timberland or timberland value are not intended to include the value, if any, of timber located on the land.
- **Trust Value:** The value of classes of assets managed by the Washington State Department of Natural Resources, which serves as the Trust Manager or Trust Management. Such assets are subject to specific laws, regulations, or management policies that restrict the use, marketability, or sale of the asset classes. Trust value is an expectation of continuing use as presently employed by Trust Management in its capacity as trust land manager. For further discussion, please reference Chapter 1.

The following page displays a valuation diagram that highlights the overall methodology.

FIGURE 77

Timber Asset Class Valuation Flow Chart



WHOLE PROPERTY VALUE METHOD INCLUSIVE OF ON-SITE TIMBER (WPV)

As described earlier, the WPV method is used to reflect the special nature of timber and timberland valuation. Timber, a commodity, is valued separately from timberland. The contribution of these two elements forms an indication of value for the Timber Asset Class.

The Trust Manager's records related to timber sale activity and independent appraisals obtained in the ordinary course of managing the assets are the principal source of market value information (i.e., comparable sales, actual sales information).

This valuation analysis only includes the net acreage that was described in detail earlier. As a reminder, the net acreage adjustment calculation accounts for a number of limitations and restrictions on timber harvest.

Timber Resources (Commodity) – WPV

Timber is valued by the market based upon its species, log quality, age, expected soil productivity, geographic region, site operability (determined by topography), and accessibility. Since timber is a commodity, buyers and sellers also factor in the distance to the market (typically the sawmills) because the greater the distance, the greater the cost to transport a heavy commodity. Implicitly, this also includes the risk associated with the ability to harvest in the associated political environment.

All of these factors contribute to the Stumpage Price, which is combined with the volume of timber within a stand. At its simplest, the value of a timber stand may be expressed as:

FIGURE 78

Stumpage Price (in $/MBF)
X Timber Volume (in MBF)
= Timber Value

This formula, however, is overly simple and does not identify underlying factors that affect the stumpage price, such as species, log quality, age, and costs of production.

For standing mature timber that is 60-69 years old or older, stumpage prices are multiplied by current volume levels (as of the date of value) to estimate sales revenue.

For less mature standing timber younger than 60 years old, stumpage prices are multiplied by volume levels that are projected to exist once the timber reaches an estimated harvest age of 60-69 years. The expected volume level relies upon volume growth rates exhibited in volume yield curves for inventory measured in the West region, as provided by the Trust Manager. For timber inventory in the East region, West region growth rates are discounted and utilized to project volume level. Such discounted growth rates reflect the inferior growing conditions in the East region. Research with industry specialists and analysis of the average volume of trust-owned forest lands at maturity (by species) are leveraged to determine the discount to apply to growth rates in the West region.

To calculate projected sales revenue for standing timber younger than 60 years old, the projected volume level at harvest age (i.e., between 60-69 years) is multiplied by the stumpage prices indicated by recent state trust timber sales. Finally, the projected sales revenue is discounted back to the present day to return the present value of standing timber that is younger than 60 years old.

Timberland Resources (Bare Land) – WPV

Timberland is valued on a per acre basis, with the soil's productivity or site index and topography given significant weight in this analysis. Timberland values tend to be higher in the West region than in the East region as land in the West region can generally produce more timber due to superior precipitation and growing conditions. Land value conclusions on a per acre basis are based on two considerations:

1. *Allocated Land Values:* The value of timber is extracted from the sales price from actual timberland transactions to reach the allocated value of the underlying land only. Note that none of these transactions are of the size and scale of the entire Timber Asset Class. Also note that the compiled timberland transactions are located in the West region and, as such, are only utilized to conclude on the prices per acre for the West region.
2. *Bare Land Values:* The discounted cash flow (DCF) method is used to calculate the residual value of theoretical land purchased with the intent to plant, grow, and sell commercial timber.

Consideration of Allocated Land Values

Actual transactions and appraisals obtained from the Trust Manager's records are used as comparables when determining land values, along with additional transactions provided by market participants.

The timber value is estimated and deducted from a transaction's overall sales price, and the remainder price is attributed to the underlying timberland. While different transactions contain property-specific influencers that affect the sales price, they provide a general range of prices to be expected per acre of timberland. The bottom end of the range includes prices for steeper land with inferior soil productivity, while the upper end of the range includes prices for level land with superior soil productivity.

Consideration of Bare Land Values

A bare land value analysis is also performed as an additional consideration when concluding on land values on a per acre basis. The bare land value calculations are utilized as a secondary approach to make price per acre conclusions for the West region (most reliance was placed on allocated land values from actual transaction data). Bare land value calculations are the only consideration used for price per acre conclusions made for the East region.

Specifically, the DCF method is used to calculate the residual value of theoretical land purchased with the intent to plant, grow, and sell commercial timber. Typical silviculture and management costs were surveyed and provided by the Trust Manager and applied as appropriate over the holding period of the DCF. The expected sales revenue in the targeted year of harvest is calculated by multiplying the projected volume level by the concluded stumpage price as no growth rate is applied to the current stumpage price. The growth rates utilized for volume growth align with the growth multiples used when valuing timber resources. The cash flows are discounted back to a net present value representative of how much a buyer would be willing to pay for the land.

Using both considerations described above, land value prices per acre are determined for each subgrouping of land in the West and East regions. The conclusions are then multiplied accordingly by the total acres in each subgrouping to calculate the value of bare land in each subgrouping. The combined values result in the total value attributable to timberland resources (i.e., bare land).

INCOME APPROACH (IA)

The IA utilizes the direct capitalization method, which capitalizes one year's income expectancy[24] at a market-derived capitalization rate to determine the combined value of timber and timberland resources in the Timber Asset Class.

Timber Asset Class – IA

The direct capitalization method captures the value of annual sales revenue received for timber purchased into perpetuity. One year's income expectancy is calculated by determining a typical gross sales revenue amount composed of two parts: (1) the stabilized volume level expected to be purchased and removed in a given year and (2) the anticipated sales price for the removed volume.

Historical amounts of harvested volume as well as reported forecasted volume levels are considered when concluding on the stabilized volume level.

When concluding on the anticipated sales revenue to be received for each MBF of volume, historical revenue is measured against the corresponding volume level removed (in MBF) in the same year. Payments that comprise gross revenues are paid right before the physical removal of the timber takes place. (e.g. If a buyer desires to remove 30 percent of timber from a timber stand won at an auction, the buyer must pay 30 percent of the agreed upon payment before the timber can be removed.)

Additionally, average stumpage prices on a $/MBF basis from individual sales of timber 40 years and older over the last three years are also considered.

Gross sales revenue is estimated by multiplying the concluded stabilized volume level (in MBF) by the concluded timber revenue (pricing) amount per MBF. An assumed stabilized operating cost percentage of 28 percent is then deducted to return the net income distributed to trust beneficiaries. The expected stabilized operating cost percentage deduction is based on historical deductions averaging near this blended rate.

The net income distributed to the trust beneficiaries is capitalized by a market-derived capitalization rate that returns the value indication of the timber resources. Further discussion regarding this rate can be found in the earlier chapter that focuses on rates of return.

Data and Data Sources

Data was compiled and analyzed from multiple data sources, including reputable industry publications that are widely known and utilized by owners, operators, investors, managers, lenders, and real estate appraisers within the Timber Services Industry. These data sources include and are not limited to the Pacific Northwest Timberland Investment Survey by Sizemore & Sizemore, Inc., as well as market data provided by S.A. Newman, an appraisal firm that specializes in providing appraisals and natural resource consulting services to the industry.

As mentioned earlier, the principal source of market value information is the Trust Manager's records, which include comparable sales, actual sales information, and volume yield growth curves.

[24] Projected income less expenses that are both subject to change but that have been adjusted to reflect equivalent stable property operations.

Extraordinary Assumptions

It is assumed that all timberlands adhere to the proper zoning regulations outlined in regional plans. If not fully compliant, it is assumed that each property is legally non-conforming to the proper zoning standards.

As previously discussed in the chapter regarding restrictions and burdens, the Trust Manager's ability to sell, exchange, or transfer state trust lands is limited by statute. For the purpose of this analysis, we assume that the ownership interest is non-transferable resulting in the land not being able to be sold.

We relied on information provided by the Trust Manager for all specific data regarding data files, leasing activities and financials, size and ownership information, etc. We assume that all information provided by the Trust Manager is accurate and sufficient for the purpose of this valuation.

Hypothetical Conditions

None noted.

Whole Property Value

The WPV method combines market data for timber and the underlying land.

INTRODUCTION

As described in the methodology section of this chapter, the whole property value method inclusive of on-site timber reflects the special nature of timber (i.e., commodity) and timberland (i.e., bare land) valuation. Timber is valued separately from timberland; the contributions of these two elements form a total indication of value for the Timber Asset Class.

Trust Manager data files have been the principal source of market and value information (comparable sales, actual sales information), based upon timber sale activity and independent appraisals which are obtained in the ordinary course of the management of assets and properties.

TIMBER RESOURCES VALUATION

Timber Subgroupings

For purposes of the timber resources valuation analysis, it is important to recognize that different species types and factors drive pricing; thus, timber inventory has been segregated into different subgroupings that indicate value, as listed in the following:

Species Type

- Douglas Fir
  - Includes Douglas Fir and Western Larch
- Hardwood
  - Includes Aspen, Bigleaf Maple, Birch, Black Cottonwood, Mixed Hardwood, Oregon Ash, Paper Birch, and Red Alder
- Whitewood
  - Includes Engelmann Spruce, Grand Fir, Lodgepole Pine, Mountain Hemlock, Noble Fir, Pacific Silver Fir, Ponderosa Pine, Sitka Spruce, Subalpine Fir, True Firs, Western Hemlock, Western White Pine, and Whitebark Pine
- Cedar
  - Includes Alaska Yellow Cedar and Western Red Cedar

Age

- 70+ years
- 60-69 years
- 50-59 years
- 40-49 years
- 30-39 years
- 20-29 years
- 10-19 years
- 0-9 years

Soil Productivity

- Site Classes I and II
- Site Class III
- Site Classes IV and V

Topography

- Cable
  - Terrain's slope is greater than 35 percent
- Shovel
  - Terrain's slope is less than or equal to 35 percent

Region

- Western Washington
- Eastern Washington

Age categories have been broken out into 10-year intervals for timber between 0 and 70 years old, plus a single category for timber more than 70 years old. Timber has been grouped by such ages for two reasons:

1. The reported average age of timber sold from trust lands between 2015 and 2018 was 64 years old. Based on conversations with market participants, this age is above the 40 to 50-year-old typical rotation age in the private sector for merchantable timber.

2. Volume yield curves for timber in the western Washington region, as provided by the Trust Manager, suggest that growth rates tend to slow after trees reach age 50, and then slow down significantly more after age 70, which implies that the optimal time to harvest is at some point younger than age 70.

It is assumed the harvest age is between 60-69 years old, and this assumption is used in the analysis projections, which reflects current practice on this ownership. Note that the customary harvest age on similarly situated private industrial forest land is younger.

Stumpage Prices per MBF – Timber Resources

To conclude on stumpage prices on a per MBF basis, trust-owned timber sales between 2015 and 2018 were compiled and reviewed. Specifically, the bid amounts paid for timber stumpage were allocated toward the species types that made up the package of volume purchased. The allocation is based on the delivered log retail prices for each species type and the percentage composition of each species type in the overall package sold.

These sales were segregated by age to conclude on average stumpage prices per MBF for different subgroupings of ages 60-69 and 70-plus. While the overall dataset of transactions is very large over the past three years, some subgroupings have fewer transactions. Due to sparse data for certain species in the East and Cable[25] subgroupings, stumpage prices per MBF for these subgroupings were concluded based on the average pricing from other subgroupings in which sales data is more prevalent.

For example, very few sales of stumpage from land designated as Cable with Site Classes IV or V occurred between 2015 and 2018. However, sales of stumpage from Cable land with Site Classes I through III are much more common. The stumpage price per MBF of timber from Cable land with Site Classes I through III is on average approximately 80 percent of the stumpage price per MBF of timber from Shovel land with the same site classes. As such, a 20 percent discount is applied to the stumpage prices of timber from Shovel land with Site Classes IV or V to obtain estimated stumpage pricing for timber from Cable land with the same site classes, but only designated as Cable.

[25] Terrain's slope is greater than 35 percent.

Further, as is common with any dataset with large populations, there are certain subgroupings that contain a wide range of prices per MBF recorded from different transactions. Many subgroupings include outliers where certain transactions record a very high price per MBF which can skew the overall averages of the subgrouping upward. To control for the upward skewing of outliers, price deductions were applied to the price per MBF of very volatile subgroupings with high outliers. To determine the volatility of subgroups with high outliers, the standard deviation was measured for each subgrouping. This results in the concluded stumpage prices being adjusted downward for the more volatile subgroupings to control for high outliers.

The concluded stumpage prices per MBF are highlighted in the following table:

FIGURE 79

Concluded Stumpage Price per MBF

Sub-Groups			Key Value Indicator					
		Age:	70+ Years			60 - 69 Years		
		Site Class:	I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	$299	$287	$261	$270	$247	$164
		Shovel	$343	$340	$326	$338	$309	$205
	East	Cable	$207	$168	$156	$228	$212	$139
		Shovel	$258	$232	$195	$286	$265	$173
Hardwood	West	Cable	$334	$326	$267	$295	$229	$159
		Shovel	$376	$351	$334	$369	$286	$199
	East	Cable	$222	$189	$95	$249	$193	$135
		Shovel	$278	$236	$119	$311	$242	$168
Whitewood	West	Cable	$264	$260	$250	$228	$237	$157
		Shovel	$331	$332	$312	$329	$303	$196
	East	Cable	$157	$142	$134	$178	$162	$106
		Shovel	$197	$178	$167	$223	$203	$133
Cedar	West	Cable	$617	$625	$520	$543	$478	$337
		Shovel	$692	$687	$650	$679	$597	$421
	East	Cable	$396	$362	$344	$459	$401	$285
		Shovel	$495	$453	$430	$573	$501	$356

DCF Assumptions for Timber Younger than 60 Years

The average stumpage prices per MBF shown in the preceding table represent the pricing for timber ages 60-69 and 70-plus sold over the past three years after adjustments made for subgroups with upwardly skewed data. Anticipated volume levels have been projected forward to capture when timber currently younger than 60 years will reach the assumed harvest age of 60-69 years old.

The concluded stumpage prices per MBF are then applied to the projected volume for each subgrouping to calculate forecasted timber sales revenue which is then discounted back to the present using a discount rate to capture the present value of timber younger than 60 years.

For example, standing timber that currently falls between the ages of 20 and 29 years old will have a different volume level once it reaches ages 60 to 69 years old. The volume level will grow over the next 40 years due to the increasing size of the trees—in both diameter and height—over time. The prices for which those trees may sell will likely be similar in 40 years. As such, the concluded stumpage prices (per MBF) for timber ages 60 to 69 years old are then multiplied by the projected volume levels (in MBF) to calculate the forecasted sales revenue. Finally, the sales revenue is discounted back 40 years to return the net present value of standing timber ages 20 to 29 years old.

Stumpage Price Growth Rate

As depicted in the market analysis section, the average delivered log price is significantly volatile from year to year. It is not atypical for the price to swing more than 20 percent in either direction in a given year. As such, it is appropriate to use a conservative growth rate for the stumpage value in such an analysis.

Further, it is common industry practice to forecast little to no growth rate in pricing, and research indicates it would be appropriate to assume an annual growth rate between 0 percent and 0.5 percent. As such, we concluded to an annual growth rate of 0 percent for stumpage prices. This results in the concluded stumpage prices being applied to projected volume levels to determine forecasted sales revenues.

Discount Rate

This analysis utilizes a discount rate of 6 percent. For further discussion regarding the determination of this discount rate, please refer to the earlier chapter that discusses rates of return.

Volume Projections

Current Volume Totals

State trusts own approximately 2.1 million acres of timberlands containing approximately 42 million MBF in gross inventory. However, much of this timber is not harvestable. Approximately 331,923 acres (16.1 percent) contain long-term deferrals. Approximately 6,778 acres (0.3 percent) contain non-commercial timber species. Approximately 241,324 acres (11.7 percent) are restricted for RMZs. Another 236,322 acres (11.5 percent) are restricted for Uplands. This results in approximately 1.24 million acres (60 percent) that are harvestable, which can produce more than 17.4 million MBF in harvestable timber.

For purposes of this analysis, timber more than 70 years old is grouped together into one age grouping. Timber younger than the assumed harvest age of 60 to 69 years old is separated into 10-year groupings. Note that approximately 302,790 MBF of net harvestable volume that technically falls to the East region has been categorized as volume for the West region. This volume is located in Klickitat County, owned by the State Forest Transfer Trust, and lies on densely stocked land with favorable growing conditions and species similar to the western Washington region as the lower elevation of the Cascades in this region allow precipitation to reach further east. The total net harvestable timber levels in MBF standing on trust-owned lands as of the date of value (DOV) are outlined in the following tables:

FIGURE 80

Net Harvestable Volume in MBF (Year 0)

Sub-Groups			Key Value Indicator					
		Age:	70 Years +			60 - 69 Years		
		Site Class:	I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	404,296	168,321	67,651	205,252	121,286	23,285
		Shovel	674,596	147,737	45,208	447,260	133,842	14,947
	East	Cable	174,575	342,428	268,115	54,182	57,152	43,179
		Shovel	289,165	442,845	322,324	148,778	101,720	56,384
Hardwood	West	Cable	18,143	13,942	14,806	16,897	16,221	8,945
		Shovel	37,542	34,240	22,295	47,039	44,848	19,575
	East	Cable	455	1,303	0	490	271	4
		Shovel	454	920	46	228	315	190
Whitewood	West	Cable	124,599	124,923	62,292	85,530	76,457	46,937
		Shovel	254,545	168,411	34,295	208,040	119,271	50,736
	East	Cable	23,511	131,980	99,734	5,614	22,794	22,278
		Shovel	126,242	302,061	200,023	44,272	80,917	59,814
Cedar	West	Cable	7,747	3,549	1,407	2,020	503	1,251
		Shovel	17,740	2,678	4,785	4,961	1,570	2,447
	East	Cable	15,599	4,167	561	821	651	988
		Shovel	38,406	20,763	2,579	5,554	4,131	2

FIGURE 81

Net Harvestable Volume in MBF (Year 0)

Sub-Groups			Key Value Indicator					
		Age:	50 - 59 Years			40 - 49 Years		
		Site Class:	I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	263,249	193,294	41,910	169,433	115,976	60,909
		Shovel	632,171	215,920	38,694	867,073	184,848	52,171
	East	Cable	80,177	53,032	45,933	32,020	29,905	19,650
		Shovel	199,336	119,326	66,368	82,754	64,696	32,685
Hardwood	West	Cable	30,582	22,132	11,790	26,877	8,513	5,205
		Shovel	55,893	41,479	27,409	74,044	30,062	32,160
	East	Cable	0	0	0	48	184	0
		Shovel	59	2	0	1,242	1,202	0
Whitewood	West	Cable	141,582	66,964	50,284	92,459	34,870	40,011
		Shovel	291,819	90,787	41,903	253,364	78,670	35,357
	East	Cable	5,481	28,134	16,845	3,849	11,068	8,909
		Shovel	85,029	143,200	65,445	70,100	122,056	42,919
Cedar	West	Cable	1,775	542	674	96	75	378
		Shovel	2,528	4,395	3,415	8,697	908	1,127
	East	Cable	2,805	2,240	21	487	261	0
		Shovel	10,417	3,921	1,647	5,379	5,585	0

FIGURE 82

Net Harvestable Volume in MBF (Year 0)

Sub-Groups			Key Value Indicator					
		Age:	30 - 39 Years			20 - 29 Years		
		Site Class:	I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	153,315	31,763	19,773	62,336	9,341	3,073
		Shovel	868,539	126,945	40,917	310,575	26,744	10,408
	East	Cable	8,668	12,304	5,080	1,248	3,464	2,766
		Shovel	22,252	11,309	6,126	4,337	7,046	4,125
Hardwood	West	Cable	11,328	4,123	2,922	5,926	1,834	109
		Shovel	63,480	12,133	10,915	40,842	11,462	1,070
	East	Cable	360	102	27	263	373	0
		Shovel	472	402	0	70	18	0
Whitewood	West	Cable	40,070	9,881	8,073	5,544	1,122	2,031
		Shovel	220,672	19,188	10,077	56,460	1,859	2,659
	East	Cable	876	5,676	3,829	1,515	2,776	2,218
		Shovel	16,304	19,725	14,400	5,278	6,593	2,760
Cedar	West	Cable	356	94	342	169	0	0
		Shovel	6,630	433	685	4,052	67	347
	East	Cable	4	135	0	0	118	55
		Shovel	1,896	1,544	0	154	151	440

FIGURE 83

Net Harvestable Volume in MBF (Year 0)

Sub-Groups			Key Value Indicator					
		Age:	10 - 19 Years			0 - 9 Years		
		Site Class:	I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	46,039	12,793	2,564	85,162	33,426	9,480
		Shovel	192,330	49,129	9,398	354,983	81,601	19,884
	East	Cable	903	4,517	534	4,602	9,054	5,349
		Shovel	10,280	4,602	1,934	23,995	55,678	19,933
Hardwood	West	Cable	7,973	3,445	1,253	6,361	3,128	1,947
		Shovel	30,732	13,237	3,671	14,987	11,422	3,012
	East	Cable	0	0	0	0	3	0
		Shovel	0	0	0	0	9	0
Whitewood	West	Cable	3,966	5,002	804	13,438	10,973	8,529
		Shovel	20,492	14,304	3,093	63,101	41,763	12,685
	East	Cable	1,404	880	583	472	2,664	805
		Shovel	14,322	3,320	1,575	8,997	23,138	10,715
Cedar	West	Cable	226	63	148	1,142	77	0
		Shovel	2,778	1,045	1,409	1,525	395	977
	East	Cable	175	37	0	1,176	750	10
		Shovel	683	226	0	3,365	379	533

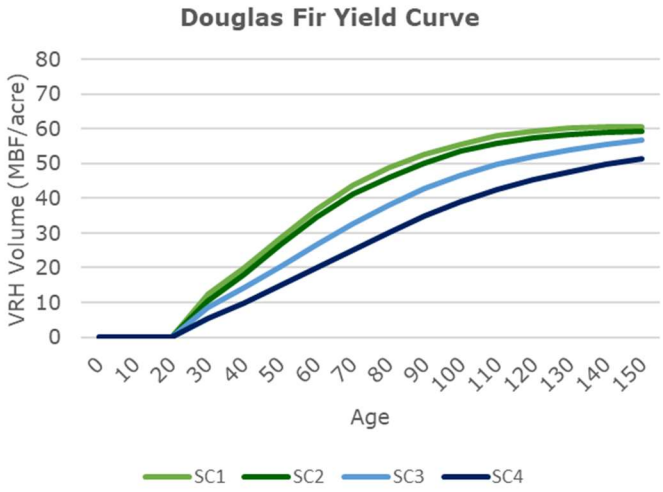
Volume Growth Rates

The current levels of standing volume for each of the subgroupings are projected to grow to the targeted age range of 60-69 years old by applying growth multiples sourced from yield curves (or volume curves) provided by the Trust Manager for the West region. Specifically, growth multiples were calculated by dividing the level of future volume (MBF per acre) at age 70 by the earlier levels of volume (MBF per acre) recorded at each 10-year period in the yield curve provided.

The Trust Manager provided data for stands that were developed and recorded after the introduction of HCP. As such, the growth rates recorded may be more conservative relative to those recorded in yield curves by private owners in which such restrictions do not exist.

An example of the yield curve for each site class (SC) of Douglas Fir species is shown in the following figure.

FIGURE 84



The yield curve reports an MBF per acre of 32.8 at age 70 for Site Class 3 in the West region. The curve also reports an MBF per acre of 14.2 at age 40 for Site Class 3 in the West region. The growth multiple in this example is approximately 2.31, which is calculated by dividing 32.8 by 14.2. The yield curve suggests that if 40-year-old Douglas Fir timber stood on a plot of Site Class 3 land in the West region today, it will grow to reach a volume by age 70 (i.e., 30 years from now) that is 2.31 times its current volume.

Note that the yield curves provided record volume levels of 0 at periods 2 and 3 (i.e., ages 10 and 20). In order to calculate growth multiples for timber with current ages found in these earlier age periods, a straight-line volume growth rate was assumed between age 0 and the volume level recorded at age 30.

As the Cedar species grouping only make up 1 percent of net harvestable volume, and yield curves for the Cedar species type are unavailable, the growth multiples for the Douglas Fir species grouping have also been utilized for the Cedar species grouping.

Conversations with market participants indicate that East region volume typically grows to be between 40 percent to 70 percent of West region volume. Further, as a general weighted-average growth assumption for all timber inventory in the East region, it was suggested that it would be appropriate to assume volume levels in the East region will be approximately 50 percent of volume levels in the West region. As such, a 50 percent discount has been applied to the rate of change in yield (on an MBF per acre basis) from the West region yield curve data to calculate growth multiples for timber growth in the East region. For example, West region yield curves show that the MBF per acre reported for Douglas Fir at Site Class 1 increased from 20 MBF to 43.6 MBF per acre between ages 40 to 70. This represents an increase in yield of 23.6 MBF per acre over the 30-year time span. The growth multiple for the East region has been calculated by solving for the multiple that would result in the rate of change in MBF per acre increasing by only 50 percent (in this case, the increase would be 11.8 MBF per acre over the same time period between ages 40 to 70).

As the growth multiples are ultimately applied to timber volume grouped within 10-year age ranges (e.g., 10-19 years old, 20-29 years old), they are calculated by taking the average of growth multiples for adjacent time periods. For example, the growth multiple for Douglas Fir in the West for Site Class 3 at age 30 is 3.86, and the growth multiple for Douglas Fir for Site Class 3 at age 40 is 2.31, then the average growth multiple applied to Douglas Fir volume with Site Class 3 soil in the West region with ages 30-39 is 3.08 (i.e., average of 3.86 and 2.31). The calculated growth multiples are shown in the following tables.

FIGURE 85

Volume Growth Multiples - West		Age Range					
Species Grouping	Site Class	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59
Douglas Fir & Cedar	I & II	11.22	8.41	4.67	2.99	1.89	1.37
Douglas Fir & Cedar	III	11.58	8.68	4.82	3.08	1.96	1.42
Douglas Fir & Cedar	IV & V	14.00	10.50	5.83	3.59	2.11	1.48
Hardwood	I & II	12.12	9.09	5.05	3.24	2.02	1.40
Hardwood	III	12.65	9.48	5.27	3.41	2.17	1.49
Hardwood	IV & V	16.03	12.02	6.68	4.19	2.46	1.60
Whitewood	I & II	12.45	9.34	5.19	3.29	2.02	1.42
Whitewood	III	13.20	9.90	5.50	3.47	2.12	1.47
Whitewood	IV & V	16.61	12.46	6.92	4.21	2.34	1.55

FIGURE 86

Volume Growth Multiples - East		Age Range					
Species Grouping	Site Class	0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50 to 59
Douglas Fir & Cedar	I & II	6.11	4.71	2.84	1.99	1.44	1.18
Douglas Fir & Cedar	III	6.29	4.84	2.91	2.04	1.48	1.21
Douglas Fir & Cedar	IV & V	7.50	5.75	3.42	2.30	1.56	1.24
Hardwood	I & II	6.56	5.05	3.03	2.12	1.51	1.20
Hardwood	III	6.82	5.24	3.13	2.21	1.58	1.24
Hardwood	IV & V	8.51	6.51	3.84	2.59	1.73	1.30
Whitewood	I & II	6.73	5.17	3.09	2.14	1.51	1.21
Whitewood	III	7.10	5.45	3.25	2.24	1.56	1.23
Whitewood	IV & V	8.81	6.73	3.96	2.60	1.67	1.28

Projected Volume Totals

Current volume levels for timber younger than 60 years old are segregated into 10-year groupings and multiplied by the concluded growth multipliers previously presented to obtain projected volume levels corresponding to when the timber age reaches 60 to 69 years old. For example, a growth multiplier of 8.41 was applied to Douglas Fir timber in the West region with a site class of I or II and a current age of 10 to 19 years old to project the volume level in 50 years. The projected net harvestable volume levels in MBF for each of the 10-year groupings of younger timber are outlined in the following tables showing how much volume is to be expected once the trees reach the age of 60-69 years old:

FIGURE 87

Net Harvestable Volume Projected at Age 60-69 (MBF)

Sub-Groups			Key Value Indicator					
Projected Years:			10 Years			20 Years		
Age (Year 0):			50 - 59 Years			40 - 49 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	359,552	273,678	61,952	319,950	227,180	128,600
		Shovel	863,436	305,713	57,198	1,637,343	362,090	110,152
	East	Cable	94,842	64,059	56,916	46,242	44,243	30,568
		Shovel	235,798	144,138	82,238	119,512	95,713	50,847
Hardwood	West	Cable	42,875	32,914	18,904	54,215	18,443	12,821
		Shovel	78,359	61,688	43,949	149,359	65,125	79,227
	East	Cable	0	0	0	72	291	0
		Shovel	71	3	0	1,874	1,904	0
Whitewood	West	Cable	200,457	98,402	78,104	186,780	73,863	93,768
		Shovel	413,168	133,411	65,085	511,832	166,644	82,860
	East	Cable	6,621	34,738	21,504	5,812	17,256	14,893
		Shovel	102,708	176,815	83,548	105,857	190,302	71,751
Cedar	West	Cable	2,424	767	997	181	148	798
		Shovel	3,453	6,222	5,048	16,423	1,779	2,380
	East	Cable	3,318	2,706	26	704	386	0
		Shovel	12,322	4,736	2,040	7,769	8,263	0

FIGURE 88

Net Harvestable Volume Projected at Age 60-69 (MBF)

Sub-Groups			Key Value Indicator					
Projected Years:			30 Years			40 Years		
Age (Year 0):			30 - 39 Years			20 - 29 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	457,898	97,969	71,053	291,330	45,056	17,929
		Shovel	2,594,012	391,543	147,030	1,451,486	129,001	60,715
	East	Cable	17,278	25,126	11,667	3,541	10,087	9,449
		Shovel	44,355	23,094	14,069	12,304	20,518	14,094
Hardwood	West	Cable	36,650	14,071	12,233	29,931	9,662	730
		Shovel	205,372	41,402	45,689	206,298	60,398	7,145
	East	Cable	762	225	71	797	1,170	0
		Shovel	999	888	0	212	57	0
Whitewood	West	Cable	131,694	34,307	33,956	28,760	6,172	14,054
		Shovel	725,258	66,623	42,383	292,904	10,225	18,406
	East	Cable	1,877	12,691	9,966	4,687	9,021	8,784
		Shovel	34,944	44,106	37,482	16,329	21,428	10,930
Cedar	West	Cable	1,064	289	1,227	788	0	0
		Shovel	19,801	1,334	2,462	18,937	321	2,023
	East	Cable	8	275	0	0	343	186
		Shovel	3,779	3,153	0	437	440	1,505

FIGURE 89

Net Harvestable Volume Projected at Age 60-69 (MBF)

Sub-Groups			Key Value Indicator					
Projected Years:			50 Years			60 Years		
Age (Year 0):			10 - 19 Years			0 - 9 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	387,295	111,073	26,918	955,216	386,957	132,713
		Shovel	1,617,954	426,558	98,674	3,981,671	944,654	278,383
	East	Cable	4,248	21,867	3,071	28,108	56,933	40,118
		Shovel	48,381	22,281	11,118	146,565	350,119	149,500
Hardwood	West	Cable	72,490	32,671	15,061	77,107	39,559	31,210
		Shovel	279,415	125,546	44,130	181,679	144,447	48,270
	East	Cable	0	0	0	0	20	0
		Shovel	0	0	0	0	63	0
Whitewood	West	Cable	37,036	49,516	10,011	167,309	144,849	141,674
		Shovel	191,356	141,605	38,530	785,660	551,272	210,717
	East	Cable	7,255	4,796	3,924	3,176	18,918	7,092
		Shovel	74,029	18,093	10,600	60,508	164,280	94,350
Cedar	West	Cable	1,901	546	1,556	12,804	891	2
		Shovel	23,367	9,073	14,796	17,104	4,575	13,675
	East	Cable	822	181	0	7,182	4,719	75
		Shovel	3,214	1,095	0	20,557	2,381	3,997

Discounted Values

Gross Revenue

The concluded stumpage prices per MBF for timber between the ages of 60 and 69 years old are grown out at the annual rate of 0 percent for the same number of projected years until the younger timber reaches the age of 60 to 69 years old resulting in the same concluded stumpage prices being applied. Gross timber sales revenue is calculated by multiplying the concluded stumpage prices per MBF by the projected volume in MBF for each subgrouping.

Net Present Cash Flows

The gross revenue from timber sales are then discounted back to the date of value (DOV) at the selected annual discount rate. The valuation analysis includes all harvestable standing timber over the age of 60 to be sold for harvest at current stumpage prices as of the DOV. As such, revenue from these sales is not discounted.

The discounted values for each of the subgroupings are presented in the following tables:

FIGURE 90

Gross Sales Revenues Discounted to DOV

Sub-Groups			Key Value Indicator					
Number of Years Discounted:			0			0		
Age (Year 0):			70 Years +			60 - 69 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	$120,943,146	$48,352,854	$17,662,707	$55,485,957	$30,001,949	$3,817,731
		Shovel	$231,559,428	$50,159,087	$14,753,718	$151,135,172	$41,384,719	$3,063,361
	East	Cable	$36,078,745	$57,372,114	$41,726,011	$12,379,113	$12,129,694	$5,983,294
		Shovel	$74,700,643	$102,640,626	$62,703,051	$42,489,434	$26,985,675	$9,766,382
Hardwood	West	Cable	$6,053,098	$4,540,802	$3,952,568	$4,981,294	$3,713,071	$1,424,362
		Shovel	$14,128,278	$12,033,316	$7,439,876	$17,334,458	$12,832,291	$3,896,047
	East	Cable	$100,933	$245,699	$0	$122,192	$52,424	$494
		Shovel	$125,903	$216,871	$5,399	$71,053	$76,136	$31,919
Whitewood	West	Cable	$32,920,718	$32,437,146	$15,558,082	$19,538,511	$18,155,800	$7,360,764
		Shovel	$84,188,787	$55,857,875	$10,706,828	$68,487,158	$36,125,179	$9,945,636
	East	Cable	$3,700,945	$18,764,537	$13,363,733	$999,637	$3,703,647	$2,362,189
		Shovel	$24,840,557	$53,682,517	$33,502,315	$9,854,183	$16,434,425	$7,927,692
Cedar	West	Cable	$4,780,460	$2,217,674	$731,334	$1,096,490	$240,619	$421,337
		Shovel	$12,274,057	$1,838,704	$3,108,449	$3,365,827	$937,618	$1,030,368
	East	Cable	$6,182,444	$1,509,172	$193,034	$376,616	$260,960	$281,271
		Shovel	$19,027,396	$9,400,048	$1,108,813	$3,185,126	$2,071,064	$710

FIGURE 91

Gross Sales Revenues Discounted to DOV

Sub-Groups			Key Value Indicator					
Number of Years Discounted:			10			20		
Age (Year 0):			50 - 59 Years			40 - 49 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	$54,274,878	$37,802,449	$5,671,901	$26,968,720	$17,522,300	$6,574,443
		Shovel	$162,920,874	$52,784,123	$6,545,838	$172,515,363	$34,909,817	$7,039,132
	East	Cable	$12,099,684	$7,591,734	$4,403,963	$3,294,211	$2,927,811	$1,320,766
		Shovel	$37,602,977	$21,352,401	$7,954,120	$10,642,266	$7,917,424	$2,746,150
Hardwood	West	Cable	$7,057,970	$4,207,073	$1,680,776	$4,983,583	$1,316,350	$636,555
		Shovel	$16,124,097	$9,856,223	$4,884,489	$17,161,794	$5,810,293	$4,916,815
	East	Cable	$0	$0	$0	$5,617	$17,526	$0
		Shovel	$12,427	$367	$0	$182,019	$143,541	$0
Whitewood	West	Cable	$25,570,153	$13,047,999	$6,839,456	$13,304,080	$5,469,013	$4,585,046
		Shovel	$75,950,437	$22,563,426	$7,124,291	$52,537,806	$15,737,872	$5,064,615
	East	Cable	$658,348	$3,151,699	$1,273,220	$322,673	$874,220	$492,392
		Shovel	$12,765,384	$20,052,759	$6,183,321	$7,346,641	$12,051,430	$2,965,182
Cedar	West	Cable	$734,711	$204,719	$187,559	$30,666	$21,992	$83,803
		Shovel	$1,308,147	$2,075,687	$1,187,047	$3,474,621	$331,406	$312,517
	East	Cable	$850,016	$606,000	$4,150	$100,699	$48,326	$0
		Shovel	$3,945,603	$1,325,950	$405,465	$1,389,070	$1,291,772	$0

FIGURE 92

Gross Sales Revenues Discounted to DOV

Sub-Groups			Key Value Indicator					
Number of Years Discounted:			30			40		
Age (Year 0):			30 - 39 Years			20 - 29 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	$21,552,028	$4,219,406	$2,028,331	$7,656,774	$1,083,560	$285,789
		Shovel	$152,616,478	$21,079,106	$5,246,562	$47,685,184	$3,878,004	$1,209,769
	East	Cable	$687,308	$928,468	$281,486	$78,663	$208,128	$127,295
		Shovel	$2,205,510	$1,066,724	$424,295	$341,621	$529,201	$237,350
Hardwood	West	Cable	$1,881,222	$560,798	$339,149	$857,870	$215,030	$11,304
		Shovel	$13,176,904	$2,062,606	$1,583,309	$7,391,096	$1,680,162	$138,252
	East	Cable	$33,075	$7,593	$1,658	$19,311	$22,001	$0
		Shovel	$54,183	$37,383	$0	$6,432	$1,351	$0
Whitewood	West	Cable	$5,237,946	$1,418,416	$927,137	$638,734	$142,497	$214,272
		Shovel	$41,569,860	$3,513,355	$1,446,553	$9,374,585	$301,091	$350,783
	East	Cable	$58,184	$359,028	$183,984	$81,137	$142,501	$90,553
		Shovel	$1,354,199	$1,559,691	$864,954	$353,361	$423,119	$140,841
Cedar	West	Cable	$100,539	$24,049	$71,993	$41,560	$0	$0
		Shovel	$2,339,275	$138,794	$180,514	$1,249,212	$18,641	$82,823
	East	Cable	$630	$19,237	$0	$0	$13,373	$5,157
		Shovel	$377,272	$275,244	$0	$24,367	$21,429	$52,058

FIGURE 93

Gross Sales Revenues Discounted to DOV

Sub-Groups			Key Value Indicator					
Number of Years Discounted:			50			60		
Age (Year 0):			10 - 19 Years			0 - 9 Years		
Site Class:			I & II	III	IV & V	I & II	III	IV & V
Douglas Fir	West	Cable	$5,683,864	$1,491,609	$239,603	$7,827,899	$2,901,680	$659,623
		Shovel	$29,680,985	$7,160,347	$1,097,882	$40,786,721	$8,854,613	$1,729,557
	East	Cable	$52,688	$251,950	$23,104	$194,673	$366,297	$168,522
		Shovel	$750,107	$320,906	$104,548	$1,268,880	$2,815,736	$784,999
Hardwood	West	Cable	$1,160,173	$406,001	$130,187	$689,094	$274,503	$150,647
		Shovel	$5,589,899	$1,950,175	$476,836	$2,029,554	$1,252,918	$291,240
	East	Cable	$0	$0	$0	$0	$118	$0
		Shovel	$0	$0	$0	$0	$461	$0
Whitewood	West	Cable	$459,302	$638,341	$85,229	$1,158,612	$1,042,703	$673,513
		Shovel	$3,419,871	$2,328,407	$410,037	$7,840,522	$5,061,595	$1,252,176
	East	Cable	$70,134	$42,304	$22,587	$17,142	$93,180	$22,797
		Shovel	$894,532	$199,499	$76,269	$408,270	$1,011,455	$379,084
Cedar	West	Cable	$56,027	$14,169	$28,449	$210,685	$12,911	$23
		Shovel	$860,719	$294,243	$338,240	$351,817	$82,852	$174,562
	East	Cable	$20,467	$3,938	$0	$99,887	$57,374	$650
		Shovel	$100,044	$29,816	$0	$357,358	$36,184	$43,120

Timber Revenue – Eastern Washington Adjustment

Based on the previous analysis and discussions with the Trust Manager, it became apparent that the lower timber volume yield, poorer soil conditions, and longer travel distance to log markets associated with timber from the East region all lower the financial feasibility for commercial harvest of such lands. Moreover, in eastern Washington, restoration by artificial regeneration overall experiences higher seedling mortality once planted post-harvest than on corresponding lands in western Washington. As a result, most often the timber is harvested to leave sufficient commercial tree species to comply with the natural regeneration standards of WAC 224-34-020. The analyst team includes a forester who has indicated that this "leave tree" volume comprises approximately 20 percent of the average merchantable volume per acre on lands in the East region projected for near-term harvest. A related impact is a decrease in harvesting efficiency due to the need to identify and operate around these leave trees. The lesser need to artificially replant is a partial value offset. In this analysis, therefore, the Timber Asset Class in the East region includes a 20 percent value reduction adjustment for the indicated volume set aside.

The total values (rounded) for timber resources (commodity) are as follows:

FIGURE 94

Timber Resources (Commodity) - Whole Property Value Method			
		West	East
NPV of Gross Sales Revenue		$2,723,000,000	$942,000,000
Natural Regrowth Discount (East Side)	20%	$0	($188,400,000)
Timber Resources Value (Rounded)		$2,723,000,000	$754,000,000
$/Net Acre		$3,947	$1,370
Combined Timber Resources Value (Commodity)		**$3,477,000,000**	
$/Net Acre		**$2,804**	

TIMBERLAND RESOURCES VALUATION – WPV

Prices per Acre – Timberland Resources (Bare Land)

For the purposes of this valuation analysis, acres of trust-owned timberland have been segregated into different groupings that indicate underlying land value. Timberlands have been separated by soil productivity (i.e., site class), topography (i.e., Cable and Shovel), and region (i.e., East and West). Topography is determined by the percentage slope of the land. Acres of timberland with terrain greater than 35 percent slope are classified as Cable. Timberlands with terrain less than or equal to 35 percent slope are classified as Shovel.

As introduced in the methodology section, land value conclusions for timberland on a per acre basis were based on two considerations:

1. Analysis of allocated land value
2. DCF analysis of bare land value

Analysis of Allocated Land Value

Timberland value conclusions were partially based on actual transactions utilized as comparables in independent appraisals obtained in the ordinary course of management of assets and properties, along with additional transactions provided from market participants.

The timber value is estimated and deducted from a transaction's overall sales price, and the remainder price is attributed to the underlying timberland. While different transactions contain property-specific influencers that affect the sales price, they provide a general range of prices to be expected per acre of timberland. The bottom end of the range includes prices for steeper land with inferior soil productivity, while the upper end of the range includes prices for less steep land with superior soil productivity.

Just as the majority of state-owned timberlands lie on the western side of the Cascade mountain range (roughly 66 percent of gross acres), the majority of timberland transactions occur in the West region. Multiple sales transactions of timberlands located in the West region have been compiled for the period from January 2015 to July 2018. The total acreage of the transactions ranged between 50 acres to 3,800 acres, and the average transaction was approximately 550 acres. The transactions contain a wide range of implied values for the underlying land in the West region, ranging from $350 for low soil productivity and high-sloped terrain to $1,650 per acre for high soil productivity and low-sloped terrain. The implied prices per acre are shown below.

FIGURE 95

Allocated Land Value - Price per Acre

	Site Class:	I & II	III	IV & V
West	Cable	$850	$600	$350
	Shovel	$1,650	$1,200	$750

DCF Analysis of Bare Land Value

A bare land value analysis is also performed as an additional consideration when concluding to land values on a per acre basis. The bare land value calculations are utilized as a secondary approach to make price per acre conclusions for the West region, and they are the only consideration referenced for price per acre conclusions made for the East region.

Specifically, the DCF method is used to calculate the residual value of theoretical land purchased with the intent to plant, grow, and sell commercial timber. Typical silviculture and management costs were surveyed and provided by the Trust Manager and applied as appropriate over the holding period of the DCF. The expected sales revenue in the targeted year of harvest is calculated by multiplying the projected volume level by the concluded stumpage price. The growth rates utilized for volume growth align with the growth multiples concluded to in the valuation of timber resources. Cash flows are discounted back to a net present value representative of how much a buyer would be willing to pay for the land.

DCF for Bare Land Value

The DCF method was used to calculate the bare land value for a theoretical purchase of 1,000 acres of timberland in both the West and East regions, assuming the highest and best use of the land is to produce and sell timber for harvest. The future revenue and expenses applicable to the sites are discounted back to the present using a real discount rate.

A sensitivity analysis was performed to compare the use of the following assumptions applied to the DCF.

- Land Size Acquired: *1,000 acres*
- Species Type Intended to Grow: *Douglas Fir*
- Site Class: *I and II, III, and IV and V*
- Topography: *30 percent Cable and 70 percent Shovel*
- Harvest Year Targeted: *Sensitivity for year 40 and year 65*
- Current Stumpage Price per MBF for DCF: *Ranges from $180 for East Region land with Site Classes IV or V to $385 for West Region land with Site Classes I or II based on average stumpage prices calculated for timber 40 years old and older.*
- Stumpage Price Growth Rate: *0 percent annually*
- Discount Rate: *Sensitivity from 3 percent to 7 percent*
- Expense Growth Rate: *0 percent annually*

Gross Sales Revenue

Estimated revenue was based on anticipated stumpage prices per MBF multiplied by the projected volume level in MBF that can be sold at the targeted year of harvest. The same growth rates for volume growth estimated in valuing prior timber resources are utilized in the bare land value calculations.

Expenses

Expenses are made up of different planting and silviculture costs required to plant and grow timber. Expense costs have been applied to different years in the holding period that are most typical and appropriately based.

The following table presents the estimated costs on a per acre basis sourced from median silviculture activity costs as surveyed and provided by the Trust Manager. Research indicates that certain expenses will likely not be applied to every acre where timber is grown. It is typical for ground release and precommercial thinning activities to be applied to 20 percent and 30 percent of the total acreage, respectively.

Additionally, conversations with market participants have suggested that the costs for ground site preparation and ground release herbicide application should be weighted as 80 percent of surveyed aerial costs and 20 percent of ground costs. The reported expenses in the following table reflect the weighted amounts.

FIGURE 96

Silviculture Activity	Expense ($/Acre)	% of Total Area	Year of Term Forecasted
Ground Site Preparation	$80	100%	Year 0
Seedling Cost	$200	100%	Year 0
Planting Labor	$115	100%	Year 0
Ground Release Herbicide Application	$80	20%	Year 3
Pest Management	$18.75	100%	Year 0
Hand Release (Slashing)	$100	100%	Year 5
Pre-commercial Thinning	$150	30%	Year 15

Discount Rate

The annual Pacific Northwest Timberland Investment Survey (as of March 2019) by Sizemore and Sizemore, Inc. reports discount rates (or "rates of return") for the industry are within an average range of 4.8 percent to 8.0 percent, with central tendencies between 5.0 percent and 5.6 percent. As such, a discount rate of 5 percent is deemed appropriate as the center for the sensitivity analysis. The nature of timber investments involves long holding periods with the majority of revenue being received at the end of the holding period; thus, the DCF calculations are significantly sensitive to the discount rate used in the calculation. A sensitivity analysis that displays the land value when using discount rates of 3 percent, 5 percent, and 7 percent is provided.

Net Present Value

Revenue and expenses are discounted back to the present using a selected discount rate that results in a net present value (NPV) that represents the amount a potential buyer would be willing to pay for the land. The following table shows the sensitivity analysis for bare land values using a central discount rate (DR) of 5 percent and a 200 basis-point spread above and below the central rate. The results of the sensitivity analysis are displayed for illustrative purposes.

FIGURE 97

Species	Site Class	Region	Hold Period (Years)	DR	ASPGR*	NPV/acre	DR	ASPGR	NPV/acre	DR	ASPGR	NPV/acre
DF	I & II	West	40	3%	0.00%	$1,697.19	5%	0.00%	$510.69	7%	0.00%	($26.30)
DF	I & II	West	65	3%	0.00%	$1,646.33	5%	0.00%	$99.81	7%	0.00%	($330.39)
DF	III	West	40	3%	0.00%	$1,064.42	5%	0.00%	$217.49	7%	0.00%	($164.14)
DF	III	West	65	3%	0.00%	$1,059.93	5%	0.00%	($68.19)	7%	0.00%	($379.67)
DF	IV & V	West	40	3%	0.00%	$281.00	5%	0.00%	($145.51)	7%	0.00%	($334.80)
DF	IV & V	West	65	3%	0.00%	$342.76	5%	0.00%	($273.65)	7%	0.00%	($439.94)
DF	I & II	East	40	3%	0.00%	$91.50	5%	0.00%	($233.32)	7%	0.00%	($376.08)
DF	I & II	East	65	3%	0.00%	$77.08	5%	0.00%	($349.77)	7%	0.00%	($462.26)
DF	III	East	40	3%	0.00%	($59.80)	5%	0.00%	($303.43)	7%	0.00%	($409.04)
DF	III	East	65	3%	0.00%	($61.15)	5%	0.00%	($389.37)	7%	0.00%	($473.88)
DF	IV & V	East	40	3%	0.00%	($263.25)	5%	0.00%	($397.70)	7%	0.00%	($453.36)
DF	IV & V	East	65	3%	0.00%	($247.06)	5%	0.00%	($442.63)	7%	0.00%	($489.50)

*ASPGR = Annual Stumpage Price Growth Rate

The calculations returned significant differences in value when the discount rate is toggled. For example, if a stand of Douglas Fir timber grew for 40 years on a plot of land in the West with a Site Class of III, the analysis suggests the plot of land is worth nearly $218 per acre if the future revenue received once the timber is sold 40 years from now is discounted back with a 5 percent rate of return. However, if a 7 percent discount rate is used, the analysis returns a negative NPV of -$164 per acre, suggesting the investment would not break even and purchasing the land would not be financially feasible. However, if a rate of return of 3 percent is used, the analysis returns an NPV of $1,064 per acre, which is nearly $850 per acre higher than if a discount rate of 5 percent is used. The results of the sensitivity analysis demonstrate the significant impact the discount rate can have on timber projections.

Overall, the NPV of bare land ranges from approximately -$490 to $1,697 per acre, depending on the inputs. The very low end of the range represents the value of East region land with a Site Class of IV or V, assuming a 65-year hold and a 7 percent discount rate. The very high end of the range represents the value of West region land with a Site Class of I or II, assuming a 40-year hold and a 3 percent discount rate.

Conversations with market participants confirm that, realistically, a potential buyer in the private sector would target more than a 3 percent rate of return, probably closer to a 5 percent rate of return. The bare land value sensitivity shows that land in the West ranges from -$274 to $511 depending on the site class and holding term. The sensitivity analysis suggests that it would not be profitable to purchase land in the East region if targeting a 5 percent rate of return as all NPVs return negative.

Focusing on the center of the sensitivity analysis with a targeted rate of return of at least 5 percent, the following implied prices per acre for bare land were estimated.

FIGURE 98

Bare Land Value - Price per Acre

Site Class:		I & II	III	IV & V
West	Cable	$500	$250	$50
	Shovel	$700	$350	$100
East	Cable	$50	$25	$10
	Shovel	$100	$50	$25

It is noted that while the sensitivity analysis resulted in primarily negative bare land values for the East region, discussions with market participants acknowledge these results are common, but buyers and seller will typically attribute a nominal value to the bare land. This appears to be reasonable given a competent seller would not give away the land for free. The analysis confirms that timber productivity is very low in the East region.

Reconciliation of Considerations

Final price per acre value for timberland resources (i.e., bare land) were concluded to by reconciling the two different considerations detailed earlier.

For price per acre conclusions for land in the West region, primary weight was placed on the allocated land values resulting from actual transactions of timberland located in western Washington. Secondary weight was placed on the bare land value calculations for the West region. For final price per acre conclusions for land in the East region, the only estimates considered were those resulting from the bare land value calculations.

The following table shows the final land value conclusions resulting from reconciling the two different considerations. Note that zero value has been attributed to trust lands that are not harvestable.

FIGURE 99

Concluded Price per Acre (Harvestable Acres)

Site Class:		I & II	III	IV & V
West	Cable	$780	$530	$290
	Shovel	$1,460	$1,030	$620
East	Cable	$50	$25	$10
	Shovel	$100	$50	$25

Total Net Harvestable Area in Acres – Timberland Resources

Net harvestable acres of timberland have been grouped together based on the same indicators mentioned earlier.

Eastern Washington Klickitat Adjustment. As described earlier, approximately 13,000 net harvestable acres that technically fall in eastern Washington have been recategorized as lands in the western Washington region. The lands are in Klickitat County and owned by the State Forest Transfer Trust. These high-density lands experience favorable growing conditions similar to the West region as the lower Cascades allow precipitation to reach further east.

The adjusted net acreage for each subgrouping is highlighted below:

FIGURE 100

Total Net Harvestable Acres

Site Class:		I & II	III	IV & V	**Total**
West	Cable	99,896	49,961	32,180	**182,036**
	Shovel	369,747	100,023	38,046	**507,816**
East	Cable	26,096	71,440	61,181	**158,717**
	Shovel	91,232	182,670	117,691	**391,593**
Total:		**586,971**	**404,093**	**249,098**	**1,240,163**

Total Indicated Value – Timberland Resources

Total indicated values for timberland resources (i.e., bare land) have been calculated by multiplying the concluded prices per acre by the total acreage for each subgrouping. This results in an indicated value of zero for non-harvestable acres. The indicated values for harvestable acres are shown in the table below:

FIGURE 101

Total Indicated Value (Price per Acre X Quantity of Area in Acres)

	Site Class:	I & II	III	IV & V	Total
West	Cable	$77,918,851	$26,479,205	$9,332,094	**$113,730,150**
	Shovel	$539,830,765	$103,023,218	$23,588,771	**$666,442,754**
East	Cable	$1,304,804	$1,785,999	$611,809	**$3,702,612**
	Shovel	$9,123,196	$9,133,509	$2,942,280	**$21,198,985**
	Total:	**$628,177,617**	**$140,421,931**	**$36,474,953**	**$805,074,501**

The total value indications (rounded) for the bare land owned by the trusts are as follows:

FIGURE 102

Timberland Resources (Bare Land) - Whole Property Value Method		
Resource Type	**Value (Rounded)**	**$/Net Acre**
Timberland Resources - West	$780,000,000	$1,131
Timberland Resources - East	$25,000,000	$45
Combined Timberland Resources (Bare Land)	**$805,000,000**	**$649**

TIMBER ASSET CLASS TRUST VALUE SUMMARY – WHOLE PROPERTY VALUE METHOD

Lump-Sum Adjustment. The ideal analysis would have been to locate large transactions that have similar geographical locations, physical attributes, and timber characteristics as the subject property. However, large sales transactions similar to the subject are rare, and they often involve elements of enterprise (i.e., business) value that contribute to the overall value of the transactions. These elements include plant, property, and equipment; assembled work force; customer relationships; monetary assets; and liabilities that limit a direct comparison to the subject.

In this analysis, the pricing for the timber resources is based on a public auction, which provides a right to harvest the timber for a limited period of time, which is typically two years. Further, the pricing reflects the financial benefit of only requiring a very small down payment for transaction costs, with the final payment deferred until the time the timber is harvested. As a result, the pricing for a real estate holding as large as the Timber Asset Class would be lower given all of the timber volume could not be harvested in such a short period of time and would require full payment.

It is helpful to keep in mind that the pricing used in the analysis is much like a retail price as it reflects sales of small amounts to be consumed quickly. The timber sale transactions are used as a point of reference, but the analyst recognizes the difficulty in applying these to the entire population. Specifically, the data for the timber sale transactions involve stands that typically range from 100 acres to 200 acres, but the net trust land population is 1.24 million acres. This is approximately a ratio of 1 to 8,267, which is a large difference. This adjustment is subjective. However, it's not uncommon to see large discounts when real estate is sold in a quick sale liquidation; these types of discounts can easily be in the range of 20 to 40 percent. Similar discounts are observed when market participants purchase large portfolios of real estate such as during the post-recession sales of bank owned residential home portfolios.

As a result, an additional adjustment is needed to account for the size, risk, time value of money, and other factors associated with this asset class. As such, a lump-sum adjustment has been estimated and applied to the preliminary value indication to account for the economic and physical differences between the valuation data and the total combined characteristics of the timber resources contained in the Timber Asset Class.

Lastly, this approach is not performed in isolation. The income approach is also used, and the final overall value is then compared to large reported transactions as a test of reasonableness.

The following table highlights the final adjustment and value indication conclusion for the Timber Asset Class using the WPV Method.

FIGURE 103

Timber Asset Class Trust Value Summary - Whole Property Value Method			
	Timber Resources	Timberland Resources	Combined Total
West Value (Rounded)	$2,723,000,000	$780,000,000	**$3,503,000,000**
$/Net Acre	$3,947	$1,131	**$5,078**
East Value (Rounded)	$754,000,000	$25,000,000	**$779,000,000**
$/Net Acre	$1,370	$45	**$1,415**
Total Value Indications	**$3,477,000,000**	**$805,000,000**	**$4,282,000,000**
$/Net Acre	**$2,804**	**$649**	**$3,453**
Lump Sum Adjustment @ 40%			
West	($1,089,200,000)	($312,000,000)	($1,401,200,000)
East	($301,600,000)	($10,000,000)	($311,600,000)
Total	**($1,390,800,000)**	**($322,000,000)**	**($1,712,800,000)**
West Value Conclusion	$1,633,800,000	$468,000,000	**$2,101,800,000**
$/Net Acre	$2,368	$678	**$3,046**
East Value Conclusion	$452,400,000	$15,000,000	**$467,400,000**
$/Net Acre	$822	$27	**$849**
WPV Trust Value Conclusion	**$2,086,200,000**	**$483,000,000**	**$2,569,200,000**
$/Net Acre	**$1,682**	**$389**	**$2,071**

INDIVIDUAL TRUST VALUE SUMMARY – WPV

The table below highlights the trust values for each individual trust. Specifically, the trust value concluded to using the WPV method is allocated to each individual trust based on the quantities of timber and timberland resources owned by each trust. Note that the State Forest Trust Lands in Klickitat County have been recognized under western totals. The table below displays the net harvestable volume and acreage totals for each trust. This allocation is used later in the final reconciliation.

FIGURE 104

Individual Trust Volume & Acre Quantities						
Trust	Net Harvestable Volume (MBF)			Net Harvestable Acres		
	West	East	Total	West	East	Total
Common School and Indemnity	4,006,239	4,451,033	**8,457,272**	237,891	462,310	**700,201**
State Forest Transfer	4,832,750	15,546	**4,848,296**	279,421	589	**280,010**
Capitol Grant	807,840	91,970	**899,810**	38,527	10,619	**49,146**
State Forest Purchase	753,270	1,305	**754,575**	44,660	59	**44,720**
Scientific School	510,058	112,516	**622,574**	26,402	9,646	**36,048**
Normal School	242,866	221,949	**464,816**	13,483	18,442	**31,926**
Agricultural School	235,886	225,105	**460,991**	12,856	23,153	**36,009**
CEP & RI	283,740	110,117	**393,857**	16,987	10,888	**27,875**
University Transferred	272,630	137,851	**410,481**	14,586	12,745	**27,330**
Escheat	32,934	8,568	**41,502**	2,011	1,329	**3,340**
University Original	31,759	2,300	**34,060**	2,042	530	**2,572**
Community College Forest Reserve	15,945	0	**15,945**	986	0	**986**
CEP & RI Transferred	0	0	**0**	0	0	**0**
Total	**12,025,916**	**5,378,261**	**17,404,178**	**689,852**	**550,310**	**1,240,163**

The following table shows the allocated trust values for each individual trust by volume and acreage.

FIGURE 105

Individual Trusts - Timber & Timberland Resources Values - Whole Property Value Method						
Trust	Timber Resources Values			Timberland Values		
	West	East	Total	West	East	Total
Common School and Indemnity	$544,273,977	$374,404,867	**$918,678,844**	$161,386,476	$12,601,351	**$173,987,827**
State Forest Transfer	$656,560,873	$1,307,714	**$657,868,587**	$189,561,085	$16,049	**$189,577,133**
Capitol Grant	$109,750,446	$7,736,185	**$117,486,631**	$26,136,859	$289,448	**$26,426,307**
State Forest Purchase	$102,336,689	$109,813	**$102,446,502**	$30,297,890	$1,616	**$30,299,506**
Scientific School	$69,294,720	$9,464,428	**$78,759,148**	$17,911,106	$262,928	**$18,174,034**
Normal School	$32,994,979	$18,669,582	**$51,664,561**	$9,146,970	$502,693	**$9,649,663**
Agricultural School	$32,046,684	$18,935,005	**$50,981,689**	$8,721,649	$631,094	**$9,352,743**
CEP & RI	$38,547,917	$9,262,640	**$47,810,557**	$11,524,330	$296,766	**$11,821,096**
University Transferred	$37,038,558	$11,595,537	**$48,634,095**	$9,894,938	$347,382	**$10,242,320**
Escheat	$4,474,247	$720,728	**$5,194,974**	$1,364,448	$36,216	**$1,400,664**
University Original	$4,314,708	$193,502	**$4,508,209**	$1,385,326	$14,457	**$1,399,783**
Community College Forest Reserve	$2,166,202	$0	**$2,166,202**	$668,922	$0	**$668,922**
CEP & RI Transferred	$0	$0	**$0**	$0	$0	**$0**
Total	**$1,633,800,000**	**$452,400,000**	**$2,086,200,000**	**$468,000,000**	**$15,000,000**	**$483,000,000**

The next table highlights the total trust values for each trust by East and West region, along with their corresponding percentage allocations.

FIGURE 106

Individual Trust Values - Whole Property Value Method				
Trust	Total Trust Value Resources			
	West	East	Total	%
Common School and Indemnity	$705,660,453	$387,006,219	**$1,092,666,671**	**42.53%**
State Forest Transfer	$846,121,958	$1,323,763	**$847,445,720**	**32.98%**
Capitol Grant	$135,887,306	$8,025,632	**$143,912,938**	**5.60%**
State Forest Purchase	$132,634,579	$111,430	**$132,746,009**	**5.17%**
Scientific School	$87,205,826	$9,727,356	**$96,933,182**	**3.77%**
Normal School	$42,141,949	$19,172,275	**$61,314,224**	**2.39%**
Agricultural School	$40,768,333	$19,566,099	**$60,334,432**	**2.35%**
CEP & RI	$50,072,247	$9,559,406	**$59,631,653**	**2.32%**
University Transferred	$46,933,497	$11,942,919	**$58,876,415**	**2.29%**
Escheat	$5,838,695	$756,943	**$6,595,638**	**0.26%**
University Original	$5,700,034	$207,959	**$5,907,993**	**0.23%**
Community College Forest Reserve	$2,835,125	$0	**$2,835,125**	**0.11%**
CEP & RI Transferred	$0	$0	**$0**	**0.00%**
Total	**$2,101,800,000**	**$467,400,000**	**$2,569,200,000**	**100%**

Income Approach

The direct capitalization method is the primary method used to value the Timber Asset Class.

TIMBER ASSET CLASS VALUATION – IA

The IA, which utilizes the direct capitalization method, is the primary approach used to value the Timber Asset Class. In the direct capitalization method, a stabilized stream of revenue and expenses for the asset class must be determined in order to capitalize the net cash flows received into perpetuity. The stabilized stream of revenue is calculated by multiplying a determined sales revenue per MBF rate by an estimated volume in MBF to be typically purchased and removed for harvest.

Stabilized Sales Revenue per MBF

To determine the sales revenue per MBF rate, historical performance for the past 12 years was analyzed. Specifically, timber sales revenue between 2007 and 2018 was measured over volume removed for harvest (in MBF) in each fiscal year. Note that the sales revenue and removed volume amounts do not include revenue or volume from Forest Health and Forest Improvement sales.[26] The measured sales revenue per MBF ranged from $230 to $382 depending on the year. The average over the 12 fiscal years was approximately $315 per MBF.

Additionally, individual timber sales between 2015 and 2018 were compiled and analyzed. The average prorated revenue per MBF from sales containing timber older than 40 years was $360 per MBF. As a result, the concluded stabilized sales revenue per MBF amount was $340.

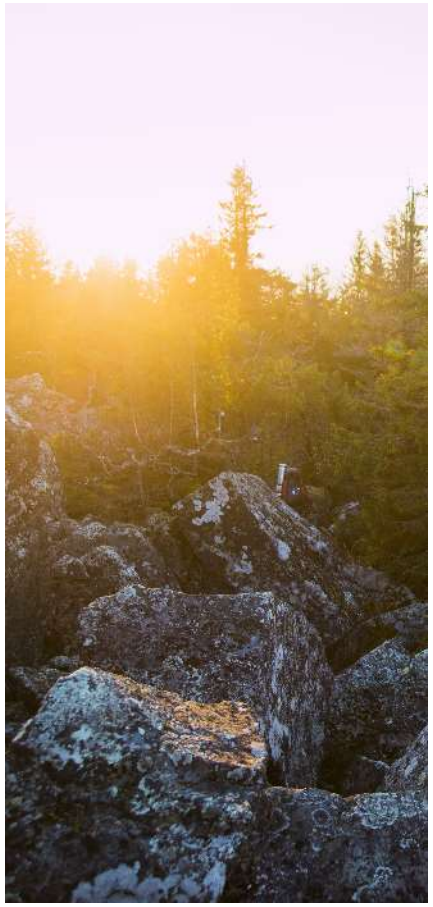
Stabilized Timber Volume Purchased and Removed in MBF

To determine a stabilized timber volume amount purchased and removed in MBF, both historical performance over the past 12 years as well as decadal projections of timber to harvest provided in sustainable yield forecasts from the Trust Manager were analyzed.

Net Acreage and Sustainable Harvest Model

Every 10 years, the Board of Natural Resources sets a level of timber harvest that the Trust Manager is required to target for sale. This process is called the sustainable harvest calculation and is required by statute and by department policy. Sustainable means harvesting timber "on a continuing basis without major prolonged curtailment or cessation of harvest."[27]

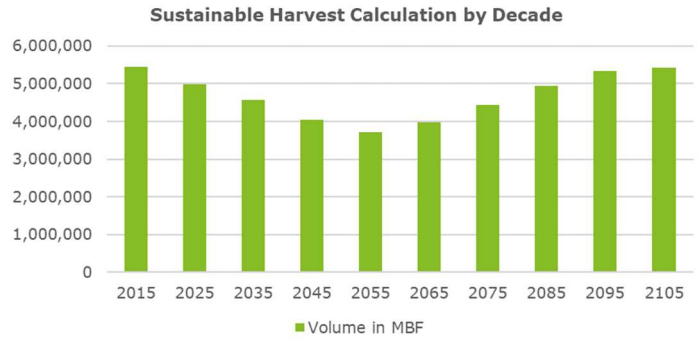
Sustainable harvest models help the department calculate the sustainable amount for each 10-year interval. The sustainable harvest level is expected to go up and down between calculations due to changes in the forest inventory, policies, and regulations.



[26] Forest Health and Forest Improvement Sales operate through legislatively designated revolving accounts that allow the department to capture all costs from the proceeds of the timber sale. The volume from these sales are not reflected in the Trust Manager's revenue system. This volume is reported separately to the legislature.
[27] (RCW 79.10.310)

The department's current planning decade for the sustainable harvest level on the Westside is 2015 through 2024, with the next planning decade from 2025 to 2034, and so on for the following planning decades. The following chart reveals the sustainable harvest level reported for each 10-year planning decade over the next century for trust lands.

FIGURE 107

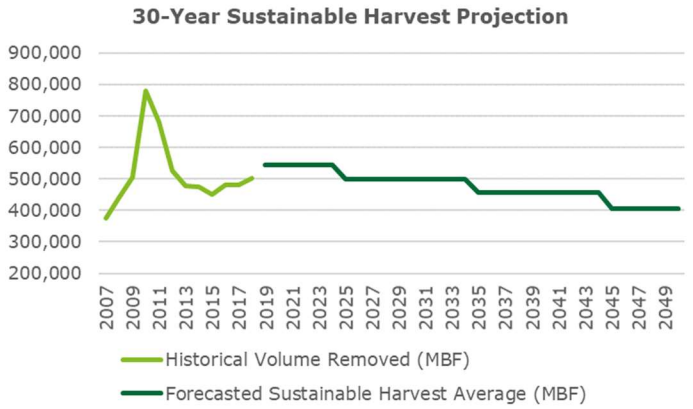


Anticipated Recession

Managing the growth for commercial timber is a cyclical process that spans many years. The amount of mature timber available for harvest is forecasted to decline over the next 40 years. The Trust Manager's sustainable harvest calculation for the decade between 2015 to 2024 is approximately 5,440,000[28] MBF, which implies an average annual amount of 544,000 MBF must be harvested over the decade to reach sustainability. This amount is projected to decrease to an annual average of approximately 498,000 MBF between 2025 to 2034 and so on until receding to an ultimate low annual average harvest of approximately 372,000 MBF starting in 2055. After this low, starting in 2065, the calculated volume of timber projected for sustainable harvest will begin to increase.[29]

Figure 108 presents reported historical volumes removed over the past 12 fiscal years, along with the average projected volumes to meet the decadal sustainable harvest calculations for the next 30 years for the entire state (both in western and eastern Washington).

FIGURE 108



The amount of purchased volume removed between 2007 and 2018 ranged from 374,506 MBF to 779,023 MBF per year, with an overall average of 514,474 MBF per year.

[28] This amount is based on the 2019 Board of Natural Resources Resolution setting the west side Sustainable Harvest Level at approximately 4,654,000 MBF for 2015-2024 and the 1996 Board of Natural Resources resolution still in effect setting the Sustainable Harvest Level for the east side of Washington at 786,000 MBF for each decade.
[29] These projected harvest levels are based on past board decisions and are subject to change.

The decadal sustainable harvest calculations are divided by 10 to show annual average harvest levels for each 10-year period. The averages display the continuing recession of mature timber available for harvest. The amounts over the next 30 years fall lower than the historical harvested average of 514,474 MBF, with 10-year averages dropping from 543,968 MBF per year to 404,040 MBF per year. The level annual equivalent over the next three decades is 501,180 MBF.

To account for the decline in the projected volume of harvested timber, this analysis determined that the annual volume to be purchased for harvest should be less than the historical average. The stabilized annual timber volume concluded to be purchased for harvest is 505,000 MBF.

Direct Capitalization

Gross timber sales revenue is calculated by multiplying the stabilized annual volume estimate (505,000 MBF) by the assumed sales revenue expected per MBF ($340).

Expenses are assumed to be 28 percent of the gross sales revenue and are paid to the Trust Manager for managing forest resources. This percentage was based on historical deductions averaging near this blended rate. Deducting the expense fee results in the trust net operating income being capitalized.

For the Timber Asset Class, the selected rate of return to capitalize the income is 6 percent. For further discussion regarding the determination of this capitalization rate, please refer to the earlier chapter of this report which discusses rates of return.

The income capitalized represents the combined value of both timber and timberland resources. The Timber Asset Class value concluded to using the IA is presented in the following table.

FIGURE 109

Direct Capitalization - Timber Asset Class		
Stabilized Volume Assumption (MBF)		505,000
Sales Revenue Assumption ($/MBF)		$340.00
Stabilized Gross Revenues		$171,700,000
Operating Cost % Deduction	28.00%	($48,076,000)
Revenue Distributed to Trusts		$123,624,000
Capitalization Rate		6.00%
Indicated Timber Asset Class Value		$2,060,400,000
Timber Asset Class Value (Rounded)		**$2,060,000,000**
Value per Net Harvestable Acre		**$1,661**

Common School and Indemnity Trust

A direct capitalization is also performed to determine the value attributable to the Common School and Indemnity Trust. This trust along with the State Forest Trust contain the majority ownership of this asset class. The total annual revenue for the trust is calculated using the same method as the Timber Asset Class; however, the stabilized volume assumption is lowered to the percentage of total annual purchased timber removed historically typical for this trust (i.e., approximately 33 percent of total volume removed).

The OCPD is changed to represent the true amount deducted for this trust beneficiary of 31 percent. The following table highlights the trust value for the Common School and Indemnity Trust concluded to using the IA.

FIGURE 110

Direct Capitalization - Common School & Indemnity Trust		
Stabilized Volume Assumption (MBF)		166,650
Sales Revenue Assumption ($/MBF)		$340.00
Stabilized Gross Revenues		$56,661,000
Operating Cost % Deduction	31.00%	($17,564,910)
Revenue Distributed to Trust		$39,096,090
Capitalization Rate		6.00%
Indicated Value		$651,601,500
Total Trust Value (Rounded)		**$651,600,000**
Value per Net Harvestable Acre		**$957**

As the majority of the net harvestable acreage (approximately 66 percent) owned by the Common School and Indemnity Trust lies in eastern Washington, an additional direct capitalization was included to show the value split between the East and West regions. The volume assumption of 166,650 MBF has also been split between the East and West regions based on average percentage splits of volume historically removed for this trust (i.e., approximately 72 percent for western Washington and 28 percent for eastern Washington).

For simplification, the sales revenue assumption has not been adjusted based on region, but the standard overall revenue assumption of $340 per MBF has been included. The following table displays the direct capitalization split between the East and West regions.

FIGURE 111

Direct Capitalization - Common School & Indemnity Trust (West vs. East)			
		West	East
Stabilized Volume Assumption (MBF)*		120,400	46,250
Sales Revenue Assumption ($/MBF)		$340.00	$340.00
Stabilized Gross Revenues (Allocated)		$40,936,000	$15,725,000
Operating Cost % Deduction	31.00%	($12,690,160)	($4,874,750)
Revenue Distributed to Trust		$28,245,840	$10,850,250
Capitalization Rate		6.00%	6.00%
Indicated Value		$470,764,000	$180,837,500
Net Harvestable Acres		237,891	462,310
Indicated Value per Net Harvestable Acre		$1,979	$391
Total Trust Value (Rounded)		**$470,800,000**	**$180,800,000**
Total Combined Trust Value (Rounded)		**$651,600,000**	
Combined Value per Net Harvestable Acre		**$957**	

*Volume Assumptions based on trust's historical percentage splits between West and East

State Forest Transfer Trust

An additional direct capitalization is performed to determine the value attributable to the State Forest Transfer Trust. This trust along with the Common School and Indemnity Trust contain the majority ownership of this asset class. The total annual revenue for the trust is calculated using the same method as the Timber Asset Class; however, the stabilized volume assumption is lowered to the percentage of total annual purchased timber removed historically typical for this trust (i.e., approximately 42 percent).

The OCPD is changed to represent the true amount deducted for this trust beneficiary of 25 percent. The following table highlights the trust value for the State Forest Transfer Trust concluded to using the IA.

FIGURE 112

Direct Capitalization - State Forest Transfer Trust		
Stabilized Volume Assumption (MBF)		212,100
Sales Revenue Assumption ($/MBF)		$340.00
Stabilized Gross Revenues		$72,114,000
Operating Cost % Deduction	25.00%	($18,028,500)
Revenue Distributed to Trust		$54,085,500
Capitalization Rate		6.00%
Indicated Value		$901,425,000
Total Trust Value (Rounded)		**$901,400,000**
Value per Net Harvestable Acre		**$3,220**

INDIVIDUAL TRUST VALUE SUMMARY – IA

The following table highlights the trust values for each individual trust. The following allocation is used in the final reconciliation. Specifically, the Common School and Indemnity Trust and State Forest Transfer Trust values (approximately $652 million and $901 million, respectively) have been deducted from the value of the Timber Asset Class concluded to using the IA ($2.06 billion). This results in a total of approximately $507 million to be allocated between the remaining smaller trusts.

The remaining value of $507 million has been allocated based on each remaining trust's historical average percentage of adjusted total removed volume. The total average removed volume level has been adjusted to exclude averages for the Common School and Indemnity Trust and State Forest Transfer Trust along with other miniscule amounts of trusts not in scope for this analysis.

Once the trust values are determined for each individual trust, they are further split between the East and West regions. This split is based on each individual trust's amount of volume and acreage harvestable in each region. This split has not been applied to the Common School and Indemnity Trust as independent direct capitalizations have already been utilized to obtain trust values by region for this trust. The following table displays the trust value for each trust along with the split amounts for the western and eastern Washington regions.

FIGURE 113

Individual Trust Values - Income Approach				
Trust	**Total Trust Value Resources**			
	West	**East**	**Total**	**%**
State Forest Transfer	$899,991,957	$1,408,043	**$901,400,000**	**43.76%**
Common School and Indemnity	$470,800,000	$180,800,000	**$651,600,000**	**31.63%**
Capitol Grant	$120,917,847	$7,141,522	**$128,059,369**	**6.22%**
Scientific School	$96,895,372	$10,808,174	**$107,703,546**	**5.23%**
Agricultural School	$43,839,093	$21,039,861	**$64,878,954**	**3.15%**
Charitable/Educational/Penal & Reformatory Institution	$49,741,593	$9,496,280	**$59,237,873**	**2.88%**
University Transferred	$39,621,523	$10,082,280	**$49,703,803**	**2.41%**
State Forest Purchase	$44,025,974	$36,987	**$44,062,961**	**2.14%**
Normal School	$30,263,273	$13,768,129	**$44,031,402**	**2.14%**
Community College Forest Reserve	$3,996,460	$0	**$3,996,460**	**0.19%**
Escheat	$2,600,534	$337,140	**$2,937,674**	**0.14%**
University Original	$2,303,904	$84,055	**$2,387,959**	**0.12%**
CEP & RI Transferred	$0	$0	**$0**	**0.00%**
Total	**$1,804,997,530**	**$255,002,470**	**$2,060,000,000**	**100%**

Reconciliation

The Income Approach has been given primary weight in the reconciliation.

TIMBER ASSET CLASS RECONCILED VALUE CONCLUSION

In reconciliation of the two approaches used to value the Timber Asset Class, primary weight was placed on the Income Approach as it directly encompasses the expected future benefits of the asset class under the existing limitations and restrictions discussed earlier. The table below highlights the reconciled value conclusion.

FIGURE 114

Timber Asset Class - Reconciliation	
Valuation Approach	**Value (Rounded)**
Gross Acres	2,056,510
Net Acres	1,240,163
Whole Property Value Method Conclusion	$2,569,200,000
Income Approach Conclusion	$2,060,000,000
Reconciled Timber Asset Class Trust Value (Rounded)	**$2,136,000,000**
Value / Gross Acre	**$1,039**
Value / Net Acre	**$1,722**

INDIVIDUAL TRUST RECONCILED VALUE SUMMARY

Reconciled trust values have been calculated for each trust by applying the reconciled weighting to the individual trust values allocated in the corresponding valuation approach. The following table reflects the reconciled values for each individual trust.

FIGURE 115

Individual Trust Values - Reconciled				
Trust	**Total Trust Value Resources**			
	West	**East**	**Total**	**%**
State Forest Transfer	$893,572,660	$1,376,796	**$894,949,456**	**41.89%**
Common School and Indemnity	$506,971,557	$208,907,901	**$715,879,458**	**33.51%**
Capitol Grant	$123,392,660	$7,177,152	**$130,569,811**	**6.11%**
Scientific School	$95,619,703	$10,504,106	**$106,123,809**	**4.97%**
Agricultural School	$43,459,272	$20,541,217	**$64,000,489**	**3.00%**
CEP & RI	$49,883,928	$9,379,008	**$59,262,936**	**2.77%**
State Forest Purchase	$57,424,019	$47,512	**$57,471,531**	**2.69%**
University Transferred	$40,794,158	$10,223,226	**$51,017,384**	**2.39%**
Normal School	$32,104,759	$14,384,371	**$46,489,130**	**2.18%**
Community College Forest Reserve	$3,829,379	$0	**$3,829,379**	**0.18%**
Escheat	$3,092,006	$394,776	**$3,486,782**	**0.16%**
University Original	$2,818,563	$101,272	**$2,919,835**	**0.14%**
CEP & RI Transferred	$0	$0	**$0**	**0.00%**
Total	**$1,852,962,664**	**$283,037,336**	**$2,136,000,000**	**100%**

REASONABLENESS CHECK

A check for reasonableness was conducted by comparing the final concluded value on a per acre basis against the transactions of large related assets and enterprises in the industry.

Overall, a list of nearly 70 transactions of mostly larger timber assets, properties, and enterprises was compiled and analyzed. The transactions occurred in the last 20 years and were located mostly in the United States and Canada. The number of timberland acres sold ranges from 300 acres to 650,000 acres, with overall transaction prices ranging from $163,000 to $8.4 billion.

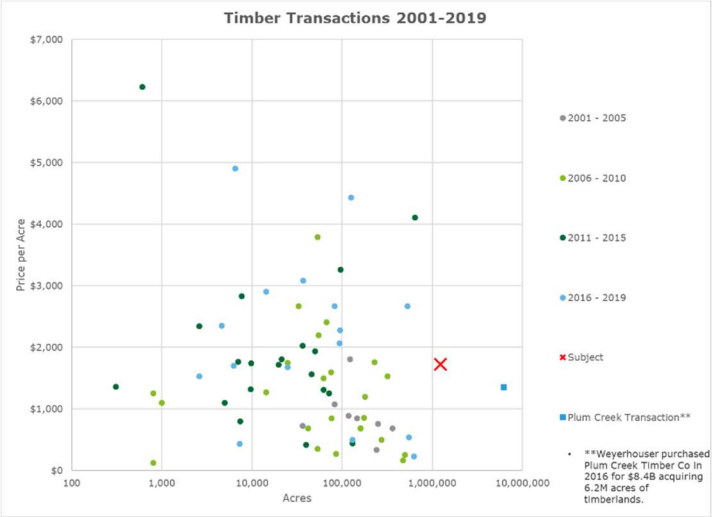
It is important to note that no adjustments have been made to the data. For example, some of the larger transactions involved an enterprise value that included businesses, buildings, equipment, recreational leased assets, and more. The potential impact of allocating or adjusting the price to the various components would have resulted in a lower value for the timberland portion.

One large transaction of recent note was the acquisition of Pope Resources by Rayonier Inc. In January of 2020, Rayonier Inc. announced that it entered into a definitive merger agreement wherein Rayonier will acquire Pope Resources for a value of $554 million. Pope Resources owns 125,000 acres of timberlands with the majority located in western Washington. The transaction represents a purchase price of $4,432 on a price per acre basis.[30]

Another large transaction of note is the acquisition of Plum Creek Timber Co. ("Plum Creek") in 2016 by Weyerhaeuser. Seattle-based Plum Creek owned approximately 6.2 million acres of timberlands located over 19 states at the time of purchase. Weyerhaeuser ultimately paid $8.4 billion to acquire Plum Creek. This equates to approximately $1,355 paid per acre of timberland acquired.[31]

The following chart displays the compiled list of large transactions. Specifically, the independent variable (x-axis) represents the total number of acres purchased and the dependent variable (y-axis) represents the price per acre paid.

FIGURE 116



Note: Red "X" indicates the value conclusion per net acre for the Timber Asset Class.

As shown above, the final value conclusion of $1,722 per net harvestable acre appears reasonable. While the subject and the Plum Creek transactions contain much larger amounts of acres than the rest of the transactions, the x-axis has been adjusted to be a logarithmic scale for presentation purposes.

[30] Rayonier to Acquire Pope Resources. (2020, January 15). Retrieved from https://www.businesswire.com/news/home/20200115005365/en/Rayonier-Acquire-Pope-Resources
[31] Monk, B. (2015, November 9). Weyerhaeuser, Plum Creek merge in $8.4 billion deal. Retrieved from https://www.bizjournals.com/seattle/blog/2015/11/weyerhaeuser-plum-creek-merge-to-form-one-of-the.html