

Forest Lands Taxation Advisory Subcommittee Summary Report

The purpose of the subcommittee was to create a reliable, transparent, and repeatable process to value private forest lands in Montana for taxation purposes. Because private landowners are not required to disclose the terms of timber sales, any valuation process must pull data from public sources, i.e., government agencies that manage public forest land. In 2019, Dr. David Jackson of the University of Montana used timber sales data from the Montana Department of Natural Resources and Conservation (DNRC) to create a regression model that aimed to track winning bid prices using a few complicated explanatory variables. Additionally, the state was broken up into four zones – Northwest, Southwest, Central, and East – to reflect differing forest values due to location and geography. A breakdown of Dr. Jackson’s ten-year average stumpage values by zone, in dollars per thousand board feet, is below*. The years 2010 through 2013 use Dr. Jackson’s previous appraisal for those years.

Table 1. Dr. David Jackson’s 2019 Ten-Year Averages

Year	NW	SW	Central	East
2019	\$357.83	\$404.56	\$340.61	\$43.26
2018	\$363.15	\$408.94	\$346.28	\$54.94
2017	\$348.85	\$393.70	\$332.32	\$46.94
2016	\$319.53	\$363.49	\$303.33	\$23.63
2015	\$337.61	\$381.24	\$321.53	\$43.92
2014	\$340.78	\$383.92	\$324.88	\$50.39
2013	\$230.63	\$222.29	\$169.10	\$13.77
2012	\$171.77	\$165.81	\$104.78	\$13.53
2011	\$156.06	\$150.85	\$87.89	\$13.26
2010	\$152.48	\$147.55	\$84.33	\$13.01
Average	\$277.87	\$302.23	\$241.50	\$31.66

*These figures have been adjusted to nominal values. Dr. Jackson originally reported the results in 2018 dollars. The unadjusted, real ten-year averages for each zone that Dr. Jackson included in his report were \$290.64, \$315.41, \$251.05, and \$32.90, respectively.

The subcommittee concluded, based on industry expertise and expectations, that Dr. Jackson’s valuations were unreasonably high. It was decided that economists at the Tax Policy and Research (TPR)

division at the Department of Revenue review the model and explore alternative valuation methods.

TPR studied different datasets, ran several different models, and, with suggestions and guidance from various members of the subcommittee, considered and attempted other options of valuation.

Ultimately, it was decided that a regression model based on data from the DNRC is the best method of valuing private forest land in Montana. TPR's core model structure remained the same as Dr. Jackson's.

The dataset and observations used, the separation of zones, the use of a timber price index, and the inclusion of stump-to-mill costs as explanatory variables are instituted in both models. The main changes were the use of a different index, earlier unit conversions, simplified explanatory variables, the calculation of the dependent variable (moving road costs to be an explanatory variable), and readjusting the results to nominal figures.

Regression Results

Below are the ten-year average results of the TPR model. Again, 2010 through 2013 contain Dr. Jackson's previous appraisal.

Table 2. TPR's Ten-Year Averages

Year	NW	SW	Central	East
2019	\$217.38	\$165.27	\$185.04	\$48.65
2018	\$228.43	\$175.57	\$172.99	\$37.35
2017	\$200.23	\$152.30	\$150.99	\$32.90
2016	\$202.12	\$159.91	\$152.55	\$34.92
2015	\$271.01	\$259.80	\$287.77	\$82.46
2014	\$228.57	\$198.00	\$182.45	\$31.84
2013	\$230.63	\$222.29	\$169.10	\$13.77
2012	\$171.77	\$165.81	\$104.78	\$13.53
2011	\$156.06	\$150.85	\$87.89	\$13.26
2010	\$152.48	\$147.55	\$84.33	\$13.01
Average	\$205.87	\$179.73	\$157.79	\$32.17

The new stumpage values are much lower in the Northwest, Southwest, and Central zones and slightly higher in the East zone. Below is a summary of the ten-year averages of both models and the percent difference.

Table 3. Jackson and TPR comparison

	Jackson 2019	TPR 2022	% difference
Northwest	\$277.87	\$205.87	-25.91%
Southwest	\$302.23	\$179.73	-40.53%
Central	\$241.50	\$157.79	-34.66%
East	\$31.66	\$32.17	1.61%

TPR believes the revised regression model using DNRC timber sales is statistically sound, defensible, transparent, and reasonable. It is also easily updated and repeatable. Other methods of valuing forest land, including methods involving additional data, can be used as reasonableness checks but do not as accurately measure expected stumpage value.

Alternative Methods

The simplest way to estimate stumpage value is to take an average of the sales by government agencies and assume they apply to private land. This is a poor method for several reasons. The first and most restrictive is the small amount of data available. The DNRC facilitated 149 sales from 2014 to 2019. 30 of them were either salvage or noncompetitive, meaning they did not meet general criteria for market pricing and were therefore excluded. This left only 119 sales to average. When those were split by year and zone, some categories had no sales to average and others had very few.

	NW	SW	Cent	E
FY14	9	6	2	0
FY15	11	5	2	0
FY16	13	6	2	0
FY17	7	6	3	3
FY18	11	3	2	3
FY19	18	6	0	0
Totals	69	32	11	6

Averaging data of this sort, especially when it is so limited, is not statistically acceptable. One solution to this is to find and include additional data, and, at the subcommittee’s suggestion, TPR sought to incorporate timber sales by the U.S. Forest Service (USFS). Initially, it was hoped that the USFS data could be added into the regression model with the DNRC data. Unfortunately, the potential explanatory variables between the two datasets did not match enough to create a unified regression with equivalent variables. Additionally, 90% of the USFS sales were salvage compared to 10% of the DNRC sales, signifying another incomparability. The DNRC data excludes salvage sales to remain consistent with the data used for the regression, but the USFS data keeps them because they make up such a significant portion of those sales. Because salvage forest land is worth less than non-salvage, the USFS averages are generally lower than the DNRC averages. However, these averages can still be used as a reasonableness check for the regression analysis. Table 5 below compares ten-year averages of annual average values of both datasets to the TPR regression results.

Table 5. Comparison of Ten-Year Averages

	Combined Average	DNRC Average	USFS Average	TPR Regression
Northwest	\$200.44	\$206.53	\$197.19	\$205.87
Southwest	\$166.05	\$177.73	\$160.09	\$179.73
Central	\$148.51	\$158.08	\$139.77	\$157.79
East	\$34.42	\$25.01	\$31.14	\$32.17

As expected, the average of DNRC sales is very similar to the TPR regression results because those sales were used as the dependent variable in the regression. The combined average is slightly lower in most zones but are overall very similar to the regression results.

A residual value analysis was also undertaken as a reasonableness check of the regression results. Residual value analysis is the process of subtracting estimated logging and hauling costs from expected timber prices to arrive at a stumpage value. Expected prices were estimated for each sale using species-specific index prices from the Bureau of Business and Economic Research (BBER) at the University of Montana. Expected logging and hauling costs – based on logging methods and haul

distance – were also estimated by BBER for the state of Montana. Below are the ten-year averages of this method using the DNRC data.

Northwest: \$140.37 Southwest: \$138.78 Central: \$104.12 East: (12.22)

The residual analysis results are much lower than both the regression and the averages of sales, and that is with the old appraisal method for 2010-2013 boosting the values in every zone. This method seems to be too reliant on haul distance, which is why the value in the East, where haul distance is the greatest, is negative. The underlying problem with the residual approach is that the estimates of all three variables from BBER – delivered log price, logging cost, and hauling cost – are too broad and imprecise to apply to such a geographically diverse range of data. It seems that more goes into the value of stumpage than just expected revenue minus logging and hauling. The regression analysis includes many of these additional variables and much more closely tracks the actual price of forest land sales. However, the residual analysis producing such markedly lower stumpage values suggests that DNRC sales may contain a value premium that private timber sales do not. This value premium may be due to size of logging, length of contract, or the reliability of dealing with the DNRC. The subcommittee is investigating the possibility of this value premium.

Conclusion

The revised version of Dr. Jackson’s regression analysis by TPR is the best statistically defensible method of valuing private forest land in Montana. It is transparent and repeatable and captures most of the variables that determine competitive bid prices of public forest land. Simple averages and residuals were used as reasonableness checks. It is possible that the DNRC sales include a premium that would not apply to private forest land, and the regression results should be revised down to reflect that premium when it is reliably understood. Until then, the ten-year average stumpage values for each zone in Montana in dollars per thousand board feet is the following.

Northwest: \$205.87 Southwest: \$179.73 Central: \$157.79 East: \$32.17