LD JELLISON

Biomass Fuel Resource Study

The Evergreen State College

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CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

FUEL RESOURCE STUDY

SUBMITTED TO:

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Submitted for The Evergreen State College
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I. EXECUTIVE SUMMARY

The Evergreen State College (TESC) is exploring the feasibility of a woody biomass heat facility to be located at the college's downtown campus in Thurston County, Washington. The facility would utilize a Nexterra gasification system, and would have a boiler size that would produce 15,000 pounds per hour (PPH) of steam.

TESC contracted with McKinstry Essention, Inc. (McKinstry), an energy service company (ESCO) for the purposes of conducting an investment grade audit of the biomass heat facility. McKinstry subcontracted with LD Jellison, Inc., (LD Jellison), a Washington forest products and renewable energy consulting firm, to conduct this Fuel Resource Study to provide a third-party independent analysis of the available woody biomass within the resource areas for the facility.

LD Jellison has more than 100 combined years of experience in the forest products industry and has performed numerous fuel resource studies and biomass feasibility analyses throughout the United States. LD Jellison is a partner of the U.S. Environmental Protection Agency (EPA) combined heat and power (CHP) partnership program and adheres to the CHP Project Development Handbook guidelines set forth by the EPA.

In accordance with its scope of services, this study analyzed only the potential biomass available as fuel for the biomass facility. LD Jellison analyzed and conducted interviews with (1) public and private commercial timberland owners, (2) biomass fuel processors and suppliers, and (3) biomass fuel consumers within the resource area, and collected, reviewed, and analyzed data from industry sources in order to provide the following analyses:

(1) **A qualitative analysis** determined that the potentially available woody biomass within the potential resource areas is composed of a combined aggregate of 10% of secondary mill residues and urban wood waste.

(2) **A quantitative analysis** determined that approximately 548,827 bone dry tons (BDT)[1] of accessible woody biomass are potentially available annually from public and private commercial timberlands within the study resource areas.

(3) **An economic analysis** of the projected cost of retrieving the potentially available fuel for the proposed biomass facility determined that the current average delivered price for forest residual biomass hogfuel within the potential resource area is approximately $24 per BDT, and that the average long-term forecast delivered price (with standard industry escalators) is estimated to be within the range of $35 to $45 per BDT.

(4) **A competition analysis** reviewed current competitors for woody biomass for the biomass facility within the study resource areas.

In addition, LD Jellison provided an analysis of various public and private commercial timberlands with respect to their certification with the Sustainable Forestry Initiative (SFI) in accordance with its forestry and environmental standards in order to assist TESC in ultimately procuring woody biomass that would have the effect of positively promoting the sustainability of forests and the environment.

[1] A bone dry ton (BDT) is the equivalent of 2,000 pounds of woody material that contains 0% moisture.

After conducting these analyses, LD Jellison concludes that there is sufficiently available woody biomass as fuel in order to justify the proposed biomass facility.

II. STUDY OVERVIEW

This study is designed to investigate and analyze four main aspects of the feasibility of acquiring woody biomass for fuel (feedstock) in the defined resource area for the proposed biomass facility:

1) a **qualitative analysis** of the potentially available fuel for the proposed biomass facility within the potential resource areas;

2) a **quantitative analysis** of the potentially available fuel for the proposed biomass facility within the potential resource areas;

3) an **economic analysis** of the projected cost of retrieving the potentially available fuel for the proposed biomass facility from within the potential resource areas; and

4) a **competition analysis** of the current competitors for potentially available fuel for the proposed biomass facility within the potential resource areas.

Each of these analyses was summarized, plus an assessment of the adherence to the SFI standards by public and private commercial timberland owners. The purpose of this study is to determine whether from the standpoint of the annual fuel requirement of approximately 5,500 BDT the proposed 15,000 PPH Nexterra gasification system is economically viable and feasible, and whether the fuel can be procured in such a way as to positively promote the sustainability of the forests and environment.

In this study, we conducted interviews with public and private landowners, biomass fuel processors and suppliers, and biomass fuel consumers within the study resource areas. We also obtained and analyzed information from a variety of industry sources, including the USDA Forest Service, the National Renewable Energy Laboratories of the U.S. Department of Energy, the Washington Department of Ecology, Washington State University, University of Washington, the Washington Department of Natural Resources, the Northwest Power and Conservation Council, Atterbury Consultants, Inc., RISI, Inc., various county graphical information services (GIS), third-party consultants, and local news media sources.

LD Jellison made the following assumptions in accordance with performing the analyses for this study and developing conclusions:

1. Woody biomass would be the sole fuel source for the biomass facility.

2. The facility would consume 5,500 BDT of woody biomass annually.

3. The site for the proposed woody biomass facility (Site) would be located on TESC's downtown campus in Olympia, Washington.

4. The potential resource areas for available fuel covers everything within a 90 minute haul-time of the Site, as shown on Figure 1 (Study Resource Area),[2] and the following eight counties that make up a majority of the public and private commercial timberlands within the Study Resource Area: Cowlitz County, Grays Harbor, King County, Kitsap County, Lewis County, Mason County, Pierce County, and Thurston County (Study Resource Counties).

[2] A full 90-Minute Haul Time Map is included in Appendix A.

5. The forecasted long-term current average and inflation-adjusted price for forest residual biomass hogfuel within the study resource areas cannot exceed $45 per BDT in order for the facility to be economically viable and feasible.

6. All information and data collected by or provided to LD Jellison in conducting this study are true, accurate, and complete.

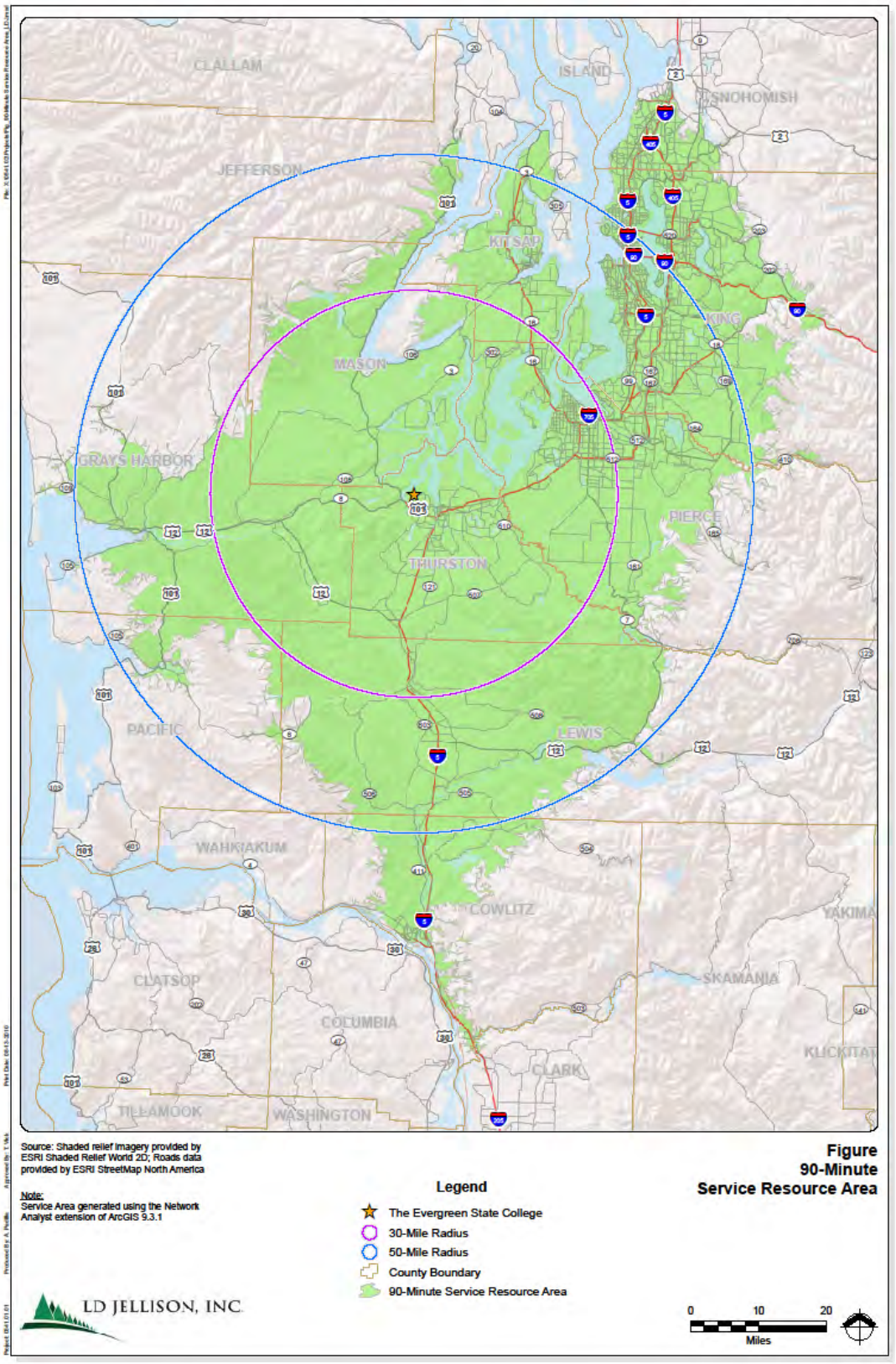


Figure 1: Study Resource Area (90 Minute Haul Time). Source: LD Jellison.

III. QUALITATIVE ANALYSIS: FUEL COMPOSITION AND QUALITY

The forest products industry recognizes four general types of woody biomass: forest residues, primary mill residues, secondary mill residues, and urban wood waste. It is recommended that a maximum of 30% of secondary mill residues and urban wood residues to fuel the proposed biomass facility.[3] The following sections describe each of the four types of woody biomass and analyze the availability of each general type of woody biomass in the Study Resource Area.

Forest Residues

Forest residues include logging residues and other removable material left after carrying out silviculture operations and site conversions. Logging residue comprises unused portions of trees cut or killed by logging and left in the woods.[4] Figure illustrates the National Renewable Energy Laboratory's (NREL) 2009 estimate of the national distribution of forest residues, county-by-county across the entire United States.

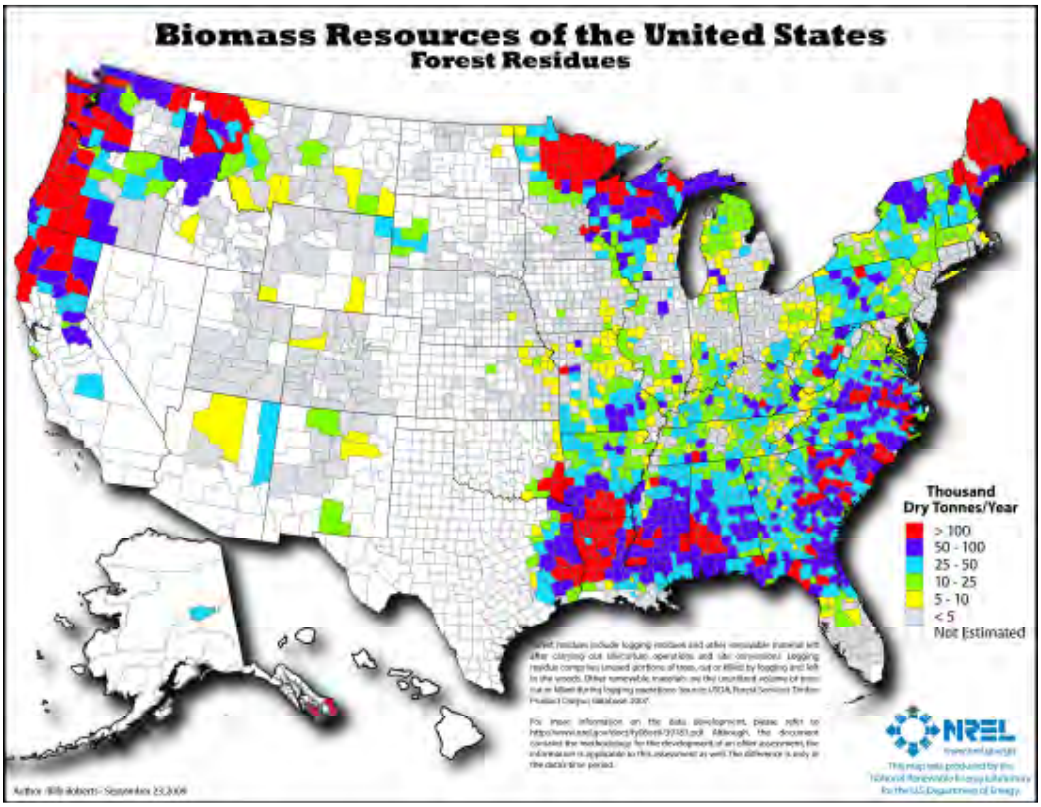


Figure 2: Distribution of forest residues in the United States. Source: National Renewable Energy Laboratories, 2009.

[3] It is essential that the urban wood residues, as with all other fuels, meet the fuel quality and specifications standards of the boiler manufacturer in order for the TESC biomass facility to be successful. While the qualitative analysis of the potentially available woody biomass within the study resource areas addresses the qualities of the types of the fuels, this study did not analyze the actual and sample the actual fuels proposed for the biomass technology and facility.

[4]United States Department of Agriculture/National Renewable Energy Laboratory definition of forest residues.

As shown in Figure 2, high concentrations of forest residues exist in Western Washington and the Study Resource Counties.

Primary Mill Residues

Primary mill residues include wood materials (coarse and fine) and bark generated at manufacturing plants (primary wood-using mills) when round wood products are processed into primary wood products such as slabs, edgings, trimmings, sawdust, veneer clippings and cores, and pulp screenings.[5] Figure 3 illustrates the national distribution of primary mill residues, county-by-county across the United States, as estimated by NREL in 2009.

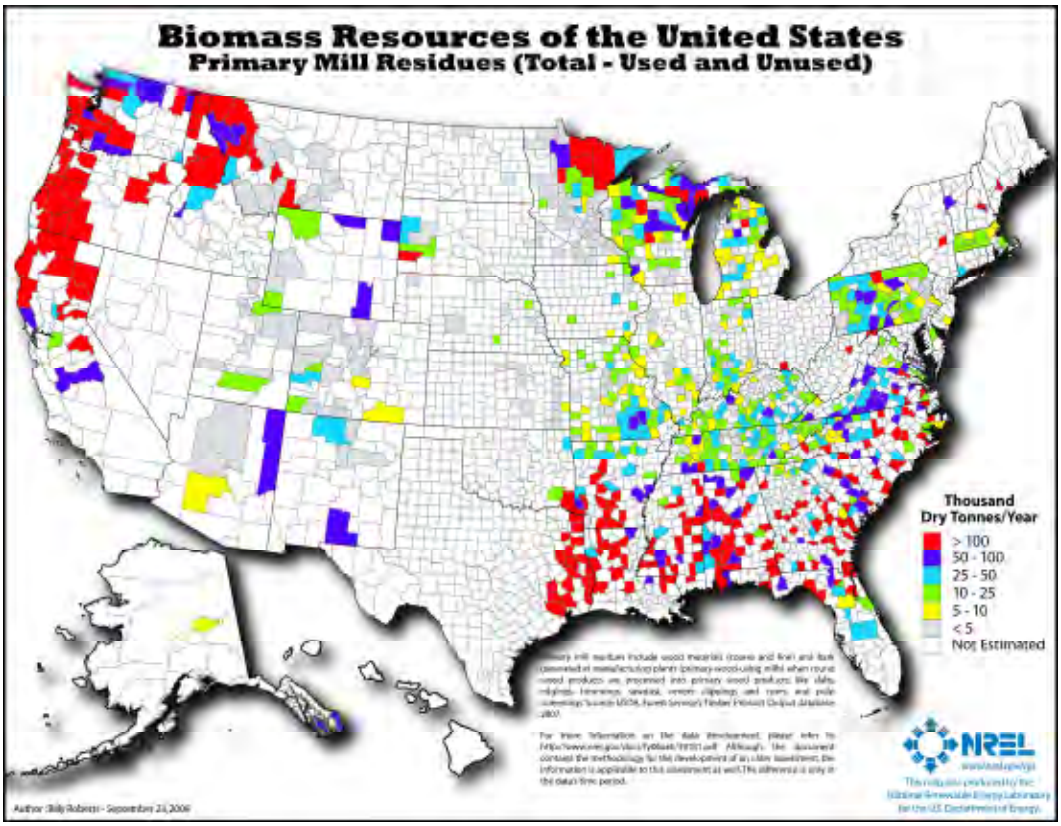


Figure 3: Distribution of primary mill residues in the United States. Source: National Renewable Energy Laboratories, 2009.

As shown in Figure 3, high concentrations of primary mill residues exist in Western Washington and the Study Resource Counties.

Secondary Mill Residues

Secondary mill residues include wood scraps and sawdust from woodworking shops, furniture factories, wood container and pallet mills, and wholesale lumberyards.[6] Figure 4 illustrates the national distribution of secondary mill residues, county-by-county basis across the United States, as estimated by NREL in 2009.

[5] NREL definition for primary mill residues.
[6] NREL definition for secondary mill residues'.

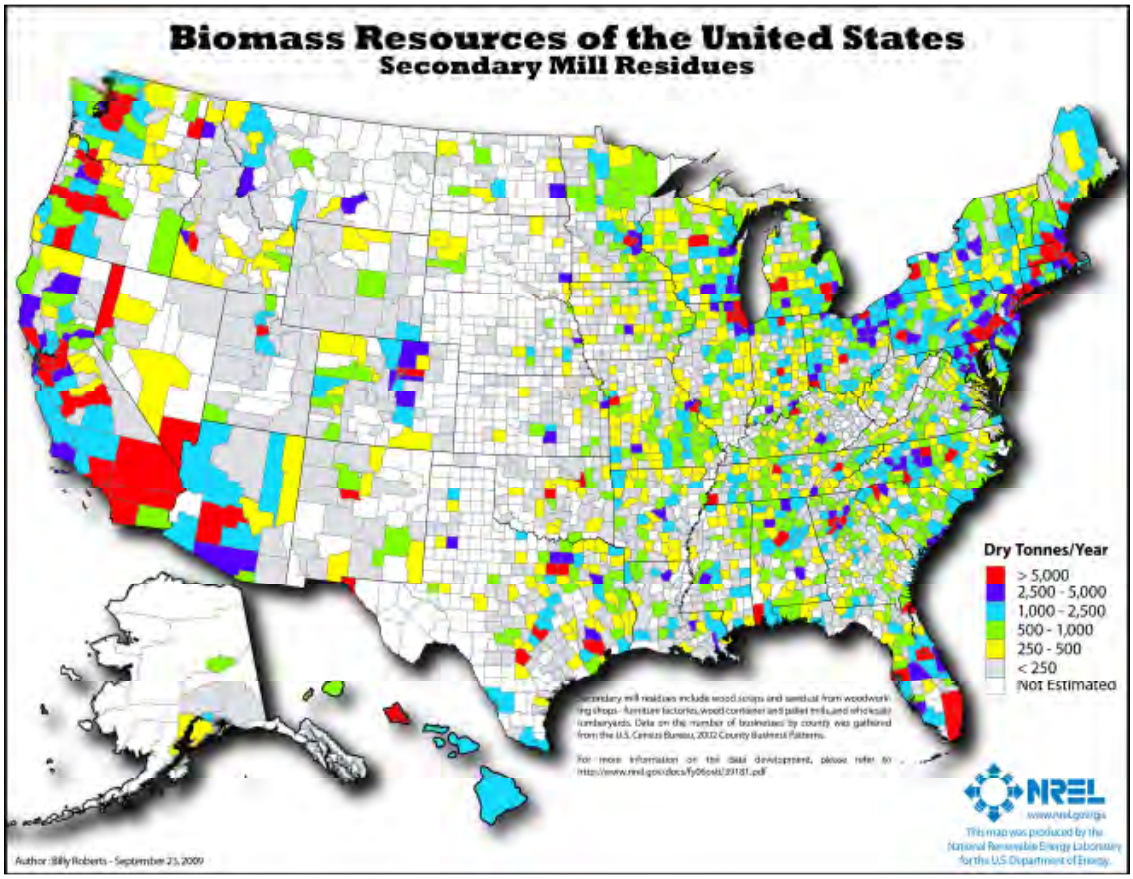


Figure 4: Distribution of secondary mill residues in the United States. Source: National Renewable Energy Laboratories, 2009.

As shown in Figure 4, moderate concentrations of secondary mill residues exist in Western Washington and the Study Resource Counties.

Urban Wood Residues

Urban wood residues include wood residues from municipal solid waste (wood chips and pallets), tree trimming from utilities or from private tree companies, and construction and demolition sites.[7] Figure 5 illustrates the national dispersal of urban wood residues, county-by-county across the United States, as estimated by NREL in 2009.

[7] NREL definition for urban wood residues.

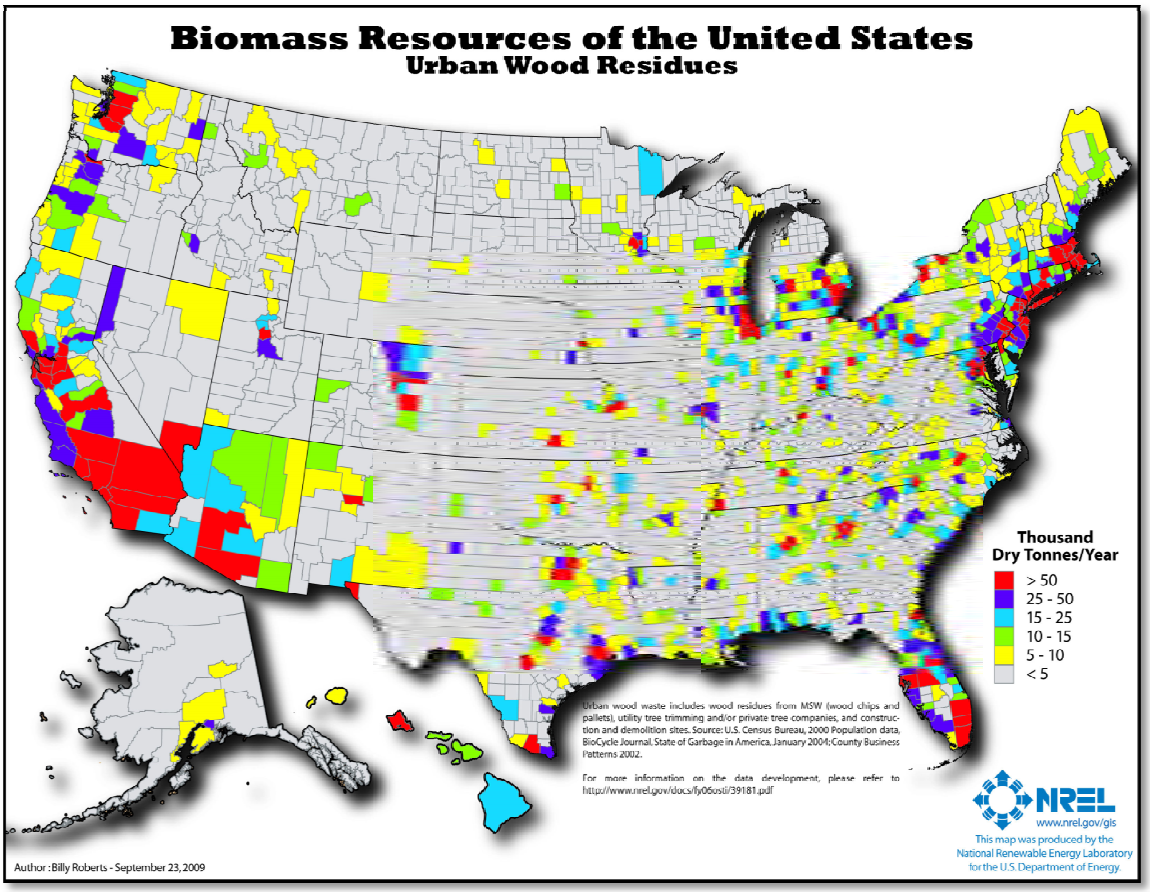


Figure 5: Distribution of urban wood residues in the United States. Source: National Renewable Energy Laboratories, 2009.

As shown in Figure 5, moderate concentrations of urban wood residues exist in Western Washington and the Study Resource Counties.

Washington

According to 2005 NREL estimates, the composition of all woody biomass (forest residues, primary mill residues, secondary mill residues, and urban wood waste) available annually in Washington is shown on Figures 6 and 7.[8]

[8] Anelia Milbrandt. "A Geographic Perspective on the Current Biomass Resource Availability in the United States." National Renewable Energy Laboratory, Golden CO, December 2005.

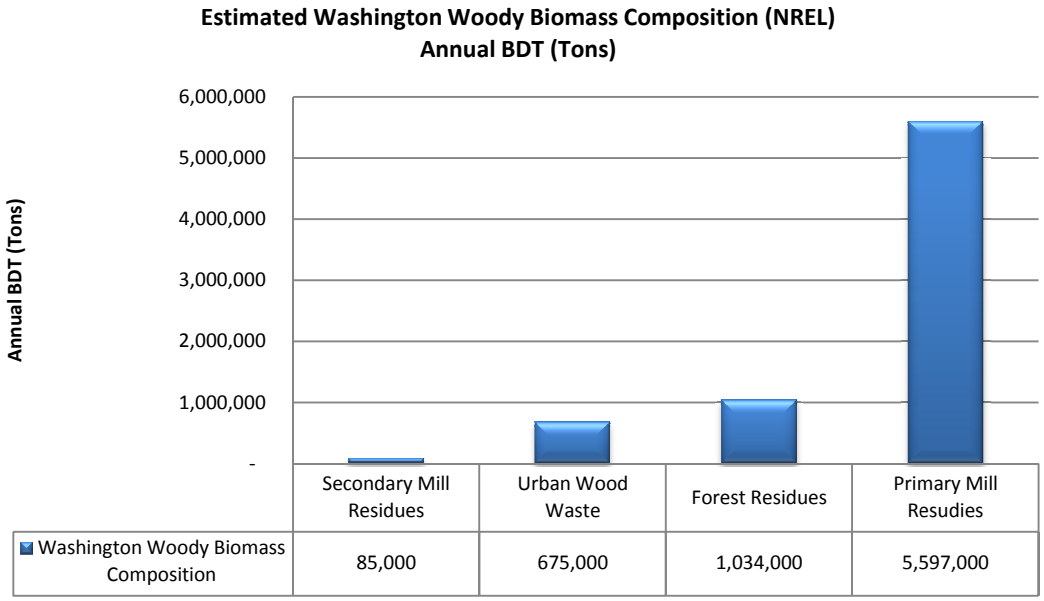


Figure 6: Estimated Washington Woody Biomass Composition (NREL). Source: National Renewable Energy Laboratories, 2005.

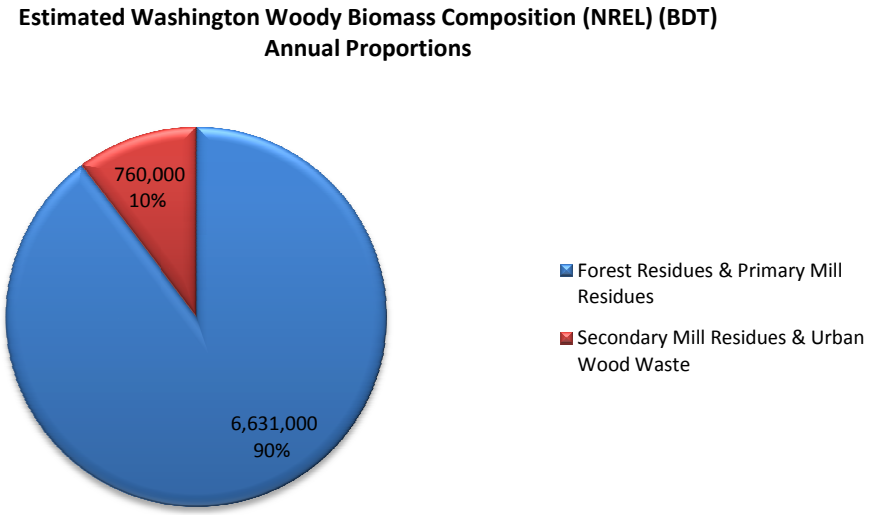


Figure 7: Estimated Washington Woody Biomass Composition (NREL). Source: National Renewable Energy Laboratories, 2005.

In addition to the 2005 NREL statewide estimate, a December 2005 Washington Department of Ecology (WDOE) and Washington State University (WSU) study estimated the amount of woody biomass in Washington[9] at 8,973,569 BDT of woody biomass available annually for energy use.[10] The results of the WDOE/WSU study are depicted on Figures 8 and 9.

[9] Biomass Inventory and Bioenergy Assessment: An Evaluation of Organic Material Resources for Bioenergy Production in Washington State, Mark R. Fuchs, C. Frear et al., December 2005, revised August 2006,

[10] The 2005 Washington Department Of Ecology/Washington State University study did not examine secondary mill residues, which were addressed in the NREL study. As with virtually any estimate of potentially available woody biomass, estimates will vary depending on assumptions of the area needing treatment, the volume removed per acre,

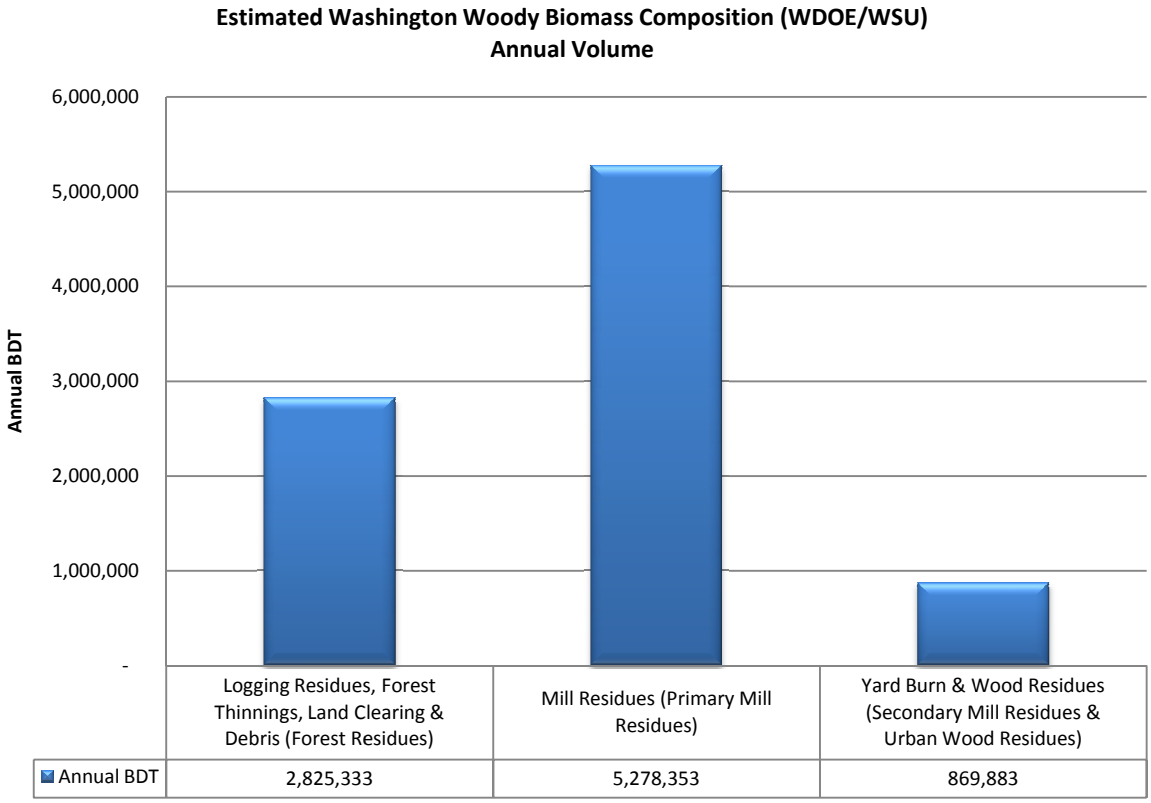


Figure 8: Estimated Washington Woody Biomass Composition (WDOE/WSU). Source: Washington Department of Ecology/Washington State University, 2005.

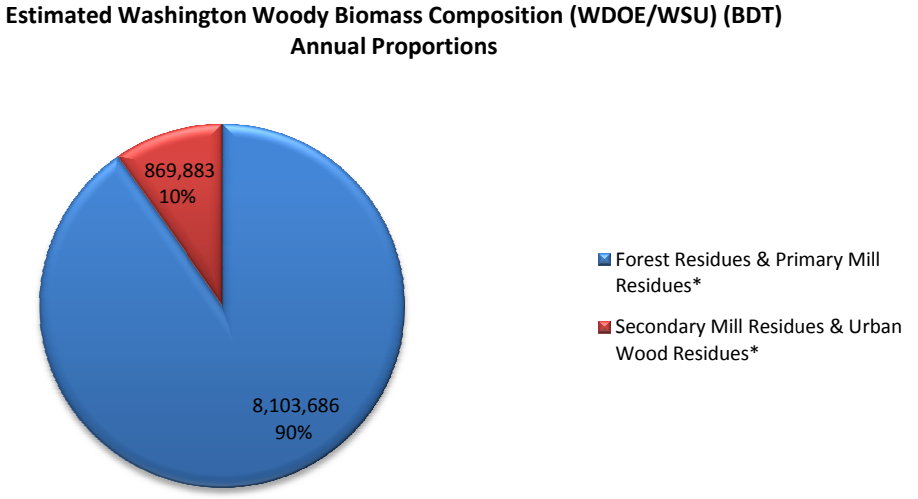


Figure 9: Estimated Washington Woody Biomass Composition (WDOE/WSU). Source: WDOE/WSU, 2005. *WDOE/WSU definitions approximated to NREL definitions of forest residues, primary mill residues, secondary mill residues and urban wood residues.

the proportion of volume that is biomass versus commercial timber, and the number of years over which treatments are completed.

Assuming that (1) logging residues, forest thinning, land clearing and debris are substantively equal to forest residues, (2) mill residues are substantively equal to primary mill residues, and (3) yard burn and wood residues are substantively equal to secondary mill residues and urban wood waste, then as a proportion this equates to approximately 90% forest residues and primary mill residues and 10% secondary mill residues and urban wood waste, which is significantly approximately equal to the 10% combined aggregate threshold for secondary mill residuals and urban wood residues.

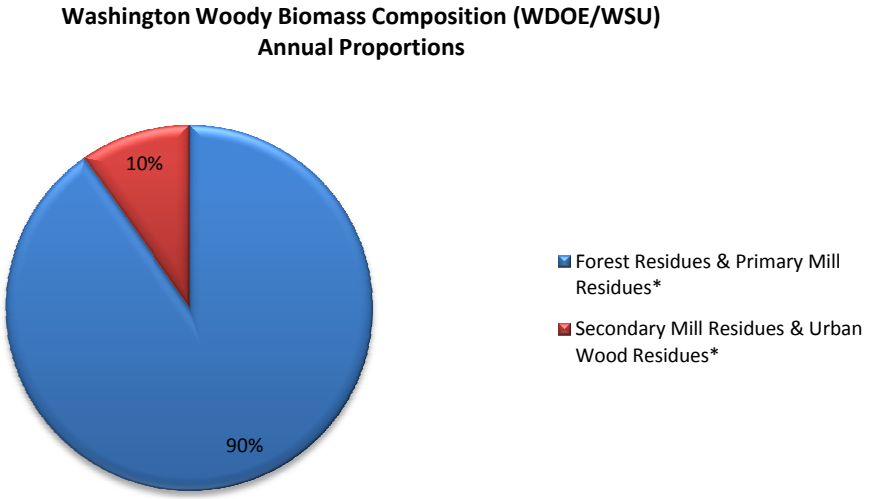


Figure 9: Estimated Washington Woody Biomass Composition (WDOE/WSU). Source: Washington Department of Ecology/Washington State University.
***WDOE/WSU definitions approximated to NREL definitions of forest residues, primary mill residues, secondary mill residues and urban wood residues.**

Summary of Qualitative Analysis

It is recommended that a maximum composition of 10% combined aggregate of secondary mill residues and urban wood residues for fuel for the proposed biomass facility. Based on the analysis of available data from the 2005 NREL and 2005 WDOE/WSU studies and our interviews with biomass fuel processors and suppliers, this study concluded that the makeup of the potentially available woody biomass within the study resource area is likely comprised of an estimated aggregate 10% of secondary mill residues and urban wood residues. This means that the composition of woody biomass residues within the study resource area is not overly weighted by secondary mill residues and urban wood residues so as to make the procurement of the required woody biomass for the proposed biomass facility difficult.

IV. QUANTITATIVE ANALYSIS: FUEL SUPPLY

This analysis considers ownership classes, timberland locations, timberland composition statistics, existing biomass assessments, and historical harvesting trends. In this study, we contacted both public and private landowners, biomass suppliers and processors, biomass consumers, fuel processors, and in-woods grinders within the study resource areas in order to determine the current and anticipated supply and demand for woody biomass. This information, in addition data analyzed from various governmental agencies and industry sources, allowed us to estimate the current amount of forest residues, primary mill residues, secondary mill residues, and urban wood residues within the study resource areas on an ongoing basis. By analyzing the current supply and demand for woody biomass, we were able to asses whether

there is sufficient biomass within the study resource areas, given the current demand, in order to adequately support the proposed biomass facility.

Forest Residues

Land Ownership Analysis

Using geographic information system (GIS) software and data obtained from the USDA Forest Service, this study estimates that the Study Resource Area is composed of approximately 1,752,641 acres of public and private commercial timberland. Figure 10 depicts a map showing the distribution of timberland with the Study Resource Area,[11] while Table 1 depicts the public and private commercial timberland ownership in terms of acreage and percentage distribution.

[11] A full 90-Minute Timberland Ownership Map is included in Appendix B.

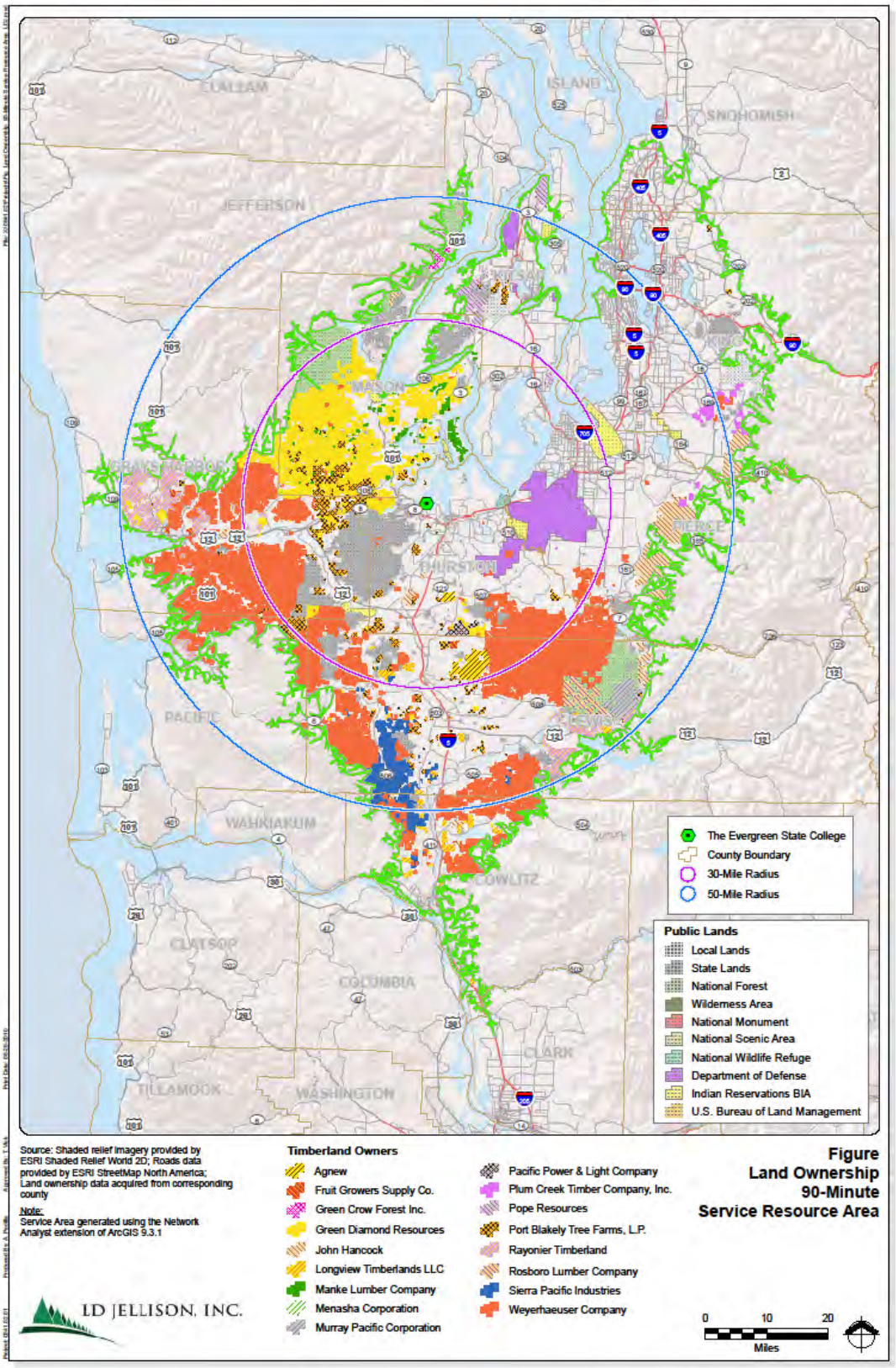


Figure 10: Study Resource Area Timberland Ownership Map: Source: LD Jellison.

Table 1 – Study Resource Area Timberland Ownership

PUBLIC TIMBMERLAND OWNERSHIP		
Landowner	**Acreage**	**Percentage**
Local	27,248	4.9%
State	281,472	50.2%
Federal	252,126	45.0%
Total Public Timberland	**560,847**	**100.0%**
PRIVATE COMMERCIAL TIMBERLAND OWNERSHIP		
Landowner	**Acreage**	**Percentage**
Agnew	12,531	1.1%
Fruit Growers Supply Co.	2,712	0.2%
Green Crow Forest Inc.	2,512	0.2%
Green Diamond Resources	206,096	17.3%
John Hancock	76,787	6.4%
Longview Timberlands LLC	16,162	1.4%
Manke Lumber Company	9,356	0.8%
Menasha Corporation	319	0.0%
Murray Pacific Corporation	13,941	1.2%
Pacific Power & Light Company	3,511	0.3%
Plum Creek Timber Company, Inc.	12,271	1.0%
Pope Resources	21,567	1.8%
Port Blakely Tree Farms, L.P.	61,852	5.2%
Rayonier Timberland	59,639	5.0%
Rosboro Lumber Company	12,008	1.0%
Sierra Pacific Industries	50,626	4.2%
Weyerhaeuser Company	629,907	52.9%
Total Private Commercial Timberland	**1,191,794**	**100.0%**

Source: LD Jellison.

Figure 11 shows the proportional acreage distribution of public and private commercial timberland within the Study Resource Area in relationship to the total amount of timberland.

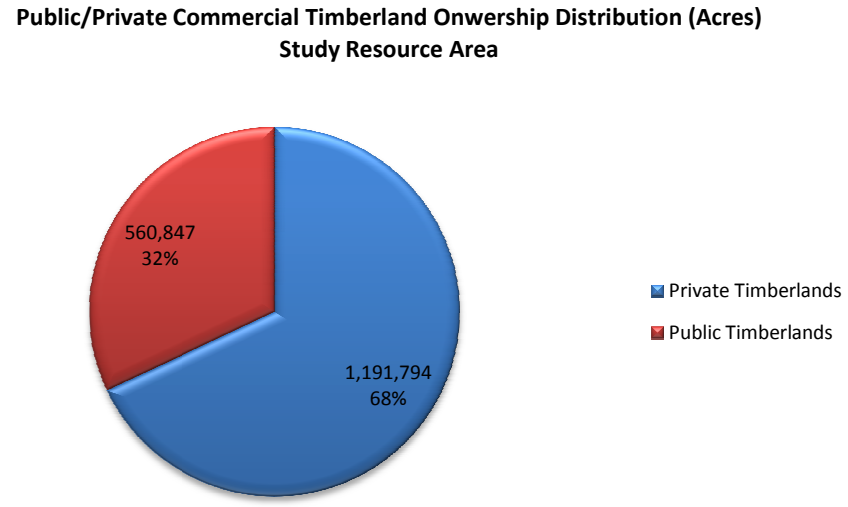


Figure 11: Public/Private Commercial Timberland Ownership Distribution for Study Resource Area. Source: USDA Forest Service, LD Jellison.

Timberland Analysis

A factor to be considered in estimating the amount of potential woody biomass from private commercial timberland is the diameter of the trees. The diameter at breast height[12] (DBH) is used in conjunction with species type to calculate the volume of potential biomass that could be collected from a stand of trees. DBH is a determining factor in defining merchantable timber. When more merchantable timber exists in a stand of trees, the potential for logging slash increases. Figures 12 and 13 illustrate the distribution of trees on public and private commercial timberland according to diameter class in accordance with USDA Forest Service acreage estimates.

[12] Diameter at Breast Height (DBH) is defined by the USDA Forest Service as being the diameter for the tree stem measured at 4.5 feet above the ground on the uphill side of a tree.

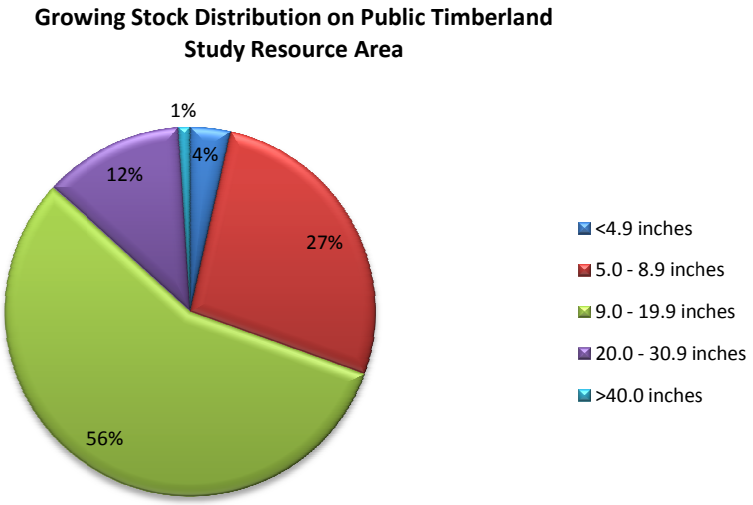


Figure 12: Growing Stock Trees Distribution on Public Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

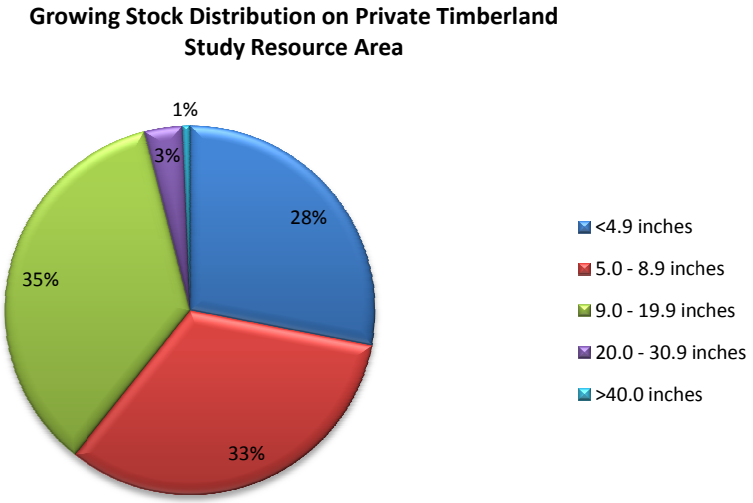


Figure 13: Growing Stock Trees Distribution on Private Commercial Timberland for Study Resource Area. Source: USDA Forest Service.

The public and private commercial timberlands within the Study Resource Area can further be divided into separate stocking classes of growing-stock trees. Growing-stock trees, as defined by the USDA Forest Service,[13] are live trees at least 5.0 inches DBH that meet merchantability requirements. The five stocking classes identified by the USDA Forest Service are overstocked, fully stocked, medium stocked, poorly stocked, and nonstocked. Figures 14 and 15 illustrate the dispersal of the stocking classes among the private commercial timberland in the Study Resource Area.

[13] FIA Glossary, May 2006.

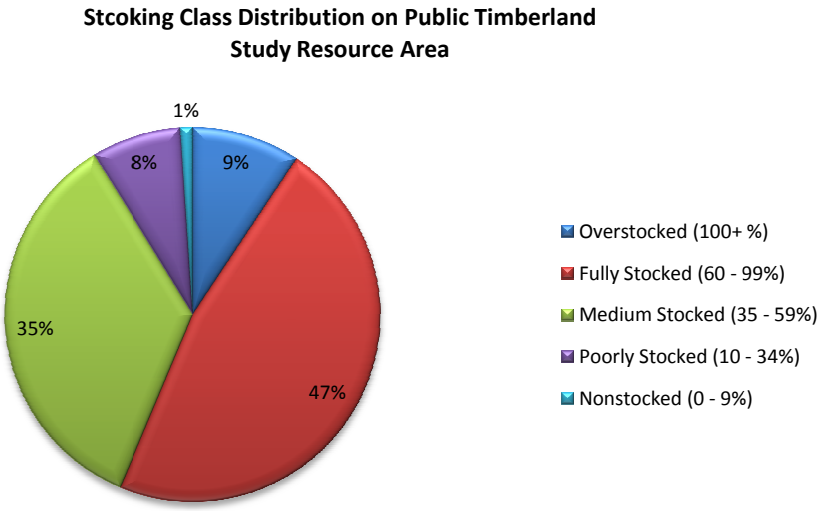


Figure 14: Stocking Class Distribution on Private Commercial Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

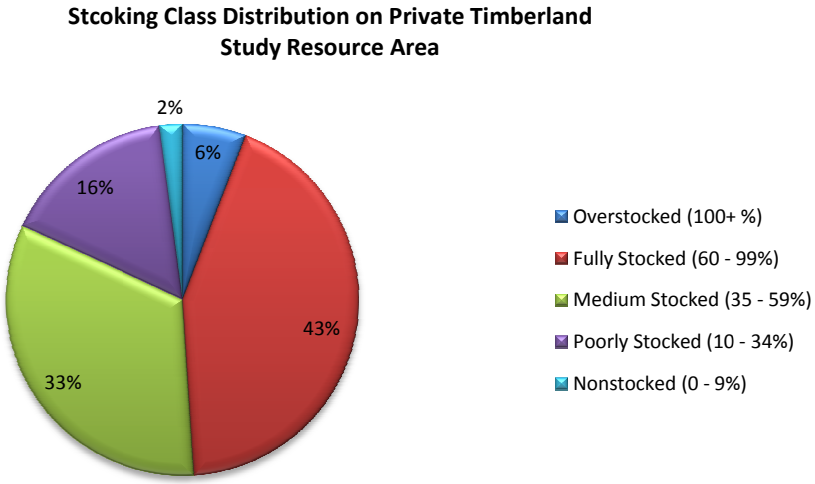


Figure 15: Stocking Class Distribution on Private Commercial Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

The composition of species types assists in determining the density and volume of the retrievable woody biomass from logging and thinning operations. Figures 16 and 17 present the ratio of hardwoods to softwoods (based on the total number of live trees) in accordance with USDA Forest Service estimates.

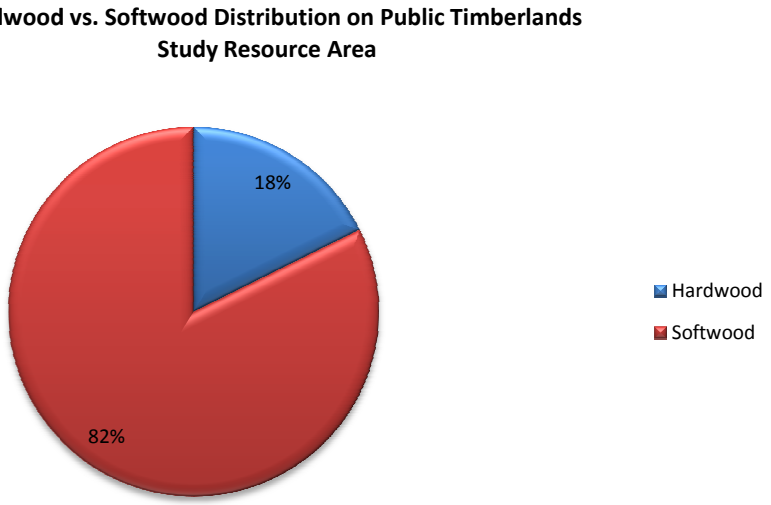


Figure 16: Hardwood vs. Softwood Distribution on Public Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

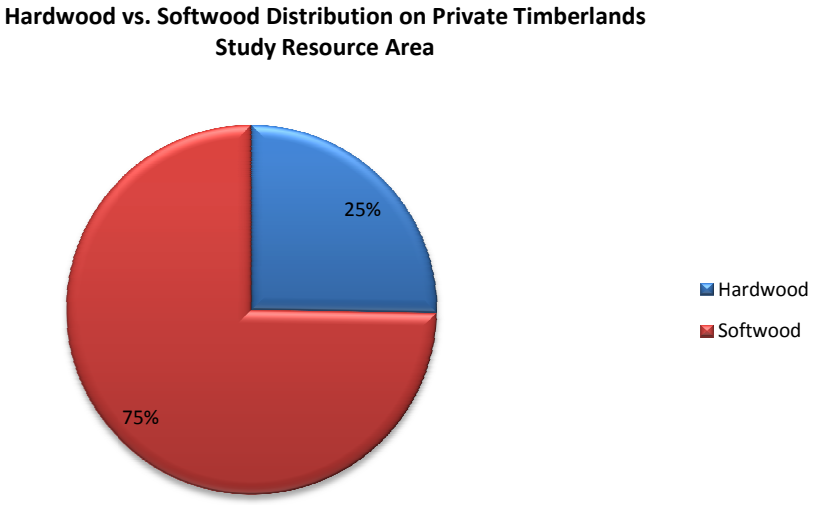


Figure 17: Hardwood vs. Softwood Distribution on Private Commercial Timberland for Study Resource Area. Source: USDA Forest Service.

The vast majority of live trees (82% of public timberlands and 75% of private commercial timberlands) are classified as softwoods, which the USDA Forest Service defines as coniferous trees, usually evergreen, and having needles or scale-like leaves.[14]

Figures 18 and 19 display the proportional distributions of the various tree species composing the private commercial timberland located in the Study Resource Area (also based on the total number of live trees) in accordance with USDA Forest Service estimates.

[14] FIA Glossary, May 2006.

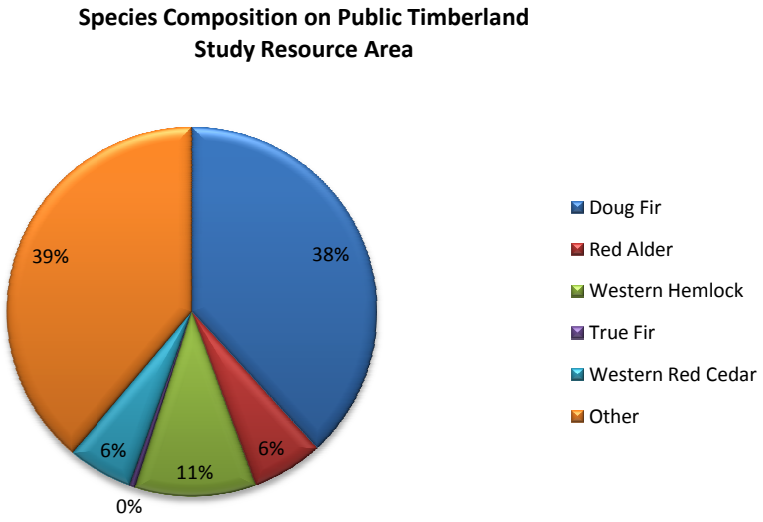


Figure 18: Species Composition on Public Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

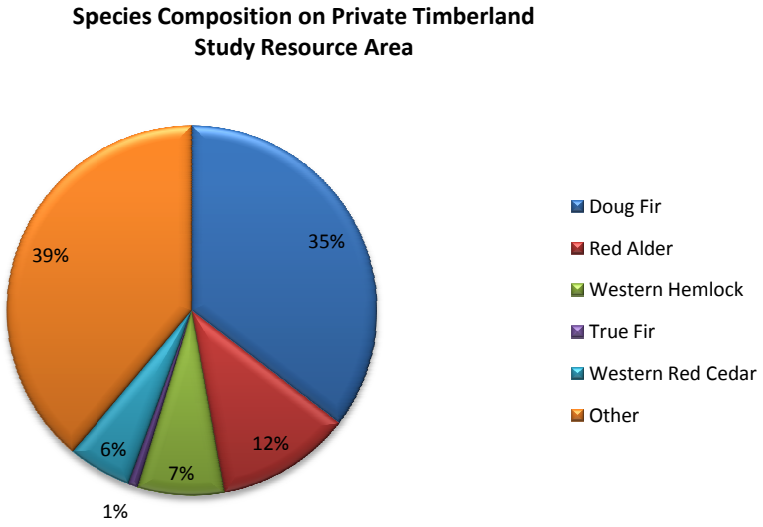


Figure 19: Species Composition on Private Commercial Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

Of the softwoods growing in the Study Resource Area, approximately 38% of public timberland and 35% of private commercial timberland belong to the Douglas Fir species. According to the California Department of Forestry, the typical heating value for Douglas Fir is approximately 9,000 British thermal units (BTU) per pound, which is slightly higher than the approximately 8,000 BTU/pound heating value for a hardwood such as maple.[15]

[15] California Department of Forestry. "Wood Energy in California." 1981.

This study further analyzed the stand age for the Study Resource Area in order to assess the possibility for classification of private commercial timberland old-growth timber. As seen in Figure 20 and Figure 21 below, an estimated 5% of public timberland stands are 100 years or older, whereas an estimated 1% of private commercial timberland is in excess of 100 years old using the information analyzed from the USDA Forest Service.

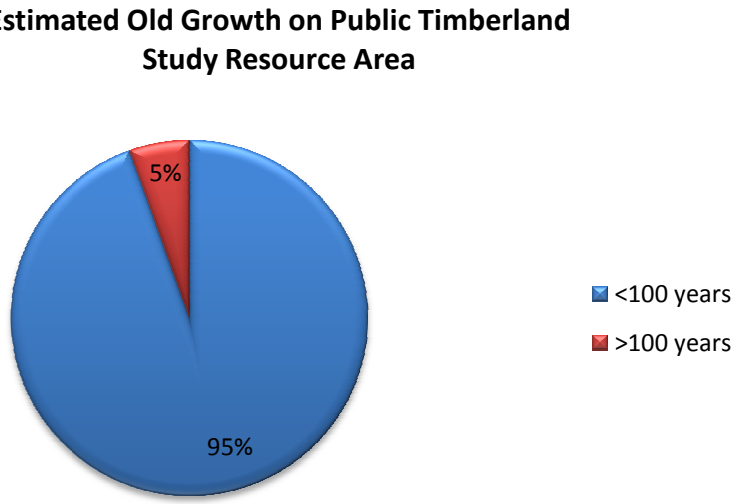


Figure 20: Estimated Old Growth Stands on Public Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

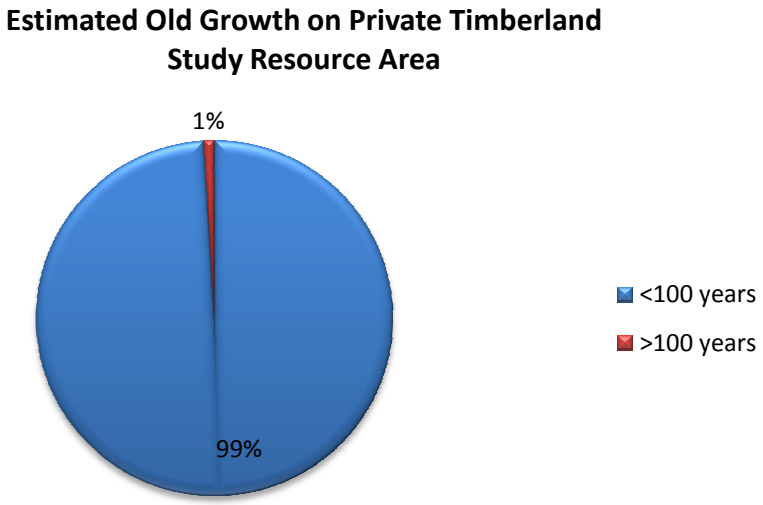


Figure 21: Estimated Old Growth Stands on Public Timberland for Study Resource Area. Source: USDA Forest Service, LD Jellison.

According to our analysis of the data obtained USDA Forest Service, we estimate that there are 31,215,120 BDT of live forest biomass located on public and private commercial timberland within the Study Resource Area. According to the definition provided by the USDA, this number includes the complete above-ground weight of wood and bark in live trees at least 1.0 inch DBH, not including all

foliage.[16] It also includes the weight of wood and bark in lateral limbs and secondary limbs and twigs from sapling-size trees but not from poletimber and sawtimber-size trees.

In order to more accurately assess the amount of woody biomass material economically available for recovery, this study first narrowed the amount of woody biomass to that located less than 200 feet from an existing road and on land with less than a 40% slope. Industry standards indicate that this material is too costly to recover at this time. Applying these filters, the amount of total live woody biomass within these economically retrievable areas within the Study Resource Area is estimated to be 5,094,909 BDT in accordance with USDA Forest Service data. Figure 22 below provides a summary of the estimated total live forest biomass and total live estimated live forest biomass across the various public and private commercial timberlands.

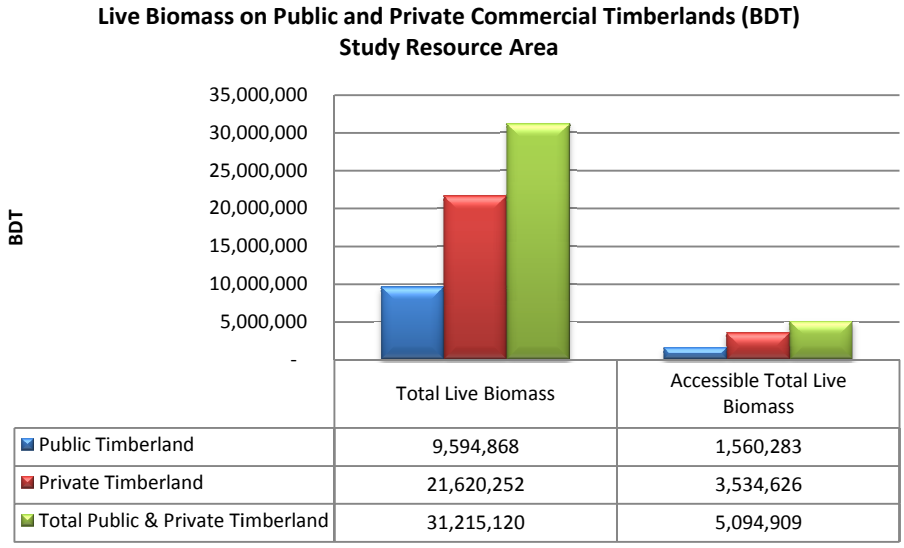
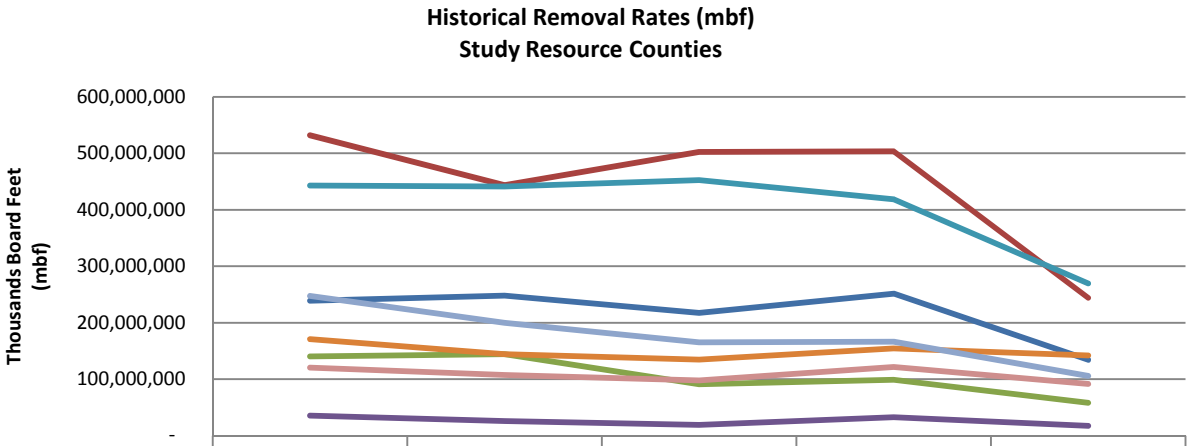


Figure 22: Live Biomass on Public and Private Commercial Timberlands for Study Resource Area. Source: USDA Forest Service.

Historical Harvest Analysis

Historical timber production is an important part of the statistical analysis of the Study Resource Area because it provides insight into the future potential for biomass retrieval. Because some counties have only a small portion of timberland falling within the Study Resource Area, harvest data was narrowed to the eight Study Resource Counties. Figure 23 shows the historical volume of timberland harvesting data for each of the Study Resource Counties in accordance with data obtained from the Washington Department of Natural Resources (Washington DNR).

[16] FIA Glossary, 2006.



	2000	2001	2002	2003	2009
Cowlitz	239,098,000	248,132,000	217,327,000	251,547,000	134,102,000
Grays Harbor	531,731,000	443,297,000	502,709,000	503,428,000	243,857,000
King	140,504,000	144,156,000	90,985,000	99,097,000	58,084,000
Kitsap	35,539,000	25,814,000	19,083,000	32,355,000	17,307,000
Lewis	443,048,000	441,118,000	452,829,000	418,711,000	269,434,000
Mason	170,687,000	144,364,000	134,873,000	154,703,000	142,097,000
Pierce	247,287,000	200,111,000	165,329,000	166,506,000	105,649,000
Thurston	120,272,000	107,371,000	97,558,000	121,562,000	91,345,000

Figure 23: Historical Removal Rates for Study Resource Counties. Source: Washington Department of Natural Resources, 2008.

Potential Forest Residues

By analyzing the historical harvest data from Washington DNR for the Study Resource Counties in conjunction with data USDA Forest Service from 2009, this study estimated the total potential amount of forest residues produced from logging operations by dividing the gross weight of merchantable biomass located in the Study Resource Counties by the gross volume of sawtimber located in the Study Resource Area, and multiplying the harvest data from 2009. This number provides an estimated approximation of the resulting total potentially available biomass from forest residues created by logging slash based upon the 2009 Washington DNR historical removal data for the Study Resource Counties, assuming that all biomass from timber harvesting operations is perfectly utilized. Table 2 provides a summary of these calculations. It is important to note, however, that the creation of this biomass does not necessarily translate to the recoverable amount of biomass, which depends on a variety of factors such as the accessibility of the biomass, harvesting methods used, and efficiency of the biomass recovery operations.

Table 2 – Estimated Total Potential Annual Logging Slash for Study Resource Counties

	Weight of Merchantable Biomass	÷	Volume of Merchantable Sawtimber	x	2009 Timber Harvest Data	=	Estimated Total Annual Slash
County	(BDT)		(Board Feet)		(Board Feet)		(BDT)
Cowlitz	30,467,235		9,766,217,281		134,102,000		418,352
Grays Harbor	66,816,243		24,188,353,526		243,857,000		673,614
King	54,363,420		20,474,372,314		58,084,000		154,224
Kitsap	16,985,284		6,536,968,206		17,307,000		44,970
Lewis	81,904,309		30,208,238,581		269,434,000		730,523
Mason	26,881,980		9,790,419,010		142,097,000		390,162
Pierce	36,121,423		13,221,843,944		105,649,000		288,628
Thurston	15,108,619		5,234,331,416		91,345,000		263,662
Totals:	**328,648,513**		**119,420,744,278**		**1,061,875,000**		**2,964,135**

Source: USDA Forest Service, Washington DNR.

The estimated 2,964,135 BDT per year includes only forest residues (slash) created from logging operations on public and private commercial timberlands within the eight counties comprising the Study Resource Counties. It does not include forest residuals resulting from thinning operations, land-clearing operations, or fire-reduction treatments. For the purposes of maintaining more conservative estimates, these additional forestry activities were not taken into account in assessing the potentially available forest residues.

The total amount of recoverable in reality is going to be significantly less than the total potential due to various efficiencies. Based upon our experience in the forest products industry, our experience with fuel resource studies within Western Washington, our analyses of the public and private commercial timberlands within the Study Resource Counties, an October 2009 report by the University of Washington to the Washington State Legislature, and industry standards,[17] this study assumed a recovery rate of 20% of the total estimated annual slash. This places the total estimated economically recoverable forest residues, based on 2009 historical harvest rates, at approximately 592,826 BDT annually.

Current Utilization of Forest Residues

From our interviews with private commercial timberland owners, fuel processors and sawmills, this study estimated that there is the equivalent of approximately two full-time grinders engaging in in-woods grinding operations within the Study Resource Counties. Industry standards indicate that one full-time grinder can produce approximately 300 BDT of biomass fuel per day, or 77,000 BDT per year. This equates to an estimated 144,000 BDT annual current utilization of forest residues from the logging slash created by timber harvesting within the Study Resource Counties, resulting in a remaining estimated 448,827 BDT of unutilized forest residues available annually from logging slash created from timber harvesting within the Study Resource Counties.

[17] See Elaine Oneil and Bruce Lippke, *Eastern Washington Biomass Accessibility*, a Report to the Washington State Legislature and Washington Department of Natural Resources, October 2009.

Summary of Available Forest Residues

This study determined from interviews and industry sources that based upon historical and forecasted harvesting of public and private commercial timberlands there is an estimated 448,827 BDT of forest residues from logging slash available annually within the Study Resource Counties, as shown on Figure 24.

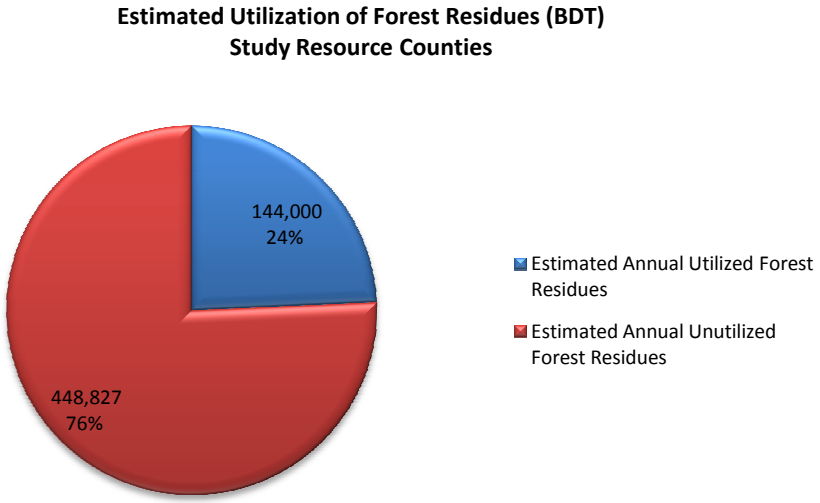


Figure 24: Estimated Utilization of Forest Residues for Study Resource Counties. Source: LD Jellison.

Primary Mill Residues

Available Primary Mill Residues

Reliable assessment of the potential woody biomass in the Study Resource Area that can be used for fuel for the proposed biomass facility must include the sawmill residuals that are part of the current biomass market. This information is summarized in Table 3.

Table 3 – Summary of Sawmills within Study Resource Counties

Sawmill	Location	County	Distance from Olympia (miles)	8 Hour Capacity (mbf)	Estimated Annual Production (mbf)**	Estimated Annual Production (BDT)***
Dahlstrom Lumber Co., Inc.	Hoquiam, WA	Gray's Harbor	55	40	19,200	16,896
Hampton Lumber Mills (Morton Division)	Morton, WA	Lewis	70	200	96,000	84,480
Hampton Lumber Mills (Morton Division)*	Randle, WA	Lewis	85	250	120,000	105,600
iLevel by Weyerhaeuser Longview, Washington	Longview, WA	Cowlitz	85	440	211,200	185,856
Manke Lumber Co.	Tacoma, WA	Pierce	25	250	120,000	105,600
Mason County Forest Products	Shelton, WA	Mason	20	240	115,200	101,376
Premier Forest Products	Humtulips, WA	Gray's Harbor	75	50	24,000	21,120
RSG Fores Products Kalama, Washington	Kalama, WA	Cowlitz	75	120	57,600	50,688
Sierra Pacific Industries Aberdeen, WA	Aberdeen, WA	Gray's Harbor	50	350	168,000	147,840
Simpson Lumber Co., LLC Commencement Bay*	Tacoma, WA	Pierce	25	400	192,000	168,960
Simpson Lumber Co., LLC Dayton, Washington Mill #5*	Shelton, WA	Mason	20	300	144,000	126,720
Simpson Lumber Co., LLC Longview Operations*	Longview, WA	Cowlitz	85	250	120,000	105,600
Simpson Lumber Co., LLC Shelton, Washington Mill #3*	Shelton, WA	Mason	20	300	144,000	126,720
TMI Forest Products Inc. Crane Creek Division	Amanda Park, WA	Gray's Harbor	90	150	72,000	63,360
TMI Forest Products Inc. Morton, Washington	Morton, WA	Lewis	70	160	76,800	67,584
Welco Lumber Co., USA Shelton Fence Mill	Shelton, WA	Mason	20	50	24,000	21,120
TOTAL:						**1,499,520**

Source: Random Lengths, 2010.
*** Annual production estimated at 2 shifts per day, 5 day workweek, 4 weeks per month, 12 months per year.**
**** Assumed 1mbf = .88 BDT of residual material. Source: Alaska Wood Energy Conference, 2005.**
***** 8 hour capacity estimated per LD Jellison.**

Current Utilization of Primary Mill Residues

This study assumed that all primary mill residues currently being produced are current being consumed by the market. The reasoning for this assumption is that primary mill residues are more accessible and comparatively more economically retrievable than forest residues.

Secondary Mill Residues

In accordance with the interviews conducted in this study, and taking into account the population density of the Study Recourse Counties, this study estimates that the current and historical annual volume of secondary mill residuals within the Study Resource Counties is minimal and estimated to be approximately 15,000 BDT annually. Furthermore, this study assumed that like primary mill residues, all secondary mill residues are being consumed by the market due to the fact that these residues are comparatively more economically retrievable than forest residues.

Urban Wood Residues

In accordance with the interviews conducted in this study, and taking into account the population density of the Study Resource Counties, this study estimates that the average annual volume of urban wood residues within the Study Resource Counties is 350,000 BDT annually. However, when taking into account the estimated volume of urban wood residues that is likely to meet the final wood fuel air permit requirements for the TESC facility and the air permit standards of the local Olympic Region Clean Air Agency administering the various state and federal regulator standards, we estimate that the amount of urban wood residues meeting these standards is likely to be approximately 200,000 BDT annually. When taking the population density into account, it is further estimated that 50% of this 100,000 BDT within the Study Resource Counties is unutilized and therefore potentially available for use for woody biomass facilities. These findings are summarized in Figure 25.

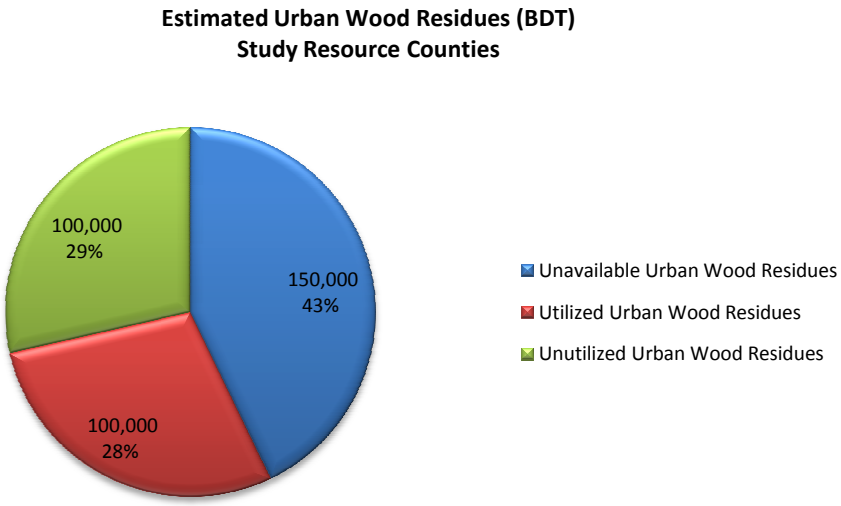


Figure 25: Estimated Urban Wood Residues for Study Resource Counties. Source: LD Jellison.

Summary of Quantitative Analysis

This study concludes that there is an estimated total potential of 2,307,347 BDT annually of woody biomass available annually within the Study Resource Counties, comprised of the various residues as shown on Figure 26.

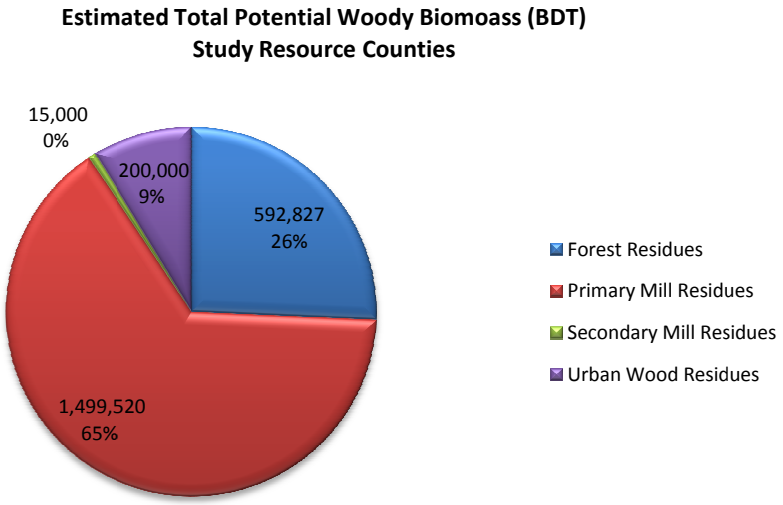


Figure 26: Estimated Total Potential Woody Biomass (BDT) for Study Resource Counties. Source: LD Jellison.

Of this total potential 2,307,347 BDT of woody biomass available annually within the Study Resource Counties, it is further estimated that 1,758,520 BDT is being utilized by various consumers, and with the 5,500 BDT annual consumption anticipated by TESC for the biomass facility, this would leave an estimated remaining 543,327 BDT of potentially unutilized woody biomass available annually within the Study Resource Counties as shown on Figure 27.

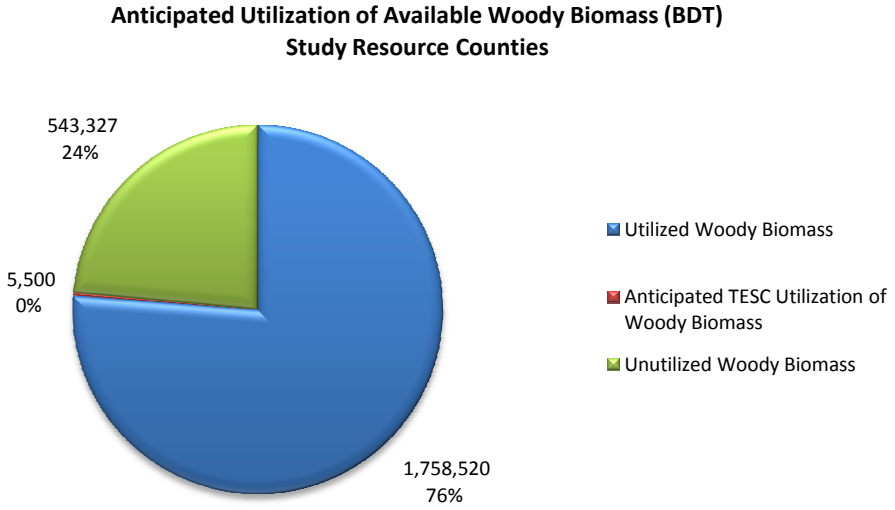


Figure 27: Anticipated Utilization of Available Woody Biomass (BDT) for Study Resource Counties. Source: LD Jellison.

V. ECONOMIC ANALYSIS

The economic analysis of this study involved reviewing regional woody biomass recovery operations and examining past, current, and future regional prices for woody biomass materials. For this analysis, we gathered information from leaders in the regional forest products industry. We further obtained and analyzed information from RISI, Inc. (RISI), generally considered the leader in both the forest products and financial industries in providing economic forecasting for wood products on both national and regional levels.

Biomass Recovery Operations

Logging methods have a significant impact on the availability of forest-sourced woody biomass. Regional logging methods used for harvesting timber can be divided into two general categories: conventional harvesting and whole-tree harvesting.

Conventional harvesting means that after a tree is felled, the tree limbs and top are then removed in-place where the tree is felled. As a result, the tree limbs and tops are scattered across the entire logging area making it difficult to economically retrieve the logging slash created from conventional harvesting methods. The wood waste requires extra handling of the slash to extract it to a landing area or to pile the slash for open burning.

Whole-tree harvesting involves the felling of the tree, which is then transported a central processing area (landing) where the tree limbs and top are removed. This type of harvesting method concentrates the logging slash in a central landing area where they can be more economically retrieved from a central location.

Historically, the majority of timber was harvested using conventional harvesting methods, which made the collection and utilization of slash created by forest residues difficult. Changing timber harvesting practices, however, have encouraged whole-tree harvesting, which significantly increases the potential availability for forest residues from logging slash created by timber harvesting.

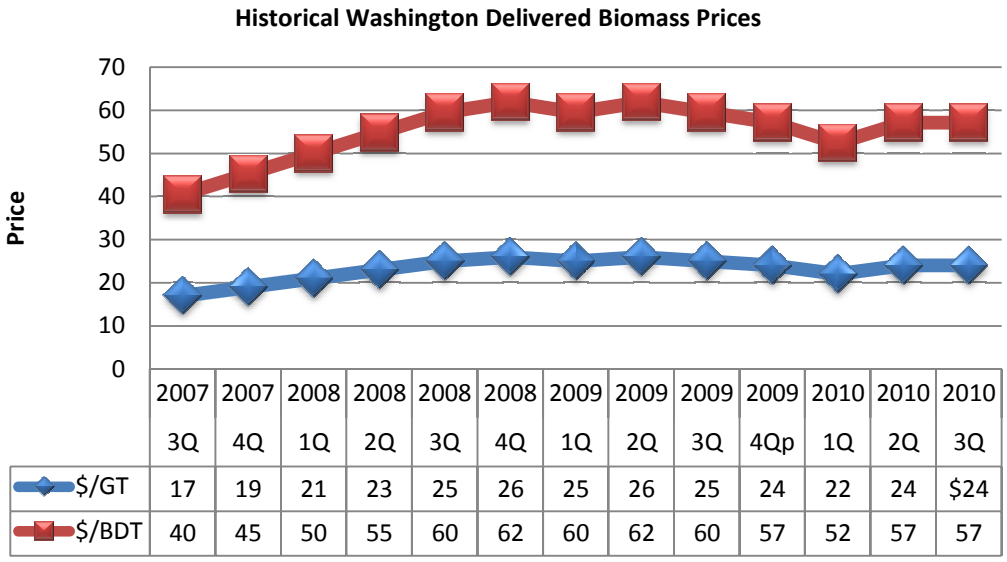
Public and private commercial timberland owners and have begun to favor whole-tree harvesting as a more efficient means of harvesting timber as one of the ways to more efficiently manage timberland as the removal of slash promotes the growth of seedlings and reduces open burning of forest residues. In addition, government incentive programs such as the U.S. Department of Agriculture's Biomass Crop Assistance Program (BCAP), have sought to further increase the incentive for the removal of biomass from timberlands.

It is expected that federal, state, and local regulations will become more restrictive in the future with respect to open burning of forest residues, which would have the likely positive effect of increasing the supply of woody biomass for forest residues from logging operations.

Historical Price

According to RISI,[18] the average delivered price for woody biomass in Washington for the past three years has ranged from a low of $17 per green ton to a high of $26 per green ton, with an average price of $23 per green ton. This study assumed a moisture content of 42% for a green ton, which translates into a low of $40 per BDT, a high of $62 per BDT, and an average of $55 per BDT. These historical prices are shown in Figure 28 below.

[18] RISI Wood Biomass Market Report, 2010.



	2007 3Q	2007 4Q	2008 1Q	2008 2Q	2008 3Q	2008 4Q	2009 1Q	2009 2Q	2009 3Q	2009 4Qp	2010 1Q	2010 2Q	2010 3Q
$/GT	17	19	21	23	25	26	25	26	25	24	22	24	$24
$/BDT	40	45	50	55	60	62	60	62	60	57	52	57	57

Figure 28: Historical Washington Woody Biomass Prices. Source: RISI, 2010.

It is important to note and take into account that the prices provided by RISI include the cost of higher-value sawmill residuals, such as shavings, sawdust, bark, and chips, and are therefore higher than the cost of lower-grade forest residual biomass hogfuel that is expected as the primary source of fuel for the proposed biomass facility. Based on interviews with private commercial timberland owners, fuel processors, sawmills, and woody biomass fuel consumers in the study resource areas, this study estimates that the average historical delivered prices for this lower-grade fuel for the last two years have ranged from approximately $20 to $32 per BDT with a current average delivered price of approximately $24 per BDT. The historical prices from RISI as shown in Figure 28, however, provide a general index for market fluctuation over time.

Current Price

According to RISI,[19] the most recent delivered price index for woody biomass in Washington for 2010 is $107 per green ton ($24 per BDT assuming a moisture content of 42% per green ton). This price includes the higher-value sawmill residuals discussed above and is therefore not an accurate indication of current local forest residual biomass hogfuel market conditions.[20] Furthermore, interviews with regional landowners and biomass hogfuel suppliers and consumers within the study resource areas separately concluded that the current average delivered price for forest residual biomass hogfuel is $24 per BDT.

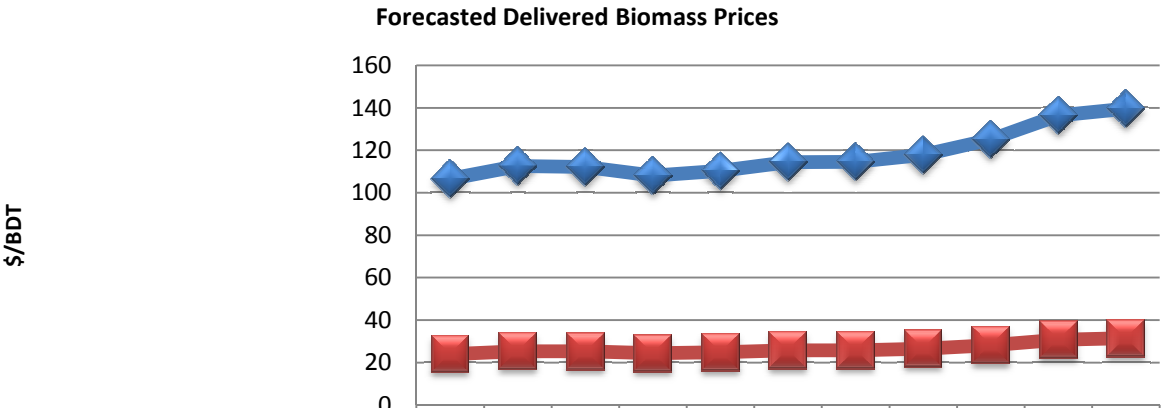
Forecast Price

In accordance with conversations and discussions with some of the senior economists at RISI, this study assumes a 1:1 correlation between RISI's forecast delivered chip prices index and woody biomass prices in order to forecast the delivered forest residual biomass hogfuel prices within the study resource areas for the TESC facility. Figure 29 illustrates RISI's price forecast for residual chips and the forecast woody biomass price using the foregoing assumptions. As can be seen in Figure 29, using the forecast price for

[19] RISI Wood Biomass Market Report, 2010

[20] Based upon interviews of timberland owners, fuel processors, sawmills and biomass consumers, the volume of both forest residues and primary mill residues is sufficient to supply the private and public biomass facilities for the demand price range above the current $24 per BDT at or below below the maximum $45 per BDT.

woody biomass in Washington, based upon RISI's forecast delivered chip price index and assuming a current woody biomass price of $24 per BDT, the delivered price for woody biomass with the Study Resource Area is not forecasted to exceed $45 per BDT. This study estimates that ten-year long-term fuel supply contracts within the study resource areas with negotiated escalation and hedging indices would currently average between $35 and $45 per BDT.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
National Delivered Chip Prices ($/BDT)	107	113	112	108	110	114	115	118	125	136	140
Study Resource Area Delivered Hogfuel Prices ($/BDT)*	24	25	25	24	25	26	26	27	28	31	31

Figure 29: Forecasted Biomass Prices. Source: RISI, 2010.
***Initial price estimates provided by LD Jellison.**

Summary of Economic Analysis

This study estimates that the current average price for forest residual biomass hogfuel within the Study Resource Area suitable for the TESC facility is currently $24 per BDT. Both the current and ten-year forecasted prices for forest residual biomass hogfuel within the Study Resource Area are forecasted not to exceed $45 per BDT.

VI. FUEL COMPETITION ANALYSIS

Competition from Existing Large Biomass Power Facilities

According to the Northwest Power and Conservation Council, there are large eight biomass power facilities currently existing (although not necessarily in operation) in Washington. These facilities for Idaho, Montana, Oregon, and Washington are shown in on Figure 30, with the information for the Washington facilities shown on Table 4.

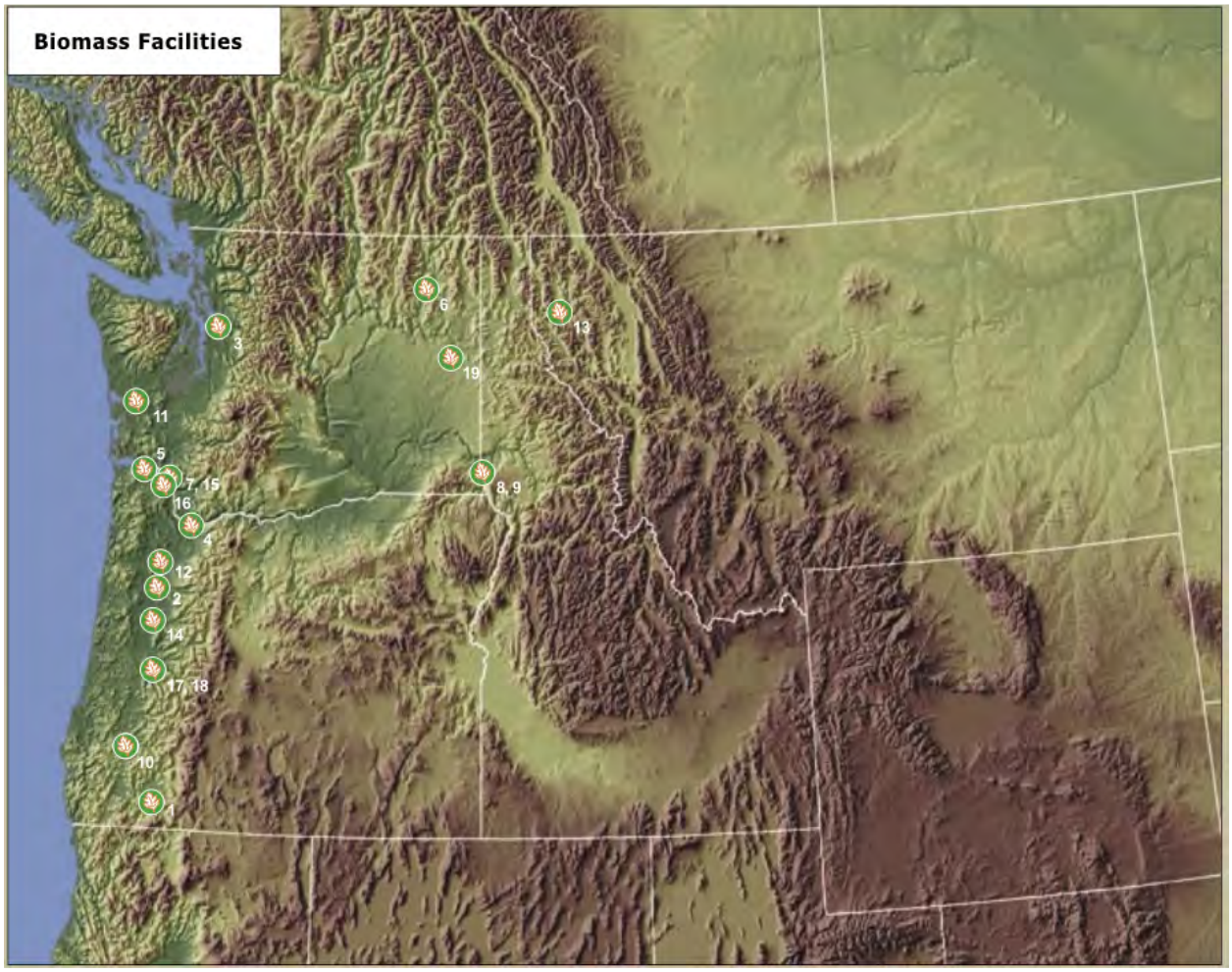


Figure 30: Locations of existing biomass plants in the Pacific Northwest. Source: Northwest Power and Conservation Council, 2010.

Table 4 – Washington Biomass Power Facilities

Map Number	Facility Name	Owner	Capacity (MW)
3	Everett Cogeneration Project	Snohomish Co. PUD	42
4	Georgia Pacific (Camas)	PacifiCorp	52
6	Kettle Falls Generating Station	Avista	50.7
7	Longview Fibre 1-7 (CR & Pwr Boilers)	Longview Fibre Co.	67
11	Sierra Pacific (Aberdeen)	Sierra Pacific Industries	18
15	Weyerhaeuser (Longview) TG 4	Weyerhaeuser Co.	18
16	Weyerhaeuser (Longview) TG 5	Weyerhaeuser Co.	31.4
19	Wheelabrator Spokane GEN 1	City of Spokane	26

Source: Northwest Power and Conservation Council, 2010.

The existing large biomass power facilities within the Study Resource Counties and their estimated draws upon the available woody biomass from within the Study Resource Counties are set forth on Table 5.

Table 5 – Existing Biomass Power Facilities Draw upon Study Recourse Counties

Biomass Power Facility Name	Location	Size (MW)*	Estimated Annual Fuel Requirement (BDT)**	Estimated Study Resource Counties Draw (BDT)	Distance from Olympia, WA (miles)
Grays Harbor Paper	Aberdeen, WA	16	80,000	40,000	50
Sierra Pacific Industries	Aberdeen, WA	18	90,000	45,000	50
King County Wastewater Treatment Plant	Renton, WA	8	40,000	18,800	53
Simpson Lumber Co.	Tacoma, WA	50	250,000	172,500	31
Longview Fibre 1-7 (CR & Pwr Boilers)	Longview, WA	67	335,000	50,250	85
Weyerhaeuser (Longview) TG 4	Longview, WA	18	90,000	13,500	85
Weyerhaeuser (Longview) TG 5	Longview, WA	31.4	157,000	23,550	85
Totals:			**460,000**	**276,300**	

Source: LD Jellison.
***Source: Northwest Power and Conservation Council, 2010.**
****Consumption estimated assuming 10,000 BDT annual woody biomass fuel consumption per MW of power generation with 50% of woody biomass requirements being supplied from internal sources.**

LD Jellison estimates that these co-generation facilities on average obtain approximately 50% of their required fuel from non-woody biomass, such as black liquor, sludge, etc. Accordingly, the estimated draws on available woody biomass within the study resource areas for the planned biomass facility are estimated to be 276,300 BDT annually based upon LD Jellison's experience and interviews with the various woody biomass suppliers and consumers. For the purposes of this study, the estimated study resource area draw of 276,300 BDT annually by these existing biomass power facilities are included within the current existing demand for woody biomass as discussed in the Quantitative Analysis (Section IV) above.

Summary of Fuel Competition Analysis

Currently, there are seven identified competing large biomass facilities within the Study Resource Counties that annually consume an estimated 276,300 BDT of woody biomass within the Study Resource Counties. The draw of these existing facilities upon the Study Resource Area and Study Resource

Counties are assumed in the current utilization of the available woody biomass as previously discussed in Section IV above.

VII. FOREST SUSTAINABILITY

In assessing the potentially available woody biomass fuel within the Study Resource Area for the proposed facility, TESC has made clear its desire to ensure that all forest-sourced woody biomass for the facility would be obtained from forest-sourced material that would be obtained responsibly from the forests in order to promote environmental sustainability. Therefore, TESC intends that the woody biomass fuel derived from forests to supply the required fuel for the facility would have the effect of positively promoting the environmental sustainability of those forests and the environment, rather than having negative detrimental effects. Sustainable forest management certifications include the Sustainable Forestry Initiative and Forest Stewardship Council certifications which are discussed below.

Sustainable Forestry Initiative

The Sustainable Forestry Initiative (SFI) is a voluntary third-party forest certification that began in the 1990s in response to market concerns about forest management and illegal logging. The SFI program was launched in 1994 as one of the U.S. forest sector's contributions to the vision of sustainable development established by the 1992 United Nations Conference on Environment and Development. Its original principles and implementation guidelines began in 1995, and it evolved as the first SFI national standard backed by third-party audits in 1998. Today, SFI Inc. is an independent, non-profit organization responsible for maintaining, overseeing and improving a sustainable forestry certification program that is internationally recognized and is the largest single forest standard in the world. The SFI 2010-2014 Standard is based on principles and measures that promote sustainable forest management and consider all forest values. It includes unique fiber sourcing requirements to promote responsible forest management on all forest lands in North America.

Sustainable Forestry Initiative Standards and Certifications

The SFI program at large is made up of the following four key components.[21]

- **SFI forest certification** promotes responsible forestry practices. An SFI-certified program participant who owns or manages forestland is certified to SFI Requirements.
- **SFI chain-of-custody certification** is an accounting system that tracks fiber content through production and manufacturing to the end product. Companies can make claims about how much of their product comes from certified lands, how much contains recycled content, and how much is non-certified/non-controversial forest content.
- **SFI fiber sourcing certification** addresses the 90% of the world's forests that are not certified. Program participants must show that the raw material in their supply chain comes from legal and responsible sources, whether the forests are certified or not. To meet the fiber sourcing requirements, primary producers must be third-party audited and certified to SFI Requirements.
- **SFI labels** are recognized globally and provide a visual cue to help customers source responsibly managed forest products. In order to use any of the SFI labels, the company must be certified to SFI standards and have authorization from SFI.
- Each of the SFI program requirements are audited by independent, third-party certification bodies to ensure they conform for each company.

[21] See SFI 2010-2014 Standard.

SFI Principles

SFI Program Participants believe forest landowners have an important stewardship responsibility and a commitment to society, and they recognize the importance of maintaining viable commercial, family forest, and conservation forest land bases. They support sustainable forestry practices on forestland they manage, and promote it on other lands. They support efforts to protect private property rights, and to help all private landowners manage their forestland sustainably. In keeping with this responsibility, SFI Program Participants shall have a written policy (or policies) to implement and achieve the following principles in accordance with the SFI 2010-2014 Standard[22]:

1) **Sustainable Forestry.** To practice sustainable forestry to meet the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic that integrates reforestation and the managing, growing, nurturing and harvesting of trees for useful products and ecosystem services such as the conservation of soil, air and water quality, carbon, biological diversity, wildlife and aquatic habitats, recreation, and aesthetics.
2) **Forest Productivity and Health.** To provide for regeneration after harvest and maintain the productive capacity of the forest land base, and to protect and maintain long-term forest and soil productivity. In addition, to protect forests from economically or environmentally undesirable levels of wildfire, pests, diseases, invasive exotic plants and animals and other damaging agents and thus maintain and improve long-term forest health and productivity.
3) **Protection of Water Resources.** To protect water bodies and riparian zones, and to conform with best management practices to protect water quality.
4) **Protection of Biological Diversity.** To manage forests in ways that protect and promote biological diversity, including animal and plant species, wildlife habitats, and ecological or natural community types.
5) **Aesthetics and Recreation.** To manage the visual impacts of forest operations, and to provide recreational opportunities for the public.
6) **Protection of Special Sites.** To manage forests and lands of special significance (ecologically, geologically or culturally important) in a manner that protects their integrity and takes into account their unique qualities.
7) **Responsible Fiber Sourcing Practices in North America.** To use and promote among other forest landowners sustainable forestry practices that are both scientifically credible and economically, environmentally and socially responsible.
8) **Avoidance of Controversial Sources including Illegal Logging in Offshore Fiber Sourcing.** To avoid wood fiber from illegally logged forests when procuring fiber outside of North America, and to avoid sourcing fiber from countries without effective social laws.
9) **Legal Compliance.** To comply with applicable federal, provincial, state, and local forestry and related environmental laws, statutes, and regulations.
10) **Research.** To support advances in sustainable forest management through forestry research, science and technology.
11) **Training and Education.** To improve the practice of sustainable forestry through training and education programs.
12) **Public Involvement.** To broaden the practice of sustainable forestry on public lands through community involvement.
13) **Transparency.** To broaden the understanding of forest certification to the SFI 2010-2014 Standard by documenting certification audits and making the findings publicly available.
14) **Continual Improvement.** To continually improve the practice of forest management, and to monitor, measure and report performance in achieving the commitment to sustainable forestry.

[22] See SFI 2010-2014 Standard.

Identified SFI Program Participants

Table 6 provides a summary list of all current active SFI certified forest program certificate holders within Washington. It is assumed for the purposes of this study that these forest certificate holders with timberlands within the Study Resource Area could potentially be suppliers of forest residues as fuel for the proposed facility. (It should be noted that due to the new SFI 2010-2014 Standard, the majority of these active certificate holders were certified under the previous SFI 2005-2009 Standard).

Table 6 – SFI Certified Forest Certificates in Washington

CERTIFIED ORGANIZATION	CERTIFICATE TYPE	CERTIFICATE EXPIRATION	CERTIFIED FOREST AREA (ACRES)
Forest Capital Partners, LLC	SFI 2005-2009	12/7/2011	289,751
Green Diamond Resource Company	SFI 2005-2009, SFI 2010-2014	07/28/2011, 07/25/2013	322,000
Hampton Resources, Inc.	SFI 2005-2009	8/24/2012	12,705
Hancock Timber Resource Group	SFI 2005-2009	5/22/2013	474,568
Longview Timberlands LLC	SFI 2005-2009	7/24/2013	323,315
Naselle Timberlands Holdings LLC	SFI 2005-2009	12/31/2012	6,920
Olympic Resource Management	SFI 2005-2009		138,488
PB Lumber, LLC	SFI 2005-2009		7,076
Penguin Forest	SFI 2005-2009		4,595
Plum Creek Timber Company, Inc.	SFI 2005-2009	3/14/2012	101,732
Port Blakely Tree Farms, L.P.	SFI 2005-2009, SFI 2010-2014	06/16/2013, 07/17/2010	220,752
Rayonier, Inc.	SFI 2005-2009	07/12/2014, 06/07/2014	412,770
Seefeld Corporation	SFI 2005-2009		5,165
Sierra Pacific Industries	SFI 2005-2009	04/29/2011, 06/12/2010	233,000
Stimson Lumber Company	SFI 2005-2009	10/28/2013	120,085
TWR Timberlands LLC	SFI 2005-2009	12/31/2010	5,041
University of Washington	SFI 2005-2009	10/5/2012	4,300
WACF TA LLC c/o International Forestry Consultants	SFI 2005-2009	12/31/2010	25,040
Washington Department of Natural Resources	SFI 2005-2009	9/15/2014	2,008,006
Weyerhaeuser Company	SFI 2005-2009, SFI 2010-2014	02/18/2013, 01/31/2011	1,098,712

Source: Sustainable Forestry Initiative, 2010.

Table 7 provides a summary list of all current active SFI certified fiber sourcing program certificate holders within Washington. It is assumed for the purposes of this study that the fiber sourcing certificate holders with operations within the Study Resource Area could potentially be suppliers of primary and/or secondary mill residuals as fuel for the proposed facility. (Again, it should be noted that due to the new SFI 2010-2014 Standard, the majority of these active certificate holders were certified under the previous SFI 2005-2009 Standard).

Table 7 – SFI Certified Fiber Sourcing Certificates within Washington

Certified Organization	Organization Type	Certificate Type	Certificate Expiration
Alliance Packaging LLC/SP Holdings	Paperboard Converter	SFI Fiber Sourcing Label User	40479
Bennett Lumber Products, Inc.	Forest Landowner	SFI 2005-2009	40724
Boise Cascade, L.L.C.	Wood Manufacturer	SFI COC, PEFC CoC, SFI 2005-2009	04/10/2012, 07/20/2010, 07/27/2011
Boise Paper Holdings, LLC	Pulp & Paper Producer	SFI COC, SFI Fiber Sourcing Label User, PEFC CoC, SFI 2010-2014	04/08/2015, 08/17/2013, 07/11/2013, 06/20/2012
Canyon Lumber Co., Inc.	Forest Landowner	SFI 2005-2009	41120
Graphic Packaging Corporation	Pulp & Paper Producer	SFI Fiber Sourcing Label User, SFI 2005-2009	41953
Longview Fibre Paper and Packaging, Inc.	Pulp & Paper Producer	SFI 2005-2009	41910
Pacific Woodtech Corporation	Wood Manufacturer	SFI COC, SFI Fiber Sourcing Label User, PEFC CoC	02/07/2013, 02/14/2013
Plum Creek Timber Company, Inc.	Forest Landowner	SFI Fiber Sourcing Label User, SFI 2005-2009	40982
Ponderary Newsprint Company	Pulp & Paper Producer	SFI 2005-2009	40333
Pregis	Paperboard Converter	SFI Fiber Sourcing Label User	41880
Simpson Tacoma Kraft Company LLC	Pulp & Paper Producer	SFI 2005-2009	41776
SMC Packaging Group	Paperboard Converter	SFI Fiber Sourcing Label User	40377
Washington Alder LLC	Wood Manufacturer	SFI COC, SFI 2005-2009	41206
Weyerhaeuser NR Company - Hardwoods	Wood Manufacturer	SFI Fiber Sourcing Label User, SFI 2005-2009	01/15/2011, 07/07/2013

Source: Sustainable Forestry Initiative, 2010.

Forest Stewardship Council

The Forest Stewardship Council (FSC) is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Established in 1993 as a response to concerns over global deforestation, FSC is a pioneer forum where the global consensus on responsible forest management convenes and through democratic process effects solutions to the pressures facing the world's forests and forest-dependent communities. Within this forum, voices from the Global North and South, from organizations big and small, assemble to define environmentally appropriate, socially beneficial and economically viable forest management and identify the tools and resources that will effect positive, lasting change. As a multi-stakeholder organization, FSC applies the directive of its membership to develop forest management and chain of custody standards, deliver trademark assurance and provide accreditation services to a global network of committed businesses, organizations and communities. FSC certification provides a credible link between responsible production and consumption of forest products, enabling consumers and businesses to make purchasing

decisions that benefit people and the environment as well as providing ongoing business value. FSC is nationally represented in more than 50 countries around the world.

FSC Standard and Certifications

FSC certification is a voluntary, market-based tool that supports responsible forest management worldwide. FSC certified forest products are verified from the forest of origin through the supply chain. The FSC label ensures that the forest products used are from responsibly harvested and verified sources.

The FSC Principles and Criteria (P&C) describe how forests can be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. Developed through a strong, multi-stakeholder process, they include managerial aspects as well as environmental and social requirements.

FSC certification provides a mechanism for companies, organizations, and communities to demonstrate their commitment to the FSC Principles and Criteria for responsible forest management and be part of the FSC solution. Three core activities support the FSC P&C to be implemented in forests worldwide through FSC certification:

1) **Standards Setting.** FSC standards are set in accordance with the requirements of the ISEAL Code of Good Practice for Setting Social and Environmental Standards. This means that the standards are set on the basis of consultations with the major stakeholders. ISEAL is the global association for social and environmental standards systems. FSC is the only certification scheme in forestry recognized by ISEAL to follow best-practice in standard-setting
2) **Accreditation Program.** FSC does not issue certificates itself. The certification process is carried out by independent organizations called certification bodies. Before being able to certify according to FSC standards, certification bodies have to gain FSC accreditation. To do this, certifiers have to comply with an extensive set of rules. FSC is the only global forest management certification system with an integrated accreditation program that systematically controls its certification bodies. Compliance with these rules and procedures is verified by Accreditation Services International (ASI) – the company managing the FSC accreditation program – through office audits and the witnessing of one trial audit in the field prior to gaining FSC accreditation. One such requirement is that all FSC accredited certification bodies have to be in compliance with relevant international ISO standard (ISO/IEC Guide 65: 1996 (E)). Every year, ASI controls the continued implementation of FSC rules and procedures through at least office and field audits for each FSC accredited certification body.
3) **Trademark Assurance.** The FSC trademarks offer a guarantee that products come from responsible sources. To maintain FSC's credibility and goodwill, it is essential that the trademarks are used correctly. FSC has a dedicated Trademark Service Unit that provides guidance on how to use the FSC trademarks.

FSC Principles and Criteria

The FSC Principles and Criteria (P&C) describe how the forests have to be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. They include managerial aspects as well as environmental and social requirements. FSC rules are the strictest and FSC's social and environmental requirements the highest.

The FSC P&C form the basis for all FSC forest management standards. Based on these 10 principles, the FSC has developed further rules (called policies or standards) that define and explain specific requirements.

1) Compliance with all applicable laws and international treaties.
2) Demonstrated and uncontested, clearly defined, long–term land tenure and use rights.
3) Recognition and respect of indigenous peoples' rights.
4) Maintenance or enhancement of long-term social and economic well-being of forest workers and local communities and respect of worker's rights in compliance with International Labor Organization (ILO) conventions.
5) Equitable use and sharing of benefits derived from the forest.
6) Reduction of environmental impact of logging activities and maintenance of the ecological functions and integrity of the forest.
7) Appropriate and continuously updated management plan.
8) Appropriate monitoring and assessment activities to assess the condition of the forest, management activities and their social and environmental impacts.
9) Maintenance of High Conservation Value Forests (HCVFs) defined as environmental and social values that are considered to be of outstanding significance or critical importance.
10) In addition to compliance with all of the above, plantations must contribute to reduce the pressures on and promote the restoration and conservation of natural forests.

In addition to the above standards, the Pacific Coast Regional FSC Standard requires that growth rates equal or exceed annual harvest rates over rolling periods of no more than 10 years.[23]

Identified FSC Program Participants

Table 8 provides a summary list of some of the active FSC certified program participants with forestland within Washington that were identified in this study.

Table 8 – FSC Certified Forest Certificates in Washington

CERTIFIED ORGANIZATION	CERTIFICATE CODE	CERTIFICATE EXPIRATION	CERTIFIED ACRES
City of Seattle	SW-FM/COC-001909	05/31/2011	40,241
Fort Lewis Military Installation	SCS-FM/COC-00096N	03/31/2012	22,076
Northwest Natural Resource Group	SA-FM/COC-001394	01/06/2015	9,000*
Washington Department of Natural Resources	BV-FM/COC-080501	05/14/2013	166,000**

Source: Forest Sustainability Council, 2010
***Estimated amount of acres in Washington per Northwest Natural Resource Group**
****Estimated per Washington Department of Natural Resources**

The percentage of forest lands that are FSC certificated is a relatively small portion of the total available timberlands within the Study Resource Area, and the anticipated TESC annual fuel requirement of 5,500 BDT is relatively insignificant with respect to the total potentially available biomass within the Study Resource Area. It is therefore unlikely that the anticipated fuel demand by TESC for the biomass facility will precipitate additional timberland owners to obtain FSC certification of their forest lands in order to comply with TESC standards if TESC chooses to adopt a standard of utilizing only biomass sourced from FSC certified forests. It is likely that TESC would be able to procure biomass on a spot basis for the

[23] **Source:** ***Revised Final Pacific Coast Regional FSC Standard Version 9.0.*** **May 9, 2005.**

proposed facility from fuel suppliers utilizing woody biomass sourced from Washington Department of Natural Resources' South Puget HCP Planning Unit, which currently consists of 144,630 acres of FSC certified forests, at prices that are not significantly above market rates. However, such procurement that is limited to biomass sourced from FSC certified forests will be more difficult to manage and obtain and possibly more expensive.

VIII. SUMMARY AND CONCLUSIONS

In the course of this study, LD Jellison conducted four analyses of woody biomass in the Study Resource Area to determine whether a Level 2 Feasibility Analysis is justified and recommended. The **qualitative analysis** determined that the composition of potentially available woody biomass in the Study Resource Area is composed of not more than 10% of secondary mill residues and urban wood residues. The **quantitative analysis** estimated 543,327 BDT of unutilized woody biomass potentially available annually from public and private commercial timberlands in the Study Resource Counties. The **economic analysis** estimated the current average delivered price for forest residual biomass hogfuel in the study resource areas at $24 per BDT, and the ten-year forecast average price for delivered forest residual biomass hogfuel not to exceed $45 per BDT. Finally, the **competition analysis** determined that the current and proposed competition for potentially available woody biomass in the Study Resource Area is not sufficient to dissuade from the facility being able to contract to meet its total annual fuel requirements. In conclusion, this Fuel Resource Study determines that from the standpoint of the annual fuel requirement of 5,500 BDT, the proposed 15,000 PPH biomass facility at TESC is economically viable and feasible. Furthermore, if the required woody biomass is sourced from forests that are committed to long-term forest health and sustainability, which are abundantly available within the Study Resource Area, the TESC biomass facility would result in such a minimal draw upon the available woody biomass within the Study Resource Area and Study Resource Counties that is likely to have the effect of positively promoting the environmental sustainability of the forests and the environment.