

# **Analysis of the Department of Natural Resources' Sustainable Harvest Alternatives: Impacts on Employment, Wages, Business Taxes, and Timber Harvest and Excise Tax Revenues.**

Report to: Clallam County  
Port of Port Angeles

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## Executive Summary

Olympus Consulting has been retained jointly by Clallam County and the Port of Port Angeles to analyze the impacts of the Washington Department of Natural Resources' Draft Environmental Impact Statement (DEIS), *Alternatives for Establishment of a Sustainable Harvest Level*. Two questions associated with each alternative are addressed: What are the revenue implications to junior taxing districts; what are the economic impacts in terms of employment, average wages and annual business taxes?

Using data from multiple sources - including DNR annual reports, Washington State Department of Revenue timber harvest statistics, employment and wage data from the US Bureau of Labor Statistics and the software package IMPLAN - relationships were established between timber harvest and direct employment in Commercial Logging, Forestry, and Wood Products Manufacturing (i.e. Sawmilling). A given harvest level results in employment and wages that, in turn, create indirect and induced employment in the supply chain and elsewhere in the countywide economy with wages and business taxes that can be quantified. Separately, the same harvest volume can be used to estimate both the portion originating from Clallam County Forest Board Transfer and Purchase Lands (FBTPL) and the countywide harvest on all lands, public and private. Applying the historic average stumpage rate to these volumes results in direct harvest revenues remitted to Clallam County from the sales of FBTPL timber, and the excise taxes from all sales within the county. Harvest revenues and taxes are apportioned to junior taxing districts (JTD) using extant millage rates and are reported in aggregate by institutional category (e.g. schools, hospitals, libraries, and fire districts). Looking forward with respect to each alternative's annual harvest volume over ten years (Appendix G in the DEIS), we expect 29% of the volume harvested from the OESF and in Clallam, Jefferson, and Mason counties to originate from Clallam County FBTPL. Subtracting the mean harvest on Clallam FBTPL for the period 2006 through 2013 - 28.63 MMBF - from the expected volume from Clallam FBTPL by alternative yields its net harvest volume, which can support new economic activity.

Our models suggest that every 20 MMBF harvested on the Olympic Peninsula supports 24 FTE in Clallam County: 1 FTE in Forestry; 10 FTE in Commercial Logging; 13 FTE in Sawmilling. The table below summarizes wages, annual business taxes, and timber revenues to Clallam County by alternative and relative to the alternative with the greatest economic return. The categorical revenue for each alternative is the net present value (NPV) of 10 years cash flow discounted at DNR's rate of 2 percent. Alternative 2' - an even-flow version of Alternative 2 - provides the largest net increase in employment - 31.1 FTE - and economic return: total wages of \$16,715,319; total annual business taxes of \$1,656,676; total harvest revenues and excise taxes of \$38,707,989; a grand total of \$57,079,983. All other alternatives produce a smaller net increase in wages, annual business taxes, and timber revenues. The negative values in the table represent the cost to Clallam County of selecting alternatives 2, 3, 4, 5, or 1. Thus, Clallam County would forego \$32,334,905 in total economic benefits under Alternative 1 that it would otherwise receive under Alternative 2'.

Total product<sup>a</sup> of preferred alternative and relative cost of competing alternatives, by category.

Alternative	Total Wages <sup>b</sup>	Total Business <sup>c</sup>	Total Timber <sup>d</sup>	Total
2'	\$ 16,715,319	\$ 1,656,676	\$ 38,707,989	\$ 57,079,983
2	\$ -65,553	\$ -6,395	\$ -322,858	\$ -394,876
3	\$ -4,683,660	\$ -464,017	\$ -7,146,505	\$ -11,899,306
4	\$ -5,129,527	\$ -508,932	\$ -8,055,654	\$ -13,299,236
5	\$ -6,897,972	\$ -683,303	\$ -10,394,877	\$ -17,581,276
1	\$ -12,636,687	\$ -1,252,304	\$ -18,840,790	\$ -32,334,905

a: Present value of 10-year cash flow discounted at DNR's rate of 0.02.

b: Annual Direct, indirect, and induced wages in Clallam County projected by IMPLAN.

c: Local and state business taxes projected by IMPLAN to be associated with direct, indirect, and induced employment and wages.

d: Includes timber harvest revenues from Clallam County FBTPLs, and excise taxes from all (public + private) timber harvested in county.

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## Introduction

The Department of Natural Resources' (DNR) *Policy for Sustainable Forests* (December 2006) described the conditions necessary to establish a sustainable annual harvest level in Western Washington for the period 2005 through 2014. During that period, the annual average harvest on Clallam County Forest Board Transfer and Purchase Lands (FBTPL) was 28.63 million board feet (MMBF), an interval during which employment in Clallam County's wood product manufacturing sector fell from 631 in 2005 to 263 by the second quarter of 2016<sup>1</sup>. Recent contractions are explained partly by the 2014 closures of the Interfor mills in Beaver and Forks<sup>2</sup>, and the Green Creek Wood Products mill<sup>3</sup>; both of which were caused, at least in part, by a lack of available timber and associated uncertainties.

It is in this environment that DNR has released its Draft Environmental Impact Statement, *Alternatives for Establishment of a Sustainable Harvest Level for Forested State Trust Lands in Western Washington* (DEIS), containing five management alternatives each with a projected annual harvest level ranging from 398 to 550 MMBF covering the period 2015 through 2024. Each alternative has implications for direct employment in Commercial Logging, Forestry, and Wood Products Manufacturing sectors. Harvest levels also impact revenues to Clallam County's junior taxing districts (JTD) in terms of FBTPL stumpage revenues and excise tax remittances.

Accordingly, Clallam County and the Port of Port Angeles retained Olympus Consulting to answer two questions: First, what will be the revenue payments under each alternative to junior taxing districts? Second, what are the economic impacts on the forest products sector described above, its supply chain, and in those businesses where people thusly employed spend their income in terms of employment, wages, and annual business taxes?

## Compelling Need

The need for deliberate and proactive cooperative economic development policy in Clallam County is compelling. Economic well-being continues to lag behind Washington State as a whole, and the I-5 corridor (Bellevue/Seattle/Everett) in particular. In December 2016 the unemployment rate in Washington was 5.2% and 3.7% in the Bellevue/Seattle/Everett region; in Clallam County, it was 8.1%, 56% greater than the state-wide average, and nearly three times greater than the "distressed county" threshold. Similar disparities are seen in family income. For Washington, in 2016, the mean family income was \$56,650 and \$61,000 in the Bellevue/Seattle/Everett region; in Clallam County, \$36,612, with hourly wages of \$27.24, \$29.33 and \$17.60 respectively. Thus, we see that Clallam County has a poverty rate of 15.6% while the state average is 12.2%. There is a compelling need for family-wage jobs for local families.

## Scope and Direction of the Study

Each of the five management alternatives specify an aggregate harvest level by sustainable harvest unit; however, the specific location(s) of harvest, associated inventory data, and stand selection criteria are absent. Estimated harvest levels - summarized in Appendix G of the DEIS - are used to evaluate JTD timber harvest revenues and excise tax remittances; and also to quantify economic impacts in terms of employment, wages, and corresponding annual business taxes. Harvest levels associated with each alternative are not additions to

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<sup>1</sup>US Bureau of Labor Statistics' Quarterly Census of Employment and Wage Data (QCEW)

<sup>2</sup><http://archive.peninsuladailynews.com/article/20140624/NEWS/306249978/interfor-to-shut-down-operations-in-beaver/-forks-until-market>

<sup>3</sup><http://archive.peninsuladailynews.com/article/20141031/news/310319976/green-creek-wood-products-in-port-angeles/-set-to-shut-down-for-good>

current practices, but substitutions. Therefore, to evaluate the *net* impact of each in terms of revenues to junior taxing districts, employment and wages, and changes in corresponding business taxes, we subtract out the mean harvest level over the period 2006 through 2013 - 28.63 MMBF - to assess the implications of each alternative to Clallam County for potential future sustainable community economic development.

Impact values presented are not *forecasts*. Rather, they are comparative values produced using a methodology that treats each alternative identically. If there is a bias within the estimators, they are equally applied and will impact each assessment proportionately so that the final ranking of alternatives is not affected. The comparative values of economic impacts can therefore assist policy makers as they evaluate which alternative can best promote sustainable community development.

## Methods and Data

For each alternative, we examine how changes in harvest levels affect each research question. First, the net change in harvest for the OESF, Clallam, Jefferson, and Mason counties for each of the five alternatives are determined using Appendix G of the DEIS: There are three even-flow alternatives with respect to the OESF, Clallam, Jefferson, and Mason counties, each with a different harvest intensity. Two alternatives have differential harvest rates over time, both with higher volume(s) at the beginning of the period, and lower volumes for the remainder. Second, revenues to junior taxing districts are calculated for each alternative using mean stumpage prices and the methods described later in this section. Third, economic impacts in the form of changes in employment are determined along with expected wages; those wages are contrasted against a living wage for a family of four, with two children and one working adult, by constructing a living wage premium (LWP). Last, corresponding incremental changes in annual business taxes are calculated. Results are tabulated for each revenue category by alternative, presented, and discussed; the aggregate economic impact of each alternative is presented and compared.

### IMPLAN and Economic Impacts

IMPLAN is a regional input-output modeling system<sup>4</sup> that employs primary economic data obtained from the Bureau of Economic Analysis (BEA), Bureau of Labor Statistics (BLS), and the US Census Bureau. It is therefore an effective means for conducting economic impact analyses, and was used here to estimate employment, average wages and business tax revenues. The Quarterly Census of Employment and Wages (QCEW) published by the BLS is sourced for reported payroll data, and adjusted for benefits and proprietor income using intersectoral expenditure flows to impute those values. In the process, the model constructs expenditure multipliers between economic sectors within specified regions, in this study, Clallam County. These multipliers make it possible to estimate indirect and induced changes in employment, labor income, value of economic output, and business tax revenues caused by a direct effect - the employment and corresponding wages resulting from an intended outcome. In this study, those outcomes<sup>5</sup> are driven by net changes in DNR harvests from Trust Lands as stipulated in the DEIS.

IMPLAN sectors are created in a form consistent with the North American Industrial Classification System (NAICS) - the standard used in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. The system traces how changes in expenditures flow affect employment, wages and business taxes in what might otherwise appear as disparate sectors. Activities that increase direct employment in one sector (e.g. logging) have employment, labor income, and business tax impacts on the supply chain (indirect), including trucking, wholesaling, management services, and more. The numbers of full-time equivalent (FTE) jobs in each sector, along with labor income (including proprietors), are estimated along with associated business taxes. Wages associated with direct and indirect employment become expenditures in the broader economy (i.e. induced effects). The number of FTE by employment sector (food services, retail, offices of physicians, etc.) along with labor income and business taxes - federal, state and local - are estimated<sup>6</sup>. Sectors 15 (Forestry), 16 (Commercial Logging), and 134 (sawmills) were used for direct effects as they best capture the processes used for harvest and wood processing<sup>7</sup>. All monetary values in this study are expressed in \$2016.

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<sup>4</sup>IMPLAN data provides a broad description of a region's economy, including earned income, property income and unearned income. In addition, it models trade flows and the extent to which value added employment serves as a source of net income. Available online at: <http://implan.com/>

<sup>5</sup>IMPLAN data for Clallam County for the year 2015 was used.

<sup>6</sup>Only local and state business taxes are reported in this study as they are outcomes affecting sustainable community economic development.

<sup>7</sup>NAICS codes are, respectively, 115, 113, and 321. As there are no expected changes to paper production, this sector was excluded in the analysis.



## Employment per unit harvested

NAICS data for this analysis was obtained through the US BLS<sup>8</sup> and the US Forest Service<sup>9,10</sup> (USFS) for the relevant sectors described below. Aggregate harvest, stumpage, and excise tax data by year, county, and ownership class was reported by the Washington State Department of Revenue<sup>11</sup>. Each Sustainable Harvest Alternative presents harvest by Clallam, Jefferson, and Mason counties and by the Olympic Experimental State Forest (OESF), which spans western Clallam and Jefferson counties and includes some Clallam County FBTPL. Estimators of employment, public and private harvest, and stumpage were aggregated to a degree necessary for DNR's harvest estimates to align spatially with other data sources<sup>7</sup>.

### NAICS 113: Forestry and Logging

Annual FTE employment in this sector was sourced from BLS (2000-2008) and USFS (2009-2013) QCEW reports for Clallam, Jefferson, Grays Harbor, and Mason counties. Grays Harbor was included due to the adjacency of the OESF and Mason County to Grays Harbor County; it is reasonable to assume that harvest in both the OESF and Mason County may impact employment in this sector in Grays Harbor County. Employment was assumed to be a linear function of total (public and private) timber harvest in the same counties. The final model took the form  $E_{113} = 1.48 * MMBF$ . This multiplier on MMBF harvested explained more than 99% of the variation in sector employment over the period. The standard deviation of the residuals is 95.42 annual jobs; that is, two-thirds of all predictions will be within 9% of the mean. The mean absolute error is 83.4 Jobs; that is, the average prediction will be within 8% of the true value. The 1.48 jobs per MMBF harvested can be broken down by county: 0.50 FTE MMBF in Clallam County; 0.68 FTE / MMBF in Grays Harbor County; 0.02 FTE / MMBF in Jefferson County; 0.29 FTE / MMBF in Mason County. The BLS explanation of the job sector is provided below and the relationship between employment and harvest is illustrated in Figure 1.

Industries in the Forestry and Logging subsector grow and harvest timber on a long production cycle (i.e., of 10 years or more). Long production cycles use different production processes than short production cycles, which require more horticultural interventions prior to harvest, resulting in processes more similar to those found in the Crop Production subsector. Consequently, Christmas tree production and other production involving production cycles of less than 10 years, are classified in the Crop Production subsector.

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<sup>8</sup>Databases, tables & calculators by subject. Available online at:  
<https://www.bls.gov/data/#employment>

<sup>9</sup>Production, Prices, Employment, and Trade in Northwest Forest Industries, All Years. Available online at:  
<https://www.fs.fed.us/pnw/ppet/26.shtml>

<sup>10</sup>Zhou, Xiaoping. 2015. Production, prices, employment, and trade in Northwest forest industries, all quarters 2013. Resour. Bull. PNW-RB-266. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 163 p.

<sup>11</sup>Harvest Statistics available online at:  
[http://dor.wa.gov/content/FindTaxesAndRates/OtherTaxes/Timber/forst\\_stat.aspx](http://dor.wa.gov/content/FindTaxesAndRates/OtherTaxes/Timber/forst_stat.aspx)

**NAICS sector 113 employment and total timber harvested in Clallam, Grays Harbor, Jefferson, and Mason Counties by year**

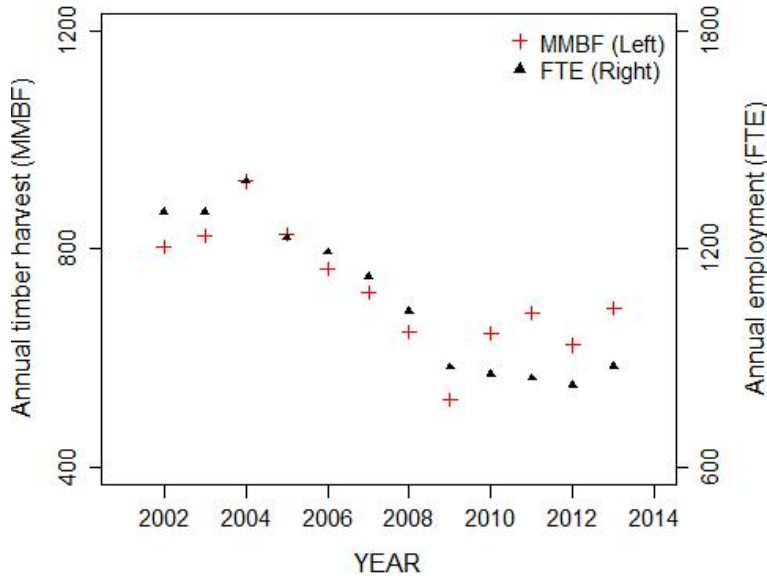


Figure 1: Total timber volume harvested (MMBF, left y-axis) in Clallam, Grays Harbor, Jefferson, and Mason Counties and employment (FTE, right y-axis) in NAICS sector 113 - forestry and logging - in those counties for the period 2002-2013.

**NAICS 115: Support Activities for Agriculture and Forestry**

Using data and methods similar to that of NAICS 113, a linear model of employment in Forestry as a function of timber harvest. The BLS description of the sector is provided below; with respect to forestry, this sector includes timber managers and other professional staff. The final model took the form  $E_{115} = 0.1 * MMBF$ . This estimator on harvest explains 78% of the variation in employment; the standard deviation of the residuals is 35.3 jobs, and the mean absolute error is 30.5 jobs. Due to proprietary restrictions on data when two or fewer reporting employers exist in a county, data is zeroed. While those gaps exist and serve to increase the variation, it would be incorrect to interpret the data gaps as zeroes. It would be reasonable to assume that employment in this sector does not equal zero for these periods; however, without prior knowledge, we did not assert or assume values for these gaps. The relationship between harvest and employment is illustrated in Figure 2.

Industries in the Support Activities for Agriculture and Forestry subsector provide support services that are an essential part of agricultural and forestry production. These support activities may be performed by the agriculture or forestry producing establishment or conducted independently as an alternative source of inputs required for the production process for a given crop, animal, or forestry industry. Establishments that primarily perform these activities independent of the agriculture or forestry producing establishment are in this subsector.

**NAICS sector 115 employment and total timber harvested in Clallam, Grays Harbor, Jefferson, and Mason Counties by year**

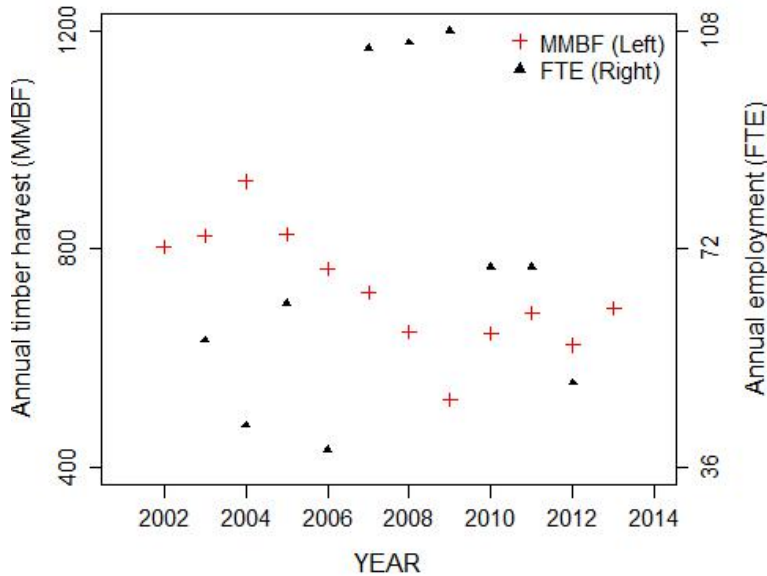


Figure 2: Total timber volume harvested (MMBF, left y-axis) in Clallam, Grays Harbor, Jefferson, and Mason Counties and employment (FTE, right y-axis) in NAICS sector 115 - forestry support services - in those counties for the period 2002-2013.

**NAICS 321: Wood Product Manufacturing**

The same data and methods were used to build a linear model of employment in Wood Products Manufacturing on total harvest, taking the form  $E_{115} = 3.84 * MMBF$ . This estimator on harvest explained 97% of the variation in this sector’s employment; the standard deviation of the residuals was 448.8 (16% of the mean), and the average estimate of employment based on harvest would be expected to be within 14% of the actual value. The BLS’ description of the manufacturing sector is provided below, and the relationship between harvest and employment is illustrated in Figure 3.

Industries in the Wood Product Manufacturing subsector manufacture wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured homes (i.e., mobile homes), and prefabricated wood buildings. The production processes of the Wood Product Manufacturing subsector include sawing, planing, shaping, laminating, and assembling of wood products starting from logs that are cut into bolts, or lumber that then may be further cut, or shaped by lathes or other shaping tools. The lumber or other transformed wood shapes may also be subsequently planed or smoothed, and assembled into finished products, such as wood containers. The Wood Product Manufacturing subsector includes establishments that make wood products from logs and bolts that are sawed and shaped, and establishments that purchase sawed lumber and make wood products. With the exception of sawmills and wood preservation establishments, the establishments are grouped into industries mainly based on the specific products manufactured.

**NAICS sector 321 employment and total timber harvested in Clallam, Grays Harbor, Jefferson, and Mason Counties by year**

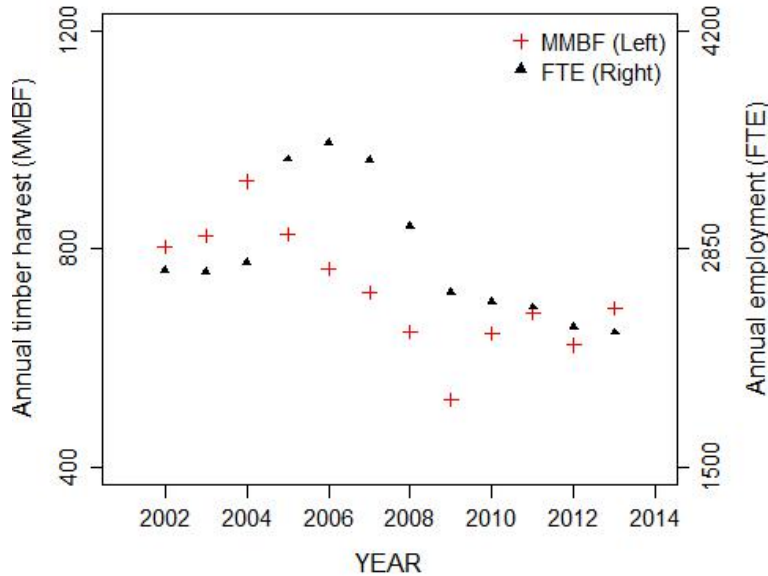


Figure 3: Total timber volume harvested (MMBF, left y-axis) in Clallam, Grays Harbor, Jefferson, and Mason Counties and employment (FTE, right y-axis) in NAICS sector 321 - wood products manufacturing - in those counties for the period 2002-2013.

**Clallam County FBTPH Harvest Calculation**

While employment figures are a function of all timber harvested, timber harvest revenues to Clallam County JTDs come from FBTPH lands, which are a subset of DNR land within Clallam County. Washington State Department of Revenue records report aggregate annual timber harvest by county and ownership type (i.e. public, private). For Clallam County, public ownership would include all of Clallam County FBTPH lands, along with the portion of OESF harvest that occurs within the county, as well as harvest from Olympic National Forest and any other state or municipal harvest. In its annual reports, the DNR details the volume of FBTPH timber harvested by county. With this data, it is possible to build a model of FBTPH harvest as a function of all public timber harvested. Here, a model of the proportion of all public timber harvested in Clallam, Jefferson, and Mason counties expected to come from Clallam County’s FBTPH took the form  $FBTPH_{CLA} = 0.29 * MMBF_{pub} + 0$ . This model on public harvest explained 90% of the variation in Clallam County’s FBTPH harvest over the period 2006-2013; the standard deviation of the residuals was 8.68 percent of the mean, and the average estimator of Clallam County FBTPH harvest volume would be expected to be within 8% of the true value. The relationship between Clallam County FBTPH harvest and all public timber harvested in Clallam, Jefferson, and Mason counties is illustrated in Figure 4. Where Grays Harbor county was included in Employment per Unit Harvested, it is excluded here due to its lack of Forest Board Transfer Lands; as a data set, it is not analogous to Clallam, Jefferson, and Mason counties.

**Clallam County FBTPPL timber harvested and all public timber harvested in Clallam, Jefferson, and Mason Counties by year**

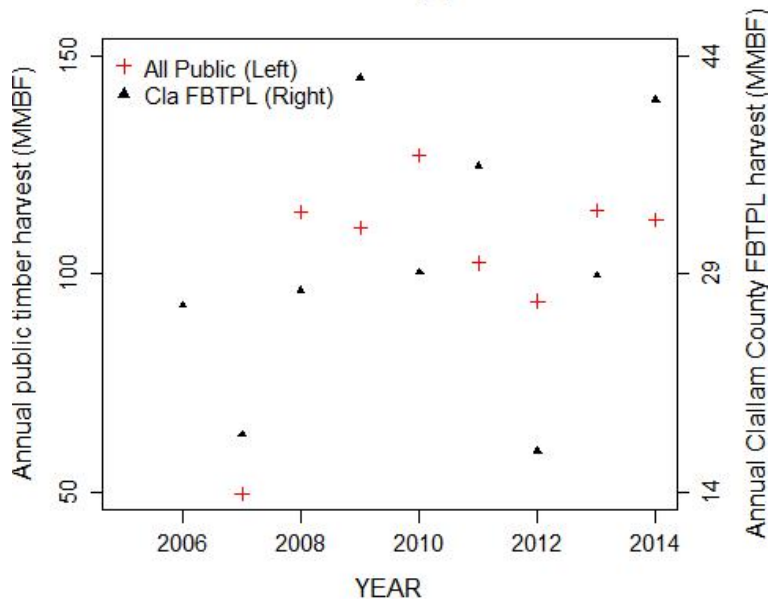


Figure 4: Total timber harvest volume (MMBF, left y-axis) from Clallam, Grays Harbor, Jefferson, and Mason Counties and the portion of that volume harvested (MMBF, Right y-axis) from Clallam County Forest Board Transfer and Purchase lands (FBTPPL) for the period 2006-2013.

### Clallam County public timber stumpage model

Estimating the price of public timber requires knowledge of the volume of public timber available, the volume of private timber available, export markets which affect directly the volume and price of private timber available, and affect indirectly the price of public timber. Also, currency exchange rates that, through substitution, affect price of both public and private timber. While aggregate public and private timber volumes and stumpage records are provided by the Washington Department of Revenue, no good estimator exists for public timber as a function of private timber without knowledge of the other factors. Therefore, the best estimator available is the mean of public stumpage in Clallam, Jefferson, and Mason counties over the period 2000-2015: \$341.90 per MBF.

### Clallam County Junior Taxing District timber revenues

When timber is harvested from Clallam FBTPPL, revenues (less DNR fees) are returned to Clallam County and apportioned among JTDs by the County Treasurer according to a defined formula - *millage* - that depends, in part, on the location of the timber sale relative to JTD boundaries. With respect to harvest volumes by DNR alternative, locations are not specified with precision to facilitate exact millage by JTD. For Clallam County, each alternative specifies the volume to either FBTPPL or OESF Trust Lands. In the analysis of each alternative that follows, timber harvest revenues are based on each alternative's total harvest for Clallam, Jefferson, and Mason counties, plus the OESF. The proportion of this total predicted to come from

Clallam County's FBTPLs (calculated with the model described previously) less the average annual volume observed from Clallam County's FBTPL over the period 2006 - 2015 (28.63 MMBF) is the expected net harvest volume for the alternative. Net revenues are computed using the stumpage price for public timber.

In order to report figures that approximate this level of precision, we have applied the mean millage rate observed by JTDs over the period 2011-2015; that is, the revenue to a junior taxing district expressed as a percentage of all FBTPL revenues over the period. And while revenues are apportioned to individual districts, we have aggregated some revenues for reporting purposes. The groupings are accompanied by the Treasurer's identifier:

1. County General (00100) including County Roads (10101).
2. Port of Port Angeles (68702)
3. North Olympic Library System (64001)
4. School Districts (SD)
  - SD121 General (68101), SD121 Bond (68104)
  - SD313 General (68121)
  - SD323 General (68131), SD323 Bond (68134), SD323 Transportation (68135)
  - SD401 General (68141), SD401 Bond (68144)
  - SD402 General (68151), SD402 Bond (68154)
5. Schools Bond (SD)
  - SD121 Bond (68104)
  - SD323 Bond (68134)
  - SD401 Bond (68144)
  - SD402 Bond (68154)
6. Fire Districts (FD)
  - FD1 Operations & Maintenance (65101)
  - FD2 Operations & Maintenance (65120) ,FD2 Reserve (65127)
  - FD3 Operations & Maintenance (65131) ,FD3 Emer Med Svc (65136), FD3 Reserve (65137)
  - FD5 Operations & Maintenance (65151) ,FD5 Reserve (65157)
  - FD6 Operations & Maintenance (65161)
  - FD4 Operations & Maintenance (65171)
7. Hospital Districts (HD)
  - HD1 General (69511), HD1 Depreciation (69512), HD1 Donation (69513), HD1 Emer Med Svc (69514), HD1 Rural Hosp Asses. (69515), HD1 Bond (69517), HD1 Employee Ed. (69518), HD1 Projects (69519)
  - HD2 General (69551)

## Clallam County Junior Taxing District excise tax revenue

Where timber harvest revenues to JTDs come from harvest on county FBTPLs, tax revenues arrive to JTDs from all timber harvest - federal, state, local public, and all private timber harvests. The amount is equal to 5% of stumpage, fourth-fifths of which is remitted to the County in which the timber was harvested and apportioned as described above. Here we use the mean rate of excise tax apportionment among JTDs reported by the Clallam County Treasurer for the period 2011-2015. If we assume that total timber harvest in Clallam County is the sum of all public and all private timber harvest, then it can be estimated using two-stage linear regression on the total timber harvest volume in the OESF and Clallam, Jefferson, and Mason counties for each alternative. Grays Harbor county is excluded for the reason mentioned previously. The first stage is to model total private timber harvest in Clallam, Jefferson, and Mason counties as a function of public timber harvest (in the same region) for the period 2006 - 2015; the final model took the form  $V_{\text{prv}} = -2.0036v_{\text{pub}} + 515.72$ . The second model provides an estimate of total timber harvest in Clallam

County as a function of total public harvest in the OESF and Clallam, Jefferson, and Mason counties; the model took the form  $V_{\text{tot}} = -1.1572V_{\text{pub}} + 515.72$ . This estimator on public timber harvested in the OESF and Clallam, Jefferson, and Mason Counties explains 63.7 percent of variation in the distribution of total timber harvested in Clallam County over the period 2006-2015. The model suggests that there is a maximum harvest that can be expected from Clallam County in any given year; higher harvest in one sector (public or private) is likely to have a negative impact in the other sector. The standard deviation of the residuals is 84.9 MMBF, and the average estimate of total timber harvested should be within 63.7 MMBF of the true value. The relationship between harvest in the OESF, Clallam, Jefferson, and Mason counties, and total timber harvested in Clallam County is illustrated in Figure 5.

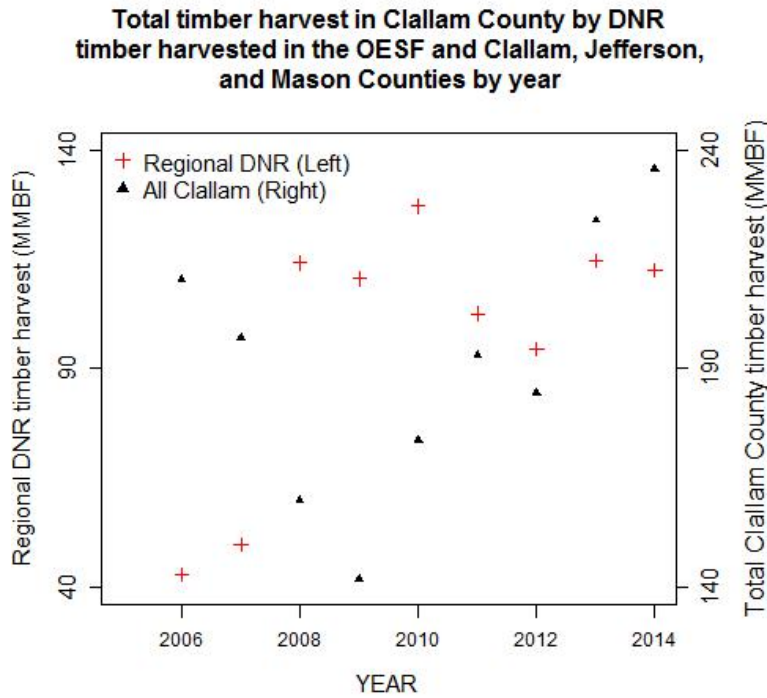


Figure 5: Timber volume harvested from DNR lands in Clallam, Jefferson, and Mason counties (MMBF, left y-axis) lands and Total timber volume harvested in Clallam County (MMBF, right y-axis) for the period 2006-2013.

## Analysis of Alternatives

Employment and wage estimates derived from IMPLAN are the result of expenditure flows across all economic sectors, from production to final retail sales. Income estimates include payroll wages and benefits. In addition, IMPLAN estimates proprietor income derived from sales in any economic sector. These estimates are problematic from the perspective of evaluating policy options for sustained community economic development, as IMPLAN combines wages and proprietor income into total labor income. Creating opportunities for additional proprietor incomes is an important policy objective, for that income supports expenditures in induced sectors, increasing employment and business taxes. However, at the same time, policy makers often need to compare expected employment and wage changes for payroll employees between alternatives to determine an optimal direction for policy. Accordingly, they need to observe expected changes in FTE with corresponding wages to inform a decision. Inclusion of proprietor income as a component of total labor income can cause a significant upward bias on average wages. In such cases, an FTE payroll wage will be below an average wage computed from total labor income that includes proprietor income. In such cases, an average payroll wage is less than the total average which includes proprietor income. Thus, those potential biases are examined and corrected.

To test the extent to which this complication biased IMPLAN wage estimates, a number of test scenarios were run. To establish a baseline for the analysis, IMPLAN results driven by expected changes in employment were run under DNR Harvest Alternative 1, using IMPLAN 16 (Commercial Logging) as it produces the greatest level of proprietor income. Direct employment of 1.3 FTE results in estimated employee compensation of \$74,780, and proprietor income of \$214,731, for total labor income of \$289,512. The result is an average annual income of \$222,701 in Commercial Logging, even though paid compensation to the 1.3 FTE is \$74,780, for an average of \$57,523. Thus we see a nearly four-fold upward bias resulting from inclusion of proprietor income into total labor income. To test the accuracy of the estimated wage for Commercial Logging when proprietor income is excluded, QCEW wage data for 2015 NAICS 113 (Commercial Logging), converted to \$2016, reveals a pre-benefit wage of \$52,087. The difference approximates a benefit factor of approximately 10 percent. Inclusion of proprietor income creates a significant upward bias for average wage estimates. If that value is excluded from wage estimates, IMPLAN produces an estimate consistent with QCEW data. Thus, IMPLAN average wage estimates are a reasonable fit if proprietor income is excluded.

This sensitivity analysis indicates that by eliminating proprietor income from total labor income derived from direct employment, IMPLAN creates an accurate estimate for average wages, including benefits, which approximate wages reported by employers through QCEW in Commercial Logging. This same assumption is used for each source of direct employment throughout this study. Estimated proprietor income for each of those sectors (Forestry, Commercial Logging, and Sawmills), under each DNR harvest alternative, is important elsewhere in the economy, affecting the total demand for goods and services. Thus, each alternative was run a second time with proprietor income to capture the economy wide impact of this income category in the form of indirect and induced effects<sup>12</sup>.

## Estimating Annual Business Taxes

IMPLAN produces estimates for state and local taxes, including property taxes, sales taxes, motor vehicle taxes, and other “minor” categories. Of these, property taxes and sales taxes comprise 88.4% of the total. Of those two categories, 80% of property taxes are returned directly to local entities: 36% local schools, 15% local taxing districts, 16% counties, 13% cities and towns: 20% goes to state funding of schools<sup>13</sup>. Thus,

<sup>12</sup>Only local and state business taxes are reported in this study as they are outcomes affecting sustainable community economic development.

<sup>13</sup>2016 report prepared by the Washington State Senate’s Ways and Means Committee titled, “A Legislative Guide to Washington State Property Taxes.” Available online at: <http://leg.wa.gov/Senate/Committees/WM/Documents/Publications/>



ultimately, all property taxes are returned directly or indirectly to counties. The 8.4% sales tax is shared between the state and local governments, with 6.5% going to the state and 1.9% to local government. Thus, local governments receive 22.6% of total sales tax collections<sup>14</sup>. Thus, of the 88.4% of total state and local taxes collected, approximately 38% goes to local government. The values presented approximate the lower bound of the share going to local government, and are presented in all tables with business tax estimates.

Annual business taxes presented in this report are those supported by employment and total labor income from a net change in DNR harvests under each alternative. Employment and total labor income represent a potential net increase in economic welfare. For business taxes, reported values do not necessarily represent additional or new revenues, as property tax collections may be the result of assessments on existing structures and would be paid in the absence of changes in net harvests under the five alternatives. Increases on expenditures subject to sales taxes would represent an unambiguous increase in business tax revenues. Thus, when interpreting business tax revenue projections, the reader must be aware those numbers represent taxes supported by the new employment and wages, some of which will be new tax revenues. However, whether the business tax estimates are new revenue or not, the increased sales going to firms paying those business taxes mean an increase in operating income and thus their bottom line. With these caveats in mind, the business tax revenue projections make possible comparison of each harvest alternative and its relative impact on Clallam County. Precisely, the analysis in this report will identify which harvest alternative supports the largest value for business taxes. The alternative providing the largest support of business taxes will also provide the largest addition to sales tax collections, and the largest increase to operating income of businesses in Clallam County.

## Alternative 1

### Economic impacts: employment, wages, and taxes

Economic impacts in terms of employment, wages, and LWP are presented in Table 1. The net increase in harvests of 2.69 MMBF can support 3.3 direct FTE jobs in Forestry (0.14), Commercial Logging (1.34) and Sawmills (1.85) at an average monthly wage of \$4,632 with a LWP of \$645. Proprietor monthly income in Forestry is \$1,300, Commercial Logging, \$18,445. Proprietor income exerts a considerable impact on induced employment: an increase from 1.4 to 2.5 FTE, with similarly impacts on business taxes. Indirect employment is 1.8 FTE with an average monthly wage of \$7,241 yielding a LWP of \$3,254. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 2.5 FTE with an average monthly wage of \$2,271 and a LWP of -\$1,716, an outcome explained by employment in retail and food related sectors.

2016/2016%20Property%20Tax%20Guide%20v9Jan8\_website.pdf

<sup>14</sup>Washington State Department of Revenue Sales and use tax rate lookup. Available online at: <http://dor.wa.gov/content/findtaxesandrates/salesandusetaxrates/lookupataxrate/>

Table 1: Net direct, indirect, and induced impacts on employment, wages, and taxes resulting from Sustainable Harvest Alternative 1 (no action): 108 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2024.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	3.3	\$ 4,632	\$ 645	\$ 2,259	\$ 3,687
Indirect	1.8	\$ 7,241	\$ 3,254	\$ 4,051	\$ 6,610
Induced	2.5	\$ 2,271	\$ -1,716	\$ 9,059	\$ 14,781
Total	7.6	\$ 4,473	\$ 486	\$ 14,965	\$ 25,482

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* LWP = estimated wage - living wage.

*d:* local taxes includes both city and county.

Annual business tax revenues under Alternative 1 total \$40,447, approximately 38% accruing to local and county government in an amount of \$14,965. Direct, indirect and induced contributions to local government are \$2,259, \$4,051 and \$9,059. The increase in induced business taxes resulting from proprietor income is \$3,754, or \$3,754 of the \$9,059 results from proprietor income.

### Timber harvest and excise tax revenues to Junior taxing districts

Based on the expected annual harvest level of 108 MMBF across the OESF, Clallam, Jefferson, and Mason counties, the expected timber harvest from Clallam County FBTPL demonstrates a net increase of 2.69 MMBF per year over current levels. Based on the historic JTD apportionment, timber harvest and excise tax revenues increase by a total of \$1,987,205; with \$919,711 from FBTL revenues and \$1,067,494 from timber excise taxes. The amounts to aggregated JTDs is detailed in Table 2.

Table 2: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 1 (no action): 108 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2024.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 342,554	\$ 444,875	\$ 787,429
Port of Port Angeles	\$ 17,218	\$ 30,583	\$ 47,801
North Olympic Library System	\$ 44,962	\$ 81,413	\$ 126,375
School Districts	\$ 255,327	\$ 334,429	\$ 589,756
Schools Bond	\$ 75,950	\$ 194,189	\$ 270,139
Fire Districts	\$ 70,110	\$ 31,552	\$ 101,662
Hospital Districts	\$ 57,291	\$ 112,744	\$ 170,035
Total <sup>b</sup>	\$ 919,711	\$ 1,067,494	\$ 1,987,205

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

## Alternative 2

### Economic impacts: employment, wages, and taxes

Alternative 2 suggests a net annual harvest of 17.48 MMBF for the first five years, with the net increase shrinking to 4.43 MMBF over the next 5 years. The economic impacts of these harvests in terms of employment, wages, LWP and business taxes are presented in Table 3. The harvest in the first five years supports 21.7 direct FTE jobs in Forestry (0.87), Commercial Logging (8.74) and Sawmills (12.06) at an average monthly wage of \$4,584 with a LWP of \$597. Proprietor monthly income in forestry is \$7,455, Commercial Logging, \$120,304 and \$2,297 in Sawmills, significant proprietor income especially in Forestry and Commercial Logging. Proprietor income exerts a significant impact on induced employment: an increase from 9.3 to 16.2 FTE, with similarly impacts on annual business taxes. Indirect employment is 11.6 FTE with an average monthly wage of \$7,322 yielding a LWP of \$3,335. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 16.2 FTE with an average monthly wage of \$2,281 and a LWP of -\$1,706, an outcome explained by employment in retail and food related sectors.

Annual business tax revenues in the first five years of Alternative 2 total \$263,289 with approximately 38% accruing to local and county government in an amount of \$100,050. Direct, indirect and induced contributions are \$14,692, \$26,397 and \$58,960. The increase in induced annual business taxes resulting from proprietor income is \$25,067.

Table 3: Net direct, indirect, and induced impacts on employment, wages, and taxes resulting from Sustainable Harvest Alternative 2 (high riparian thinning): 159 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2019.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	21.7	\$ 4,584	\$ 597	\$ 14,692	\$ 23,972
Indirect	11.6	\$ 7,322	\$ 3,335	\$ 26,397	\$ 43,069
Induced	16.2	\$ 2,281	\$ -1,706	\$ 58,960	\$ 96,199
Total	49.5	\$ 4,472	\$ 485	\$ 100,050	\$ 163,239

a: Full Time Equivalent in Clallam County as a function of MMBF harvested.

b: Average Monthly wage calculated by Implan.

c: LWP = estimated wage - living wage.

d: local taxes includes both city and county.

Economic impacts drop significantly the following five years - an outcome expected with a 75% reduction in harvest - and are presented in table 4. The net annual harvest of 4.43 MMBF can support 5.5 direct FTE jobs in Forestry (0.22), Commercial Logging (2.22) and Sawmills (3.06) at an average monthly wage of \$4,591 with a LWP of \$604. Proprietor monthly income in Forestry is \$1,855, Commercial Logging, \$30,588. Proprietor income increases induced employment: 2.4 to 4.1 FTE, with similarly impacts on annual business taxes. Indirect employment is 2.9 FTE with an average monthly wage of \$7,432 yielding a LWP of \$3,445. This high LWP is explained by high paying occupations in forestry and wholesaling, and proprietor income. Induced employment is 4.1 FTE with an average monthly wage of \$2,287 and a LWP of -\$1,716, an outcome explained by employment in retail and food related sectors.

Annual business tax revenues in the second five years of Alternative 2 total \$66,821, with \$25,392 accruing to local and county government. Direct, indirect and induced contributions are \$3,727, \$6,698 and \$14,967.

Table 4: Net direct, indirect, and induced impacts on employment, wages, and taxes resulting from Sustainable Harvest Alternative 2 (high riparian thinning): 114 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2020 through 2024.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	5.5	\$ 4,591	\$ 604	\$ 3,727	\$ 6,081
Indirect	2.9	\$ 7,432	\$ 3,445	\$ 6,698	\$ 10,929
Induced	4.1	\$ 2,287	\$ -1,716	\$ 14,967	\$ 24,419
Total	12.5	\$ 4,494	\$ 507	\$ 25,392	\$ 41,429

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* LWP = estimated wage - living wage.

*d:* local taxes includes both city and county.

### Timber harvest and excise tax revenues to Junior taxing districts

Table 5 presents the total timber harvest and excise tax revenues and the portion(s) flowing to aggregated JTD based on a harvest level of 159 MMBF across the OESF and Clallam, Jefferson, and Mason counties for the period 2015-2019. This harvest level would represent a net increase of 17.48 MMBF per year. The total revenue of \$5,301,395 is the sum of \$5,976,412 from FBTPL revenues, and excise tax revenues of -\$675,017. The increase in FBTPL revenues is explained by the overall high level of harvest - a distribution skewed heavily towards the OESF; negative excise tax revenues result from lower private (and total) harvest in Clallam County due to the high public volume.

Table 5: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 2 (high riparian thinning): 159 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2019.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 2,225,964	\$ -281,312	\$ 1,944,652
Port of Port Angeles	\$ 111,882	\$ -19,339	\$ 92,543
North Olympic Library System	\$ 292,169	\$ -51,481	\$ 240,688
School Districts	\$ 1,659,151	\$ -211,472	\$ 1,447,679
Schools Bond	\$ 493,532	\$ -122,793	\$ 370,739
Fire Districts	\$ 455,585	\$ -19,951	\$ 435,634
Hospital Districts	\$ 372,282	\$ -71,293	\$ 300,989
Total <sup>b</sup>	\$ 5,976,412	\$ -675,017	\$ 5,301,395

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

Table 6 details timber harvest and excise tax revenues under for the period 2020 through 2024. The projected annual harvest in the OESF and Clallam, Jefferson, and Mason counties is reduced to 114 MMBF, which is still a net increase of 4.43 MMBF per year. Total revenues of \$2,377,109 distributed to all junior taxing districts, with \$1,514,617 coming from FBTPL revenues while timber excise tax revenues account for \$862,492. The distribution away from the OESF in the second five years suggests a larger countywide harvest, increasing tax revenues.

Table 6: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 2 (high riparian thinning): 114 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2019.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 564,132	\$ 359,442	\$ 923,574
Port of Port Angeles	\$ 28,355	\$ 24,710	\$ 53,065
North Olympic Library System	\$ 74,045	\$ 65,778	\$ 139,823
School Districts	\$ 420,483	\$ 270,205	\$ 690,688
Schools Bond	\$ 125,077	\$ 156,897	\$ 281,974
Fire Districts	\$ 115,460	\$ 25,493	\$ 140,953
Hospital Districts	\$ 94,348	\$ 91,093	\$ 185,441
Total <sup>b</sup>	\$ 1,514,617	\$ 862,492	\$ 2,377,109

a: Forest Board Transfer Lands revenue less DNR management fee.

b: Total across all junior taxing districts; only selected districts shown here.

## Alternative 2': Even Flow

The five year arrearage harvest in Alternative 2 weights benefits forward with a harvest of 17.48 MMBF the first five years followed by an annual harvest of 4.43 MMBF the next five years. This marks a significant reduction in harvest of 75 percent. This alternative is problematic for at least three reasons. First, unless the additional volume of wood in the first five years can be used by exiting Sawmills, it will likely leave the county and thus not serve to create additional employment in the Sawmill sector which will have spillover effects in terms of indirect and induced employment, wages and business tax revenues lost. Stated differently, the 12 FTE may not materialize locally, but rather in other counties. Second, consistent annual harvests reduce uncertainty and thus increase expected rates of return that may facilitate new infrastructure (i.e. sawmills), with concurrent economic impacts. Third, and following from the second above, consistent availability of saw logs and milled timber can help create the business environment for additional investment in value-added manufacturing facilities; such products might include cross-laminated timber and parallel strand lumber within the mass timber family of products.

For these reasons, commissioners representing Clallam County and the Port of Port Angeles requested Alternative 2' be analyzed where the total volume projected for harvest occur on an even-flow annual basis over ten years, which amounts to 10.995 MMBF. Table 7 presents the results in terms of employment, average wages, LWP, and annual business taxes. The 10.995 MMBF can support 13.6 direct FTE jobs in Forestry (0.55), Commercial Logging (5.5) and Sawmills (7.59) at an average monthly wage of \$4,604 with a LWP of \$617. Proprietor monthly income in Forestry is \$4,713, Commercial Logging, \$83,707 and \$1,446 in Sawmills. Proprietor income increases induced employment from 5.9 to 10.2 FTE, with similarly impacts on annual business taxes. Indirect employment is 7.3 FTE with an average monthly wage of \$7,323 yielding a LWP of \$3,336. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 10.2 FTE with an average monthly wage of \$2,280 and a LWP of -\$1,707, an outcome explained by employment in retail and food related sectors.

Interestingly, we observe a total of 31.1 for Alternative 2', 0.1 FTE over Alternative 2, even though the values of direct, indirect and induced FTE "appear" the same. The reason is that the "true" numerical values embedded in excel and IMPLAN extend two decimal places, but appear rounded up to one decimal place. Thus, when correcting for rounding, Alternative 2 has 31 FTE; this value is 0.1 less than in Alternative 2' at 31.1. These additional 0.1 jobs are spread across indirect and induced employment, and as indirect employment has an average wage of \$7,323 causes generation of an additional \$25,148 in indirect wages over

the 10 year harvest and an additional \$10,759 from induced employment. The slightly greater average wage from direct employment adds \$29,721 in wages over the 10 year harvest. These sums are not discounted.

Overall, there is little difference in the economic impacts between Alternative 2 and Alternative 2' in the summary tables. However, the even-flow harvest is more likely to support Sawmilling jobs in Clallam County along with corresponding indirect and induced impacts than is likely the case for the 17.48/4.43 MMBF harvest pattern in Alternative 2.

Table 7: Timber harvest and excise tax revenues by aggregated junior taxing districts under modified DNR Sustainable Harvest Alternative 2': 121 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2024.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	13.6	\$ 4,604	\$ 617	\$ 9,244	\$ 15,083
Indirect	7.3	\$ 7,323	\$ 3,336	\$ 16,614	\$ 27,107
Induced	10.2	\$ 2,280	\$ -1,707	\$ 37,111	\$ 60,549
Total	31.1	\$ 4,480	\$ 493	\$ 62,969	\$ 102,739

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* LWP = estimated wage - living wage.

*d:* local taxes includes both city and county.

Table 8 presents the share of timber harvest excise tax revenues accruing to aggregated junior taxing districts in Clallam County over ten years from the net increase in the even-flow harvest of 10.995 MMBF. The total revenue going to each aggregated junior taxing district is derived from Forest Board Transfer Lands (FBTL) and excise taxes. Thus, of the total \$3,871,744 going to all junior taxing districts, \$3,795,090 come from FBTL revenues and \$76,654 from timber excise taxes. These values represent net increases in tax revenues (\$3,871,744) over contributions from extant harvest levels.

Table 8: Timber harvest and excise tax revenues by aggregated junior taxing districts under modified DNR Sustainable Harvest Alternative 2 (high riparian thinning): 137 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2024.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 1,413,512	\$ 31,945	\$ 1,445,457
Port of Port Angeles	\$ 71,046	\$ 2,196	\$ 73,242
North Olympic Library System	\$ 185,530	\$ 5,846	\$ 191,376
School Districts	\$ 1,053,580	\$ 24,014	\$ 1,077,594
Schools Bond	\$ 313,399	\$ 13,944	\$ 327,343
Fire Districts	\$ 289,302	\$ 2,266	\$ 291,568
Hospital Districts	\$ 236,404	\$ 8,096	\$ 244,500
Total <sup>b</sup>	\$ 3,795,090	\$ 76,654	\$ 3,871,744

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

## Alternative 3

### Economic impacts: employment, wages, and taxes

The economic impacts in terms of employment, wages, and LWP for Alternative 3 are presented in Table 9. The net increase in harvests of 7.91 MMBF can support 9.8 direct FTE jobs in Forestry (0.4), Commercial Logging (3.96) and Sawmills (5.46) at an average monthly wage of \$4,600 with a LWP of \$613. Proprietor monthly income in Forestry is \$3,428, Commercial Logging, \$54,509 and Sawmills, \$1040. Proprietor income exerts a considerable impact on induced employment: an increase from 4.2 to 7.3 FTE, with similarly impacts on business taxes. Indirect employment is 5.3 FTE with an average monthly wage of \$7,257 yielding a LWP of \$3,270. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 7.3 FTE with an average monthly wage of \$2,294 and a LWP of -\$1,693, an outcome explained by employment in retail and food related sectors.

Annual business tax revenues under Alternative 3 total \$119,295, with approximately 38% accruing to local and county government in an amount of \$45,332. Direct, indirect and induced contributions to local government are \$6,658, \$11,953 and \$26,721. The increase in induced business taxes resulting from proprietor income is \$11,367: \$11,367 of the induced business taxes results from proprietor income.

Table 9: Net direct, indirect, and induced impacts on employment, wages, and taxes resulting from Sustainable Harvest Alternative 3 (low riparian thinning): 126 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2024.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	9.8	\$ 4,600	\$ 613	\$ 6,658	\$ 10,863
Indirect	5.3	\$ 7,257	\$ 3,270	\$ 11,953	\$ 19,503
Induced	7.3	\$ 2,294	\$ -1,693	\$ 26,721	\$ 43,597
Total	22.4	\$ 4,477	\$ 490	\$ 45,332	\$ 73,963

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* LWP = estimated wage - living wage.

*d:* local taxes includes both city and county.

### Timber harvest and excise tax revenues to Junior taxing districts

Expected timber harvest and excise tax revenues by JTD based on an expected annual harvest of 126 MMBF across the OESF and Clallam, Jefferson, and Mason counties is presented in Table 10. This harvest level represents a net increase of 7.91 MMBF over extant harvest levels. The total revenue of \$3,156,919 comes in part from \$2,704,429 in FBTL receipts and \$452,490 in excise tax remittances. The distribution among sustainable harvest units would be associated with higher overall harvest levels in the county, such that both timber receipts and excise taxes are net-positive.

Table 10: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 3 (low riparian thinning): 126 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2015 through 2024.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 1,007,287	\$ 188,574	\$ 1,195,861
Port of Port Angeles	\$ 50,628	\$ 12,964	\$ 63,592
North Olympic Library System	\$ 132,211	\$ 34,509	\$ 166,720
School Districts	\$ 750,794	\$ 141,758	\$ 892,552
Schools Bond	\$ 223,332	\$ 82,313	\$ 305,645
Fire Districts	\$ 206,160	\$ 13,374	\$ 219,534
Hospital Districts	\$ 168,464	\$ 47,790	\$ 216,254
Total <sup>b</sup>	\$ 2,704,429	\$ 452,490	\$ 3,156,919

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

## Alternative 4

### Economic impacts: employment, wages, and taxes

The economic impacts of Alternative 4 are presented in Tables 11 and 12. Table 11 details the effects of the first-year net increase in harvest of 14.92 MMBF: supporting 18.6 FTE jobs in Forestry (0.75), Commercial Logging (7.46) and Sawmills (10.3) at an average monthly wage of \$4,591 with a LWP of \$604. Proprietor monthly income in Forestry is \$6,856, Commercial Logging, \$103,236 and Sawmills, \$1,962. Proprietor income exerts a considerable impact on induced employment: an increase from 8 to 13.9 FTE, with similarly impacts on business taxes. Indirect employment is 9.9 FTE with an average monthly wage of \$7,335 yielding a LWP of \$3,348. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 13.9 FTE with an average monthly wage of \$2,283 and a LWP of -\$1,704, an outcome explained by employment in retail and food related sectors.

The economic impacts over the remaining 9 years of a net harvest totaling 6.75 MMBF are presented in Table 12. Results indicate support of 8.4 FTE jobs in forestry (0.34), commercial logging (3.4) and sawmills (4.7) at an average monthly wage of \$4,612 with a LWP of \$625. Proprietor monthly income in Forestry is \$2,914, Commercial Logging, \$46,800 and Sawmills, \$895. Proprietor income exerts a considerable impact on induced employment: an increase from 3.6 to 6.3 FTE, with similarly impacts on business taxes. Indirect employment is 4.5 FTE with an average monthly wage of \$7,354 yielding a LWP of \$3,367. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 6.3 FTE with an average monthly wage of \$2,283 and a LWP of -\$1,704, an outcome explained by employment in retail and food related sectors.

Annual business tax revenues under Alternative 4 total \$225,908 in year 1, with approximately 38% accruing to local and county government in an amount of \$83,586. The distribution of those revenues is heavily skewed to the one year arrearage harvest. Annual business tax revenues decline to \$102,454, with local tax revenues declining to \$38,933 the following nine years.



Table 11: Net direct, indirect, and induced impacts on employment, wages, and taxes resulting from Sustainable Harvest Alternative 4 (arrearage up front): 148 MMBF harvested annually in Clallam, Jefferson, and Mason Counties in 2015.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	18.6	\$ 4,591	\$ 604	\$ 12,637	\$ 20,617
Indirect	9.9	\$ 7,335	\$ 3,348	\$ 22,572	\$ 36,828
Induced	13.9	\$ 2,283	\$ -1,704	\$ 50,637	\$ 82,617
Total	42.4	\$ 4,475	\$ 488	\$ 83,586	\$ 142,322

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* LWP = estimated wage - living wage.

*d:* local taxes includes both city and county.

Table 12: Net direct, indirect, and induced impacts on employment, wages, and taxes resulting from Sustainable Harvest Alternative 4 (arrearage up front): 122 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2016 through 2024.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	8.4	\$ 4,612	\$ 625	\$ 5,688	\$ 9,281
Indirect	4.5	\$ 7,354	\$ 3,367	\$ 10,287	\$ 16,783
Induced	6.3	\$ 2,283	\$ -1,704	\$ 22,958	\$ 37,457
Total	19.2	\$ 4,491	\$ 504	\$ 38,933	\$ 63,521

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* Living Wage Premium = living wage - estimated wage.

*d:* local taxes includes both city and county.

### Timber harvest and excise tax revenues to Junior taxing districts

Tables 13 and 14 present timber harvest and excise tax revenues to aggregated JTDs. Table 13 distributions are based on the one year harvest level of 148 MMBF across the OESF and Clallam, Jefferson, and Mason counties, a net increase of 14.92 MMBF; Table 14 is based 122 MMBF - a net increase of 6.75 MMBF - for the period 2016-2024. Of the total \$4,586,569 going to all junior taxing districts, \$4,885,751 comes from FBTL revenues while timber excise tax revenues decline by -\$299,182. Similar to Alternative 2, the distribution of harvest skews heavily towards the OESF, and suggests that the total harvest in Clallam County would be lower, leading to a net loss in excise tax revenues. In the remaining nine years, total JTD revenues of \$2,896,982 are comprised of net increases in both FBTP revenues (\$2,307,825) and excise tax remittances (\$589,157).

Table 13: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 4 (arrearage up front): 148 MMBF harvested annually in Clallam, Jefferson, and Mason Counties in 2015.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 1,819,738	\$ -124,683	\$ 1,695,055
Port of Port Angeles	\$ 91,464	\$ -8,571	\$ 82,893
North Olympic Library System	\$ 238,850	\$ -22,817	\$ 216,033
School Districts	\$ 1,356,366	\$ -93,729	\$ 1,262,637
Schools Bond	\$ 403,466	\$ -54,424	\$ 349,042
Fire Districts	\$ 372,444	\$ -8,843	\$ 363,601
Hospital Districts	\$ 304,343	\$ -31,598	\$ 272,745
Total <sup>b</sup>	\$ 4,885,751	\$ -299,182	\$ 4,586,569

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

Table 14: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 4 (arrearage up front): 122 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2016 through 2024.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 859,568	\$ 245,530	\$ 1,105,098
Port of Port Angeles	\$ 43,204	\$ 16,879	\$ 60,083
North Olympic Library System	\$ 112,823	\$ 44,932	\$ 157,755
School Districts	\$ 640,691	\$ 184,574	\$ 825,265
Schools Bond	\$ 190,580	\$ 107,174	\$ 297,754
Fire Districts	\$ 175,927	\$ 17,414	\$ 193,341
Hospital Districts	\$ 143,759	\$ 62,224	\$ 205,983
Total <sup>b</sup>	\$ 2,307,825	\$ 589,157	\$ 2,896,982

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

## Alternative 5

### Economic impacts: employment, wages, and taxes

The economic impacts in terms of employment, wages, and LWP for Alternative 5 are presented in Table 15. The net increase in harvests of 6.46 MMBF can support 8 direct FTE jobs in Forestry (0.38), Commercial Logging (3.77) and Sawmills (4.66) at an average monthly wage of \$4,596 with a LWP of \$609. Proprietor monthly income in forestry is \$2,742, commercial logging, \$44,460 and wood manufacturing, \$850. Proprietor income exerts a considerable impact on induced employment: an increase from 3.4 to 6 FTE, with similarly impacts on business taxes. Indirect employment is 4.3 FTE with an average monthly wage of \$7,304 yielding a LWP of \$3,317. This high LWP is explained by high paying occupations in Forestry and Wholesaling, and proprietor income. Induced employment is 6 FTE with an average monthly wage of \$2,276 and a LWP of -\$1,711, an outcome explained by employment in retail and food related sectors.

Annual business tax revenues under Alternative 5 total \$97,361, with approximately 38% accruing to local and

county government in an amount of \$36,024. Direct, indirect and induced contributions to local government are \$5,427, \$9,779 and \$21,791. The increase in induced business taxes resulting from proprietor income is \$9,261: \$9,261 of the induced business taxes results from proprietor income.

Table 15: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 5 (passive): 121 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2016 through 2024.

Impact	— Employment and Wages —			— Business Taxes —	
	FTE <sup>a</sup>	Avg Wage <sup>b</sup>	LWP <sup>c</sup>	Local <sup>d</sup>	State
Direct	8.0	\$ 4,596	\$ 609	\$ 5,427	\$ 8,855
Indirect	4.3	\$ 7,304	\$ 3,317	\$ 9,779	\$ 15,954
Induced	6.0	\$ 2,276	\$ -1,711	\$ 21,791	\$ 35,555
Total	18.3	\$ 4,472	\$ 485	\$ 36,024	\$ 61,337

*a:* Full Time Equivalent in Clallam County as a function of MMBF harvested.

*b:* Average Monthly wage calculated by Implan.

*c:* LWP = estimated wage - living wage.

*d:* local taxes includes both city and county.

### Timber harvest and excise tax revenues to Junior taxing districts

Table 16 presents the share of timber harvest excise tax revenues apportioned to junior taxing districts in Clallam County based on a net increase of 6.5 MMBF annually over extant levels. Of the total \$2,831,998 going to all junior taxing districts, \$2,208,674 comes from FBTL revenues and \$623,324 from timber excise taxes.

Table 16: Timber harvest and excise tax revenues by aggregated junior taxing districts under DNR Sustainable Harvest Alternative 5 (passive): 121 MMBF harvested annually in Clallam, Jefferson, and Mason Counties from 2016 through 2024.

Junior Taxing District	FBTPL Revenue <sup>a</sup>	Tax Revenue	Total Revenue
Clallam General	\$ 822,639	\$ 259,769	\$ 1,082,408
Port of Port Angeles	\$ 41,348	\$ 17,858	\$ 59,206
North Olympic Library System	\$ 107,975	\$ 47,538	\$ 155,513
School Districts	\$ 613,165	\$ 195,277	\$ 808,442
Schools Bond	\$ 182,392	\$ 113,389	\$ 295,781
Fire Districts	\$ 168,368	\$ 18,423	\$ 186,791
Hospital Districts	\$ 137,583	\$ 65,833	\$ 203,416
Total <sup>b</sup>	\$ 2,208,674	\$ 623,324	\$ 2,831,998

*a:* Forest Board Transfer Lands revenue less DNR management fee.

*b:* Total across all junior taxing districts; only selected districts shown here.

## Summary and Conclusions

The analysis in this report details the expected distribution of economic impacts on Clallam County by sustainable harvest alternatives presented in DEIS. To establish a directly comparative framework, the net change for each DEIS alternative relative to a historic average harvest level of 22.86 MMBF was calculated. By focusing on net change in harvest, direct, indirect and induced changes in economic impacts are derived to assess potential increased sustainable community economic development. This was made possible by interpolating statistically the number of FTE jobs in Clallam County in Forestry, Commercial Logging and Wood Manufacturing per MMBF harvested on the Olympic Peninsula. The result was a multiplier on harvest for employment. Using the specified harvests by county in the DEIS and the portion expected to originate from Clallam County FBTP, along with the historical millage among JTDs, harvest and excise tax revenues to JTDs were estimated. The employment multipliers, along with the net change in harvest under each alternative, were used to estimate direct, indirect and induced changes in employment, average wages, LWP, proprietor income and annual business taxes. Summary results for the economic impact analyses are presented in tables 17 and 18. Those results are used to rank DEIS alternatives in terms of their economic impacts to Clallam County. That ranking includes Alternative 2', the even-flow harvest requested by both the Clallam County and Port of Port Angeles Commissioners.

Alternative 2' provides the greatest contribution to Clallam County in terms of potential increases to sustainable community economic development and in terms of harvest revenues. Alternative 2 ranks a close second. Similarities in the harvests and relative impacts deserve some explanations. The fundamental difference in the alternatives is harvest volumes by year and over time. Alternative 2 stipulates five years of 17.48 MMBF harvested followed by 4.43 MMBF for five years. Table 17 reveals that 13.6 direct FTE at an average monthly wage of \$4,568 can be supported along with 7.3 indirect FTE at an average monthly wage of \$7,377 and 10.2 induced FTE at an average monthly wage of \$2,284. This is the average impact over ten years. While employment totals only differ by 0.1 FTE, subtle differences and slight variations in estimated wages by effect, account for different net present value monetary flows between Alternative 2 and Alternative 2' in table 18. Alternative 2' could provide \$29,721 more in direct wages, \$25,148 more in indirect wages, and \$10,759 more in induced wages. The other net present value monetary flows between these two alternatives vary by category, with Alternative 2' providing a greater flow for all categories except excise taxes, where Alternative 2 provides \$936,104 or \$169,751 more. The sum of all net present value monetary flows indicates that Alternative 2' provides the greatest potential contribution to Clallam County at \$57,079,983. Alternative 2 would provide \$56,685,102 or a net loss to Clallam County of \$394,881 relative to the best alternative.

Alternative 3 provides the next best increase in employment at 22.4 FTE with an average monthly wage of \$4,477 with LWP \$490. That employment effect is aggregated from 9.8 FTE in the forest product industry paying an average monthly wage of \$4,600, 5.3 indirect FTE in the supply chain, paying an average monthly wage of \$7,257, and 7.3 induced jobs in the general economy at an average monthly wage of \$2,294. Alternative 4 ranks third with 21.5 FTE at an average monthly wage of \$4,489 with LWP \$502. That employment effect is aggregated from 9.4 FTE in the forest product industry paying an average monthly wage of \$4,610, 5 indirect FTE in the supply chain, paying an average monthly wage of \$7,352, and 7 induced jobs in the general economy at an average monthly wage of \$2,283. Alternative 5 ranks fourth with 18.3 FTE at an average monthly wage of \$4,472 with LWP \$485. That employment effect is aggregated from 8 FTE in the forest product industry paying an average monthly wage of \$4,596, 4.3 indirect FTE in the supply chain, paying an average monthly wage of \$7,304, and 6 induced jobs in the general economy at an average monthly wage of \$2,276. Alternative 1 makes the smallest contribution to Clallam County in terms of employment and income with 7.6 FTE at an average monthly wage of \$4,473 with LWP \$486. That employment effect is aggregated from 3.3 FTE in the forest product industry paying an average monthly wage of \$4,632, 1.8 indirect FTE in the supply chain, paying an average monthly wage of \$7,241, and 2.5 induced jobs in the general economy at an average monthly wage of \$2,284. The cost to Clallam County of Alternative 1 relative

to Alternative 2' in terms of wages and employment is 23.5 FTE at an average monthly wage of \$4,480 and LWP \$493.

Any alternative selected other than Alternative 2' results in losses to Clallam County from the direct, indirect and induced economic impacts analyzed in this study. However, foregone potential sustainable community development also involves sectors not explicitly examined, and thus could be greater. Many opportunities exist for growth in wood fiber value added activities, from manufacture of wood products like trusses and windows, to the development of a new associated sector like cross laminated timber, a renewable substitute for the carbon intensive building materials steel and concrete. And then there is the potential of biofuels and the production of renewable cellulose based liquid fuels that can substitute for fossil fuel products in transportation.

Table 18 presents the net present value of monetary flows over each of the sustainable ten year harvest alternatives, discounted at the 2 percent rate used by DNR. This makes possible direct comparison of the contributions of Alternatives 1 through 5 in terms of direct wages, indirect wages, induced wages, local and state business taxes, harvest revenues to junior taxing districts and excise tax revenues. These are summed to create a total net present value for monetary benefits to be derived by Clallam County under each alternative.

The results in table 18 reinforce the comparative distributive analysis above. Alternative 2' provides the greatest monetary contribution to Clallam County at \$57,079,983. All other alternatives provide less in monetary flows and thus represent a loss in potential monetary gains to the county. In descending order, Alternative 2 provides \$56,685,102, for a net loss of \$394,876. Alternative 3 provides \$44,785,801 in monetary flows, for a net loss of \$11,899,306. Alternative 4 provides \$43,385,871 for a net loss of \$13,299,236. Alternative 5 provides \$39,103,831 for a net loss of \$17,581,276. Alternative 1, with \$24,350,203 in monetary flows would cost Clallam County \$32,334,905.

Table 17: Summary of employment, wages, and living wage premium by DNR Sustainable Harvest Alternative.

	— DIRECT —			— INDIRECT —			— INDUCED —			— TOTAL —		
	FTE	Wage	LWP	FTE	Wage	LWP	FTE	Wage	LWP	FTE	Wage	LWP
A1	3.3	\$ 4,632	\$ 645	1.8	\$ 7,241	\$ 3,254	2.5	\$ 2,284	\$ -1,716	7.6	\$ 4,473	\$ 486
A2 <sup>a</sup>	13.6	\$ 4,568	\$ 601	7.25	\$ 7,377	\$ 3,909	10.15	\$ 2,284	\$ -1,711	31	\$ 4,483	\$ 496
A2' <sup>b</sup>	13.6	\$ 4,604	\$ 617	7.3	\$ 7,323	\$ 3,336	10.2	\$ 2,280	\$ -1,707	31.1	\$ 4,480	\$ 493
A3	9.8	\$ 4,600	\$ 613	5.3	\$ 7,257	\$ 3,270	7.3	\$ 2,294	\$ -1,693	22.4	\$ 4,477	\$ 490
A4 <sup>c</sup>	9.4	\$ 4,610	\$ 623	5.0	\$ 7,352	\$ 3,365	7.0	\$ 2,283	\$ -1,704	21.5	\$ 4,489	\$ 502
A5	8	\$ 4,596	\$ 609	4.3	\$ 7,304	\$ 3,317	6.0	\$ 2,276	\$ -1,711	18.3	\$ 4,472	\$ 485

a,c: Averages weighted by distribution of harvest over the ten year period.

b: Rounding to tenths of FTE would imply totals in A2 and A2' are the same, where they actually differ slightly.

Table 18: Summary of present value of employment wages, business taxes, and timber revenues by DNR Sustainable Harvest Alternative.

	Alt 1	Alt 2	Alt 2 <sup>a</sup>	Alt 3	Alt 4	Alt 5
Direct wages	\$ 1,833,824	\$ 7,482,175	\$ 7,511,896	\$ 5,408,280	\$ 5,207,583	\$ 4,411,083
Indirect wages	\$ 1,563,674	\$ 6,388,236	\$ 6,413,384	\$ 4,614,325	\$ 4,444,473	\$ 3,767,944
Induced wages	\$ 681,134	\$ 2,779,280	\$ 2,790,039	\$ 2,009,053	\$ 1,933,736	\$ 1,638,320
Local taxes	\$ 149,613	\$ 627,108	\$ 629,536	\$ 453,209	\$ 433,888	\$ 360,152
State taxes	\$ 254,758	\$ 1,023,173	\$ 1,027,139	\$ 739,449	\$ 713,856	\$ 613,220
Harvest rev.	\$ 9,194,865	\$ 37,449,027	\$ 37,941,636	\$ 27,037,688	\$ 25,650,543	\$ 22,081,349
Excise taxes	\$ 10,672,334	\$ 936,104	\$ 766,353	\$ 4,523,795	\$ 5,001,793	\$ 6,231,763
Total product <sup>b</sup>	\$ 24,350,203	\$ 56,685,102	\$ 57,079,983	\$ 44,785,801	\$ 43,385,871	\$ 39,103,831

*a*: Even-flow version of Alternative 2.

*b*: Discount rate = 0.02

## Appendix A: The Language of Economic Development

**Economic Impact Analysis** - It is often important to know how changes in business operations will affect the local, regional or state-wide economy. A number of measures have been developed to gauge those affects. In general, a change might expand the local economy or cause it to contract. These changes are driven by expenditures: if a business spends more (or less), or if sales increase (decrease), the income of those receiving those monies will increase (decrease). With more income, they spend more, creating more income elsewhere. In this process some of the monies spent are drained away from the local economy. This drain, or leakage, results when things are purchased from suppliers or retailers located outside the local economy. Economic impact analysis traces those expenditure flows and quantifies the resulting changes in employment, income, and tax revenues.

**Economic Multipliers** - Changes in income and/or expenditures create subsequent rounds of additional income and/or expenditures. Leakages resulting from income and/or expenditures exiting the local economy limit the total expansion (contraction). The total change - initial change to final result - is the multiplier process.

**Direct Effects** - When a business expands production facilities, or adds a shift, or even a new employee, as a result of a particular activity to be analyzed, the result is called a direct effect. It is called a direct effect because it results from a decision made by the business under study. That direct effect then has subsequent impacts.

**Indirect Effects** - Changes in employment in turn change the expenditures made to operate that business. It may purchase more materials, contract for services, and have similar impacts on the supply chain. They are called indirect effects because these changes occur in the supply chain and are caused by the direct effect.

**Induced Effects** - Direct and indirect effects create income for those newly employed. As they spend that income, those expenditures support employment in establishments where the income is spent. These impacts are thus induced by direct and indirect effects across the local economy.

**Measures of Employment and Income** - For each effect, direct, indirect and induced, FTE jobs can be estimated by tracing expenditure flows. FTEs reported are based on average relationships for a particular economic sector. For instance, we can determine that sales of \$XX support xx direct jobs and create \$xx in wages; indirectly we see \$YY sales, yy indirect jobs, and \$yy in wages. Finally, those xx and yy jobs with \$xx and \$yy in wages support zz induced jobs and \$zz in wages. These relationships are captured by IMPLAN.

**Using IMPLAN** - Olympus Consulting uses IMPLAN to conduct economic impact analysis. IMPLAN is “the standard.” It is a powerful model that can trace out changes between economic sectors using the measures described above. If I know payroll in a sector, I can determine the sales necessary to support that payroll. If I know payroll and sales, I can make more accurate estimates of indirect and induced effects. In general, more information supports more accurate estimated economic impacts.

**Living Wage Premiums (LWP)** - To assess whether a job, on average, improves the quality of life for families in Clallam County, we can use living wage analysis. For instance, we use a family of 4 (2 adults, one working, with 2 children). An index for estimating living wages has been developed for each county in the USA. In Clallam County, for 2016, the living wage for a family of four was \$39,899. Olympus Consulting uses a living wage premium (LWP) to assess a wage. Using the example above for that job in sector XX paying \$38,000, we have:

$$LWP = \$38,000 - \$39,899 = -\$1,899.$$

As the sign is negative, we see the new job in sector XX does not pay a living wage, even though that job pays an above average wage. In fact, it is \$1,899 short of a living wage for a family of four. In this way, the LWP is a useful measure to assess the economic impacts of changes in employment in a county.