
New Brunswick Private Woodlot Stumpage Values

Stumpage Study
Results - October
2014 to September
2015 - REVISED

*New Brunswick Forest
Products Commission
in collaboration with
PricewaterhouseCoopers LLP*

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INTRODUCTION

What is the purpose of this report?

This report provides the results of a study which was undertaken to determine the value of forest products in the form of standing trees on private woodlots in New Brunswick. The value of standing trees is commonly referred to as stumpage and, for the purpose of this report, is the value paid to the owner(s) of the trees by the person(s) harvesting those trees. In New Brunswick, the *Crown Lands and Forests Act* requires that all stumpage transactions on Crown lands be based upon private market prices (or fair market value). This requires that Government conduct periodic studies of stumpage values on private woodlots to ensure that Crown transactions are based on recent private market rates.

Who conducted this study?

The New Brunswick Forest Products Commission (Commission) is an independent body established under the *Natural Products Act* and the *Forest Products Act*. Among the various duties of the Commission, there are two sub-sections of the *Forest Products Act* that specifically relate to this type of study:

- 11(a) *to examine and consider data relevant to the production and sales of purchased primary forest products; and*
- 11(e) *to conduct inquiries on the following matters with respect to primary forest products:*
 - (i) *The cost of production, distribution and transportation;*
 - (ii) *Prices, markets and systems of classification; and*
 - (iii) *Any other matter related to marketing.*

The Commission engaged PricewaterhouseCoopers, LLP (PwC) to assist in the development of specified procedures for the validation of data and the methodology for the statistical analysis to be applied for this study. As a multinational professional services network, PwC is globally the largest firm of its kind with more than 100 years of experience in Canada, focusing on assurance, advisory and tax services for public, private, and government clients in the areas of corporate accountability, risk management, structuring and mergers, and performance and process improvement.

What is the purpose of the study?

The value of standing timber is typically referred to as stumpage. It is the value offered to a landowner by a party interested in harvesting the landowner's timber. Section 59(1) of the *Crown Lands and Forests Act* provides that royalty rates for stumpage on Crown lands shall be based on the fair market value of standing timber.

The purpose of this study is to compile a database of stumpage transactions from private woodlots in New Brunswick and, using average values of forest products in standing timber throughout the Province, determine provincial average stumpage values. Those average values can be referred to as the fair market value of standing timber.

There are approximately 42,000 private woodlot owners in the Province, and hundreds of purchasers, including forest products processing facilities and over two hundred (200) private forestry contractors. There were over 13,000 private transactions (by load of wood products) reported in this study alone. Timber from private woodlots is also shipped to, and imported from, neighboring Canadian provinces such as Nova Scotia and the United States, but principally the state of Maine. The free inflow and outflow of wood products impact prices that private woodlot owners are paid for stumpage in New Brunswick.

Private woodlots represent almost thirty percent (30%) of the Province's forested land and were the source of over two (2) Million cubic meters of forest products in the 2015-2016 fiscal year. When combined with the estimated 500,000 cubic meters of annual hardwood firewood production from private woodlots, this represents ninety-six percent (96%) of the sustainable annual allowable cut that was recommended in the 2012 *Private Forest Task Force Report* commissioned by the New Brunswick Government.

Roughly eighty-five percent (85%) of the forest products produced annually from private woodlots are sold to mills in New Brunswick, with the remaining volume shipped to other provinces or countries. Combined, privately owned industrial forest land and private woodlots represent approximately fifty percent (50%) of the forested land and production of primary forest products in the province.

The value of standing trees to the landowner is based on several factors. These factors can be categorized in four (4) general ways:

1. market/macro-economic factors (e.g., finished product value, import/exports, exchange rates),
2. land/forest conditions (e.g., tree size, terrain),
3. landowner policies/standards (e.g., harvest treatments, tree utilization expectations), and
4. operational efficiencies (e.g., road infrastructure, distance to mill, job size)

The value of stumpage on any one woodlot can be dependent upon these and other factors and can therefore vary throughout the Province. The objective of this study is to generate statistically accurate average values for stumpage sold from private woodlots in the Province for the twelve-month period between October 2014 and September 2015.

How was the study conducted?

From the mid-1980s until present the present study, the Department of Natural Resources determined fair market values based on surveys of private land stumpage transactions in New Brunswick and the greater Maritime region. Such surveys were conducted because of the legal requirement that all royalty rates for stumpage on Crown lands be based on the fair market value of the standing timber. The surveys were conducted by independent consultants, such as AGFOR Inc. and Nortek Resource Solutions Inc., using the available means of collecting information and data at the time. Information from individual private woodlot owners was provided to independent consultants on a confidential basis and was subject to verification. The surveys were conducted every two to five years with Crown stumpage rates indexed to lumber prices in the interim years.

The Commission was engaged by the Department of Energy and Resource Development (formerly Natural Resources) to develop an enhanced stumpage study methodology in collaboration with PricewaterhouseCoopers, LLC. The methodology utilized in the study is detailed in a report titled 'New Brunswick Private Woodlot Stumpage Values – Stumpage Study Methodology', dated July 2016.

Utilizing advances in information technology and record keeping, the Commission's authority to obtain relevant information, and the improved services offered by Forest Products Marketing Boards, the present study implements improvements to make the collection and analysis of private stumpage data even more robust. These include the following:

1. Employing the Commission to conduct the study, as an entity that possesses legal authority to collect the type of data required. Based upon the legal authority, the Commission will require all relevant parties to provide the necessary information.
2. Requiring parties involved in stumpage transactions to participate. By requiring parties to participate, the system will not be voluntary. It will be mandatory, ensuring comprehensive data collection.
3. Standardizing the data collection process. By standardizing the data collection process, the Commission will enhance the quality of the data and eliminate inconsistent record-keeping.
4. Having a third party auditor verify transactions, assess the quality of reporting, and ensure valid methodologies. This ensures fair and impartial methodologies, information gathering and accuracy of data. This is an important element of the enhanced system.
5. Applying sound statistical analysis. This is important to ensure the data is interpreted properly to avoid distortions.
6. Creating a goal of compiling a robust dataset of private woodlot, product-specific stumpage transaction prices in the Province. By creating a complete dataset of the product-specific transactions that can be updated monthly when fully implemented, the Commission will be able to evaluate stumpage markets on a more frequent basis.
7. Increasing the scope of information gathered from each transaction, including transaction specific identifiers such as transportation certificate number, load scale slip number, property identification number, volume, unit of measure and stumpage value. This provides the Commission with significantly more information, permitting increased analysis and verification.
8. Enabling the Commission to more frequently analyze stumpage values to ensure that the information reflects current private market conditions. This allows the Commission to calculate FMVs on an annual basis, eliminating the need for indexing created in prior system.

The submitted data was treated with high confidentiality and a version of each submission will remain on file in its original form. When the data was added to the database, the transactions were assigned a number code in order to provide reference to the respondent for data validation purposes while ensuring anonymity.

As previously mentioned, to verify the data that was collected for this study, the Commission engaged PwC to carry out the specified procedures developed for the survey methodology. The results of the data verification process are found in Appendix A.

STUDY RESULTS

What information was requested?

The information requested included details of transactions where wood originating from a private woodlot was harvested and sold as product specific and transaction based stumpage during the time period of October 1, 2014 to September 30, 2015. Product specific and transaction based stumpage means that a monetary exchange was transacted between a woodlot owner and the person(s) conducting the harvesting of timber on the woodlot owner's land on the basis of an individual load or part thereof.

Leading up to this study, the Commission contacted the seven (7) Forest Products Marketing Boards and forest product processing facilities to determine the volume and quality of data that could be collected. It was learned that five (5) of the seven (7) Boards offered a service to the many forestry contractors and private woodlot owners whereby the Board would administer the terms of a stumpage agreement on behalf of the two parties and deduct the agreed upon stumpage value from each transaction and make payment to the woodlot owner on behalf of the forestry contractor. Although the proportion varied by region, it was learned that a large volume of data for Board-administered transactions could be collected from the Boards in the format and quality that was desired.

It was learned that, within the study period, certain domestic forest product processing facilities purchased stumpage from private woodlots to supplement their wood supply. Data from these companies could be collected for all of the products that were purchased by those companies from private woodlots in product specific and transaction based stumpage agreements.

In November of 2015 the Commission directed, using sub-section 11(1)(d) of the *Natural Products Act*, the 7 New Brunswick Forest Products Marketing Boards and all forest product processing facilities who purchase stumpage from private woodlots to submit all available stumpage transaction information for the time period. The required information is shown in Table 1 below.

In an attempt to address the issue of stumpage payments directly from forestry contractors to private woodlot owners, the Commission held meetings in several Board regions with a number of forestry contractors. The Commission determined that there are over two hundred (200) professional forestry contractors in the Province and most purchase stumpage from woodlot owners as part of their normal business.

The information collected from the Boards captured stumpage transactions originating from many forestry contractors. The purpose of these meetings was to determine if additional information of equal detail to that requested from the Boards and processing facilities could be collected directly from other forestry contractors. The Commission learned through these meetings that forestry contractors' record keeping systems were generally much less sophisticated than those of the Boards and processing facilities and would create considerable difficulty for contractors to compile verifiable data in the level of detail required. For this reason, contractor information was requested by way of a voluntary questionnaire through which contractors could report the prices offered in stumpage agreements with woodlot owners within the time period of the study, similar to surveys conducted in the past.

Table 1. Data collected by the Commission from Boards and Forest Product Processing Facilities.

Data Field	Description / Purpose
TC #	Transportation certificate number for the transaction – one of two possible methods of linking the transaction to stumpage paid to the woodlot owner for the transaction.
Load Slip #	Load or Scale slip number for the transaction - one of two possible methods of linking the transaction to stumpage paid to the woodlot owner for the transaction.
Date	Date that the transaction occurred (delivery or scale date).
PID #	Property Identification number for the private woodlot from which the transaction originated. This information is used for two purposes, first for Commission staff to verify that the property is a valid private woodlot; secondly to allow for Commission staff to assign the map grid number within which the private woodlot is located. The Department of Natural Resources (DNR) map grid location is used to assign a transportation distance for each transaction.
Species	Species of the forest products sold. This is to be used as the primary sorting field for the various timber classes. Species is also used to establish the appropriate conversion factor to convert the volume to solid cubic meters.
Product	Product of the forest products sold. This is used as the secondary sorting field for the various timber classes. Product is also used to establish the appropriate conversion factor to convert the volume to solid cubic meters.
Volume	Volume of the transaction as verifiable by the TC# or load slip #. It is used as the primary factor in converting the volume to solid cubic meters.
Unit of Measure	Unit of measure used to quantify the volume of the transaction at the destination. Unit of measure is used to establish the appropriate conversion factor to convert the volume to solid cubic meters.
Destination Mill	Delivery destination of the wood products in each transaction.
Stumpage Paid	Gross dollar (\$) value paid to the woodlot owner for the transaction.
MB Region	Forest Products Marketing Board region within which the harvesting occurred for each transaction.

Because there was a limited response to the voluntary questionnaire and the information collected was not transaction specific (only included stumpage prices offered with no associated volumes), it was not used in the Commission’s calculation of the Provincial averages. This information was, however, used by the Commission for comparison to the study results.

How much data was received?

The respondents submitted a total of 13,089 data records to the Commission. Each data record represented a transaction that corresponded to a load of forest products or part thereof (in the case of products with multiple grades).

The level of detail in the current submitted data was such that the Commission was able to determine prices paid for the species/product groups within each woodlot. In assuming that each woodlot represents a stumpage agreement, combined with the species/product pricing associated within each agreement, the Commission was able to align the study data with metrics that were used in past surveys. This enabled the Commission to conduct a direct comparison between the current study response level and those of previous surveys.

Table 2 provides a comparison of the response level from the current study to the previous two (2) surveys where stumpage agreements and price points were used as the metrics.

Table 2. Response levels: current study vs. previous two (2) surveys.

Report Period	Stumpage Agreements	Price Points
Current Study	461	2,650
December 2013	102	741
June 2011	156	716

How was the response data organized and interpreted?

As detailed in the Commission’s study methodology, a number of descriptive statistics were calculated for each species/product group. In order to establish species product groups, the Commission adopted an approach to group species and/or products that would be most likely applied in the establishment of stumpage agreements between a woodlot owner and the person wishing to harvest an owner’s trees. The Commission also considered species/product groups that were likely to be used for Crown timber harvests. Table 3 is a summary of the various species and product groups that were used to analyze stumpage values in this study.

Table 3. Species and Products groups used in the study.

SPECIES	PRODUCT	GROUP
CEDAR	SAWLOG	CEDSAW
CEDAR	STUD	
CEDAR	TREELENGTH	
POPLAR	CHIPS	HWDPW
HARDWOOD	CHIPS	
HARDWOOD	PULPWOOD	
POPLAR	PULPWOOD	
HARDWOOD	SAWLOG	HWDSL
RED PINE	PULPWOOD	OSRWB**
HEMLOCK	PULPWOOD	
WHITE PINE	PULPWOOD	
TAMARACK	PULPWOOD	
TAMARACK	SAWLOG	OSSL
HEMLOCK	SAWLOG	
WHITE PINE	SAWLOG	PISL
SPF*	ROUNDWOOD BIOMASS	SPFRWB**
SPF*	CHIPS	
SPF*	PULPWOOD	
SPF*	SAWLOG	SPFSL
SPF*	STUD	SPFST

* SPF = Spruce, Fir, Jack Pine

** RWB = Round wood biomass, including pulpwood and chips produced at the harvest site.

Often, in larger collections of data, values that are significantly higher or lower than the average are commonly referred to as outliers. Outliers can sometimes indicate faulty data, flawed procedures or cases where data is influenced by unknown or abnormal factors.

Options for identifying and dealing with outliers were explored. Ultimately, the Commission applied an approach used in an adjacent jurisdiction in averaging stumpage values (*2014 Stumpage Prices – Department of Agriculture, Conservation and Forestry, Maine Forest Service – November 6, 2015*). This approach consists of sorting the stumpage values (\$/m³) from lowest to highest for each species/product group. Once values were sorted, transactions located below the fifth (5th) and above the ninety-fifth (95th) percentiles were excluded from the statistical calculations for each species/product group.

Once the outliers were identified for exclusion, a number of statistical calculations were performed. The primary objective of the study was to determine the mean or average stumpage value of the various species/product groups for the Province. In past surveys, a variety of methods were used to calculate the average stumpage value, such as weighted averages, simple arithmetic mean, or interquartile mean.

In PwC's review of the Commission's methodology for calculating descriptive statistics from the data, it was recommended that the Commission use a simple arithmetic mean for its primary calculation of average stumpage values. The rationale was that use of simple arithmetic mean calculations would not be dependent on assumptions. In contrast, many of the other methods of calculation required assumptions to be made before conducting calculations on the data.

Nonetheless, PwC also recommended conducting calculations using the alternative methods considered, and including them in an Appendix to the report, comparing the results to those of the chosen method. Appendix B of the report provides an explanation of other calculation methods considered, as well as a comparative summary of the results. The descriptive statistics calculated for the species/product groups are detailed in Table 4 below.

Upon the confirmation of PwC, the Commission used the following formula to calculate confidence intervals for each species/product group:

$$\text{Confidence interval} = \mu \pm Z_{\alpha/2} * (s/\sqrt{n})$$

Where: μ = mean of stumpage / m³

$Z_{\alpha/2} = Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$
99% Confidence Level - $Z_{\alpha/2} = 2.575$

s = standard deviation

n = total of the volume in the response data

It should be noted that due to the robustness of the dataset, the Commission was able to apply a significant confidence level of ninety-nine percent (99%) for these calculations. This means that if a response of equal size were collected in a separate study, there would be a ninety-nine percent (99%) probability that the result would fall within the confidence interval either above or below the mean.

Table 4. Summary of descriptive statistics calculated for the species/product groups.

Statistic	Description
Species/Product	Grouping of the species and products for a timber class to be described.
Mean	Simple arithmetic mean is the sum of the values in a numeric data field divided by the number of records found in that data field. In the case of this study, the field of interest was the stumpage value expressed in dollars per cubic meter (\$/m ³). For each species/product group, the stumpage values per cubic meter for each transaction were totaled and divided by the number of transactions in the group. This method was also used for the Maine report referred to above.
Standard Deviation	For each species/product group the standard deviation was calculated as an indicator of the variability of the data. Standard deviation is a number used to tell how measurements for a group are spread out from the average (mean), or expected value.
Minimum	Lowest stumpage value (\$/m ³) within the species/product groups.
Maximum	Highest stumpage value (\$/m ³) within the species/product groups.
Response Volume	Total volume (m ³) of the transactions in the collected data for each species/product group.
Harvest Volume	Total volume (m ³) of all products harvested from private woodlots in New Brunswick within the time period studied for each species/product group.
Confidence Interval	When calculating a mean using the response data, the confidence interval is the range of values within which there is a certain percentage of confidence that the true mean falls within.

Response size and variability are two of the most influential factors when considering confidence level and calculating confidence intervals. Standard deviation (or standard error) is an indicator of the variability of the data received. The Commission tested the impact of increased standard deviation and decreased response sizes to gauge the reliability of the data and confidence interval calculations. For example, if the standard deviation of HWDPW stumpage was doubled to \$6.62, the impact on confidence interval would result in an increase of plus or minus \$0.03/m³. For the same group, reducing the response size to one quarter of the actual response size would have the same effect.

It should also be noted that the total harvest volume reported for each species/product group (see Table 5 below) includes more than transaction based stumpage sales. The total harvest volume includes: (1) transaction based stumpage sales reported by the Boards and forest product processing facilities; (2) primary forest products produced by woodlot owner/operators (for which there are no stumpage transactions); and (3) stumpage volume sold through lump-sum transactions. The volumes produced through the latter two types of transactions are estimated to represent upwards of fifty percent (50%) of the total volume produced. Accordingly, the Commission estimates that the response volume exceeds forty percent (40%) of the total production from product-specific transaction based stumpage harvests from New Brunswick private woodlots. While the total harvest volume is not considered in calculating confidence intervals for the species/product groups, it does, however, offer perspective on the amount of response data versus the total production. The Commission believes that an ability to isolate and quantify the volume of transaction based stumpage sales would significantly improve the response-to-population ratio.

What are the Provincial results?

As a result of the various analyses described in the previous sections, the Commission concludes that the provincial average stumpage value by species/product group, or the average fair market value for transaction based stumpage, is best determined using the arithmetic mean of the data collected. Table 5 below summarizes the results of the statistical calculations that were conducted for each species/product group.

Table 5. Descriptive statistics of stumpage by species/product group for the entire dataset with outliers excluded. Confidence intervals were calculated using a confidence level of ninety-nine percent (99%).

Species/ Product Group	Provincial Mean (\$/m³)	Standard Deviation	Minimum (\$/m³)	Maximum (\$/m³)	Response Volume (m³)	Total Harvest Volume (m³)	Confidence Interval* (\$/m³)
CEDSAW	\$ 19.30	\$ 3.53	\$ 10.21	\$ 25.13	3,457	21,728	± \$ 0.71
HWDPW	\$ 9.62	\$ 3.31	\$ 4.47	\$ 17.39	89,818	523,303	± \$ 0.16
HWDSL	\$ 19.06	\$ 5.71	\$ 14.29	\$ 37.86	1,174	36,837	± \$ 1.24
OSRWB	\$ 4.81	\$ 2.99	\$ 0.92	\$ 9.61	3,107	7,468	± \$ 0.70
OSSL	\$ 9.19	\$ 2.78	\$ 5.19	\$ 16.39	1,167	6,808	± \$ 0.99
PISL	\$ 14.81	\$ 2.38	\$ 10.35	\$ 20.33	4,051	14,482	± \$ 0.58
SPFRWB	\$ 5.81	\$ 1.91	\$ 1.74	\$ 11.05	104,488	368,186	± \$ 0.08
SPFSL	\$ 19.14	\$ 3.72	\$ 12.36	\$ 27.05	42,646	274,676	± \$ 0.25
SPFST	\$ 15.69	\$ 2.89	\$ 9.75	\$ 22.75	108,554	508,101	± \$ 0.13

**Revision – Fixed error in calculation of confidence interval in previous version of report.*

APPENDIX A
DATA VERIFICATION RESULTS

Summary of Data Verification Results

The Commission engaged PricewaterhouseCoopers LLC to conduct Specified Procedures in order to verify data provided to the Commission for the purpose of this study. The objective of the verification was to ensure that the data provided to the Commission aligned with source documentation held by the various organizations that provided data. In order to match the transactions, PwC compared the following data fields to transaction source documentation from each data source: Date, TC#, Species, Product, Volume, Unit of Measure and Stumpage Paid. The following table summarizes discrepancies discovered between the data provided and the source documentation for the transactions that were selected for verification. The following commentary describes the discrepancies that were discovered and the degree of impact, if any, they may have on the stumpage calculations conducted by the Commission.

Data Source	# of Selections	Date	TC#	Species	Product	Volume	Unit of Measure	Stumpage Paid
1	20	1	2	0	0	0	0	0
2	30	0	0	0	2	0	0	0
3	30	1	0	0	0	0	0	0
4	29	11	0	0	2	0	0	0
5	30	1	0	0	0	0	0	0
6	30	2	0	1	0	0	0	1
7	27	1	0	0	0	0	0	0
8	28	0	0	0	0	0	1	0
9	29	0	0	0	0	0	0	0
Totals	253	17	2	1	4	0	1	1

DATE

Within the date field, a total of seventeen (17) discrepancies were discovered. In each of the seventeen (17) cases, the transactions were verified. Of those seventeen (17) cases, seven (7) were the result of misaligned dates that fell within the same month, often within a week, indicating a delay between the dates of the transaction and the time at which the transaction was processed in respective accounting systems. The other ten (10) discrepancies were isolated to one data source where month and day were inadvertently transposed at the data entry stage.

For example: The data would have shown a date of July 1, 2015 and the source documentation a date of January 7, 2015. In this example, there would be an impact on the season and consequently on the conversion factor to be used. In order to test the potential impact, the Commission created a separate copy of the data and isolated all of the dates within that data source that could possibly be transposed (i.e. day and month were both recorded as twelve (12) or less).

Whenever necessary, the Commission changed the season in the working copy of the database to match the transposed date and then recalculated the volume in cubic meters with the appropriate conversion

factors. The Commission also recalculated the stumpage per cubic meter using the stumpage paid for the transaction and the new volume. Once completed, the Commission recalculated the average provincial stumpage rates. The following table displays the maximum resulting impact in the hypothetical event that all of the dates within the data were mistakenly transposed at the data entry stage.

Species/Product Group	Final Calculation (Original)	Final Calculation (Test for Date Issues)	Variance
CEDSAW	\$ 19.30	\$ 19.30	Nil
HWDPW	\$ 9.62	\$ 9.63	\$ 0.01
HWDSL	\$ 19.06	\$ 19.06	Nil
OSRWB	\$ 4.81	\$ 4.81	Nil
OSSL	\$ 9.19	\$ 9.19	Nil
PISL	\$ 14.81	\$ 14.81	Nil
SPFRWB	\$ 5.81	\$ 5.81	Nil
SPFSL	\$ 19.14	\$ 19.14	Nil
SPFST	\$ 15.69	\$ 15.69	Nil

The Commission is confident that problems with dates emanating from this particular data source had very little impact on the results of the final calculations. However, this issue will lead the Commission to establish data entry standards for date formatting in future data collections.

TRANSPORTATION CERTIFICATE NUMBER (TC#)

Two (2) discrepancies were identified within the Transportation Certificate Number field between the submitted data and the source documentation. In either case, they were confirmed to be typographical errors at the data entry stage as the balance of the information for the transactions was verified. These discrepancies have no impact on the results of stumpage calculations conducted by the Commission.

SPECIES

One (1) discrepancy was identified in the species field. It was determined to be a typographical error at the data entry stage. In this instance, the species was identified as spruce, fir, jack pine (SPF) and the source documentation identified the species as red pine (OS). The Commission investigated the source of the error. It was discovered that the destination mill in the transaction did not typically purchase SPF. The balance of the transactions for the destination mill did not reveal any systemic error as it was the only case in the data where the species was identified as SPF. The resulting stumpage per cubic meter for this transaction fell within the standard deviation of the mean regardless of whether the calculation pertained to the appropriate product group for SPF or OS. For that reason, as well as the fact that it appeared to be an isolated case, there was little or no impact on the results of stumpage calculations conducted by the Commission.

PRODUCT

Four (4) discrepancies were identified in the product field. All cases were determined to be typographical errors at the data entry stage. In two of the cases, the product was identified as sawlogs (SL) and the source documentation identified the product as treelength (TL). For these, the stumpage value fell within the range of data for SPF sawlogs and would therefore have little or no impact on the results of the final calculations. In the other two cases, product was identified as pulpwood (PW) and the source documentation identified the product as studwood (ST). Because the resulting stumpage value per cubic meter was unusually high, these two instances had already been identified as outliers and were not included in the final stumpage value calculations.

UNIT OF MEASURE

One (1) discrepancy was identified in the unit of measure field. This appeared to be a typographical error at the data entry stage where the unit of measure was identified as stacked cubic meters (M3ST) and the source documentation indicated the unit of measure as green metric tonnes (GMT). This type of discrepancy would have some degree of impact on the conversion from unit of measure to cubic meters. The Commission investigated other transactions in the data for the Species/product / Unit of Measure combination for the destination mill involved in this transaction. There was only one other instance where the stumpage per cubic meter calculation fell within the same range. In any case, the stumpage per cubic meter remains within the range of data used to calculate the SPF pulpwood (SPFRWB) stumpage value. Furthermore, given that this appears to be a relatively isolated case, the impact on the results of the final stumpage calculations would be minimal.

STUMPAGE PAID

One (1) discrepancy was identified in the stumpage paid column. The issue identified as a discrepancy was the result of a situation wherein a direct relationship could not be made between the specific stumpage value paid (as identified in the data) and that of the source documentation. This particular transaction was one portion of a larger transaction involving multiple grades of hardwood sawlogs. The stumpage value per unit of measure paid did however match the stumpage value per unit of measure that was paid based on the source documentation for the transaction. As a result, there is no impact from this discrepancy on the results of the stumpage calculations conducted by the Commission.

CONCLUSION

Based on the above substantiations of the discrepancies found in the verification of the data and the fact that all of the transactions could be verified, the Commission is confident that the data used to conduct calculations of average stumpage values are representative of stumpage transactions for the time period of the study. The discrepancies identified, that have any impact on the calculations, fall within the expected margin of error that was applied in selecting the transactions for verification.

APPENDIX B
OTHER ANALYSES COMPLETED

Other Analyses

The Commission conducted identical calculations of descriptive statistics using data at the Board region level, including mean, standard deviation, minimum, maximum, response volume, total harvest and confidence interval (based on a confidence level of 99%) for the Board region data collected.

Carleton-Victoria (CV)

Species/ Product Group	Mean (\$/m ³)	Standard Deviation	Minimum (\$/m ³)	Maximum (\$/m ³)	Response Volume (m ³)	Total Harvest Volume (m ³)	Confidence Interval* (\$/m ³)
CEDSAW	\$ 19.14	\$ 3.67	\$ 10.21	\$ 25.13	1,630	8,408	± \$ 1.27
HWDPW	\$ 14.28	\$ 1.58	\$ 7.26	\$ 17.24	7,690	130,182	± \$ 0.24
HWDSL	\$ 22.85	\$ 6.00	\$ 16.07	\$ 30.04	135	5,479	± \$ 4.29
OSRWB	\$ 6.09	\$ 0.14	\$ 5.99	\$ 6.18	50	50	± \$ 0.25
OSSL	\$ 8.52	\$ 1.74	\$ 5.99	\$ 9.98	67	1,108	± \$ 2.24
PISL	\$ 17.13	\$ 1.68	\$ 15.36	\$ 19.62	317	639	± \$ 1.53
SPFRWB	\$ 5.24	\$ 1.88	\$ 2.62	\$ 10.50	1,775	14,631	± \$ 0.62
SPFSL	\$ 20.09	\$ 2.86	\$ 12.53	\$ 26.56	9,233	77,782	± \$ 0.43
SPFST	\$ 12.06	\$ 2.71	\$ 10.79	\$ 19.62	3,002	16,488	± \$ 0.83

North Shore (NSH)

Species/ Product Group	Mean (\$/m ³)	Standard Deviation	Minimum (\$/m ³)	Maximum (\$/m ³)	Response Volume (m ³)	Total Harvest Volume (m ³)	Confidence Interval* (\$/m ³)
CEDSAW	\$ 17.16		\$ 17.16	\$ 17.16	22	842	
HWDPW	\$ 6.79		\$ 6.79	\$ 6.79	369	69,208	
HWDSL						23,943	
OSRWB						1,311	
OSSL						0	
PISL						216	
SPFRWB	\$ 7.09		\$ 7.09	\$ 7.09	343	42,775	
SPFSL						5,812	
SPFST	\$ 15.19	\$ 0.82	\$ 15.00	\$ 22.24	20,705	114,903	± \$ 0.09

Northumberland (NTH)

Species/ Product Group	Mean (\$/m ³)	Standard Deviation	Minimum (\$/m ³)	Maximum (\$/m ³)	Response Volume (m ³)	Total Harvest Volume (m ³)	Confidence Interval* (\$/m ³)
CEDSAW						255	
HWDPW	\$ 8.66	\$ 1.78	\$ 4.71	\$ 10.90	9,479	49,080	± \$ 0.26
HWDSL	\$ 21.66	\$ 4.65	\$ 15.64	\$ 26.00	40	597	± \$ 4.53
OSRWB						0	
OSSL						246	
PISL	\$ 15.18		\$ 15.18	\$ 15.18	47	6,490	
SPFRWB	\$ 5.11	\$ 1.78	\$ 2.36	\$ 9.15	5,667	41,728	± \$ 0.35
SPFSL	\$ 17.72	\$ 4.31	\$ 12.51	\$ 23.98	1,246	35,388	± \$ 1.99
SPFST	\$ 15.61	\$ 2.25	\$ 11.33	\$ 19.18	8,494	47,888	± \$ 0.41

South East New Brunswick (SENB)

Species/ Product Group	Mean (\$/m ³)	Standard Deviation	Minimum (\$/m ³)	Maximum (\$/m ³)	Response Volume (m ³)	Total Harvest Volume (m ³)	Confidence Interval* (\$/m ³)
CEDSAW						0	
HWDPW	\$ 7.53	\$ 1.60	\$ 4.92	\$ 13.29	2,913	62,107	± \$ 0.45
HWDSL	\$ 20.33	\$ 1.49	\$ 19.28	\$ 21.38	41	62	± \$ 2.71
OSRWB						5,207	
OSSL						0	
PISL	\$ 17.53	\$ 0.57	\$ 16.88	\$ 17.86	119	441	± \$ 0.85
SPFRWB	\$ 4.88	\$ 1.35	\$ 1.74	\$ 9.02	3,914	50,650	± \$ 0.31
SPFSL	\$ 16.75	\$ 2.30	\$ 14.67	\$ 21.64	730	17,043	± \$ 1.32
SPFST	\$ 18.08	\$ 1.78	\$ 11.33	\$ 20.31	4,994	100,553	± \$ 0.40

Southern New Brunswick (SNB)

Species/ Product Group	Mean (\$/m ³)	Standard Deviation	Minimum (\$/m ³)	Maximum (\$/m ³)	Response Volume (m ³)	Total Harvest Volume (m ³)	Confidence Interval* (\$/m ³)
CEDSAW	\$ 17.96	\$ 2.79	\$ 12.26	\$ 22.34	970	1,770	± \$ 0.94
HWDPW	\$ 9.16	\$ 3.28	\$ 4.47	\$ 17.39	64,847	85,814	± \$ 0.19
HWDSL	\$ 24.35	\$ 3.85	\$ 14.76	\$ 34.86	637	712	± \$ 1.75
OSRWB	\$ 2.31	\$ 1.69	\$ 1.79	\$ 7.40	224	654	± \$ 1.31
OSSL	\$ 9.46	\$ 2.72	\$ 5.25	\$ 16.39	553	2,225	± \$ 1.43
PISL	\$ 14.46	\$ 2.36	\$ 10.35	\$ 20.33	3,362	4,657	± \$ 0.63
SPFRWB	\$ 5.74	\$ 1.78	\$ 1.74	\$ 11.05	84,286	141,720	± \$ 0.09
SPFSL	\$ 18.99	\$ 3.87	\$ 12.36	\$ 27.05	26,028	47,258	± \$ 0.33
SPFST	\$ 15.81	\$ 3.12	\$ 9.75	\$ 22.75	66,085	121,425	± \$ 0.17

York-Sunbury-Charlotte (YSC)

Species/ Product Group	Mean (\$/m ³)	Standard Deviation	Minimum (\$/m ³)	Maximum (\$/m ³)	Response Volume (m ³)	Total Harvest Volume (m ³)	Confidence Interval* (\$/m ³)
CEDSAW	\$ 21.27	\$ 3.29	\$ 12.26	\$ 24.57	835	5,115	± \$ 1.25
HWDPW	\$ 9.80	\$ 2.17	\$ 4.88	\$ 15.18	4,519	71,824	± \$ 0.37
HWDSL	\$ 16.27	\$ 4.48	\$ 14.29	\$ 37.86	321	513	± \$ 1.24
OSRWB	\$ 5.05	\$ 3.01	\$ 0.92	\$ 9.61	2,834	3,229	± \$ 0.75
OSSL	\$ 9.03	\$ 3.03	\$ 5.19	\$ 11.48	547	676	± \$ 1.59
PISL	\$ 15.94	\$ 0.94	\$ 14.29	\$ 16.54	205	2,039	± \$ 1.08
SPFRWB	\$ 7.51	\$ 2.53	\$ 2.14	\$ 10.84	8,503	44,060	± \$ 0.40
SPFSL	\$ 18.89	\$ 3.85	\$ 13.26	\$ 24.41	5,409	45,394	± \$ 0.79
SPFST	\$ 15.46	\$ 3.42	\$ 9.95	\$ 20.02	5,274	44,979	± \$ 0.72

*Revision – Fixed error in calculation of confidence interval in previous version of report.

The Commission also explored a number of different methods for calculating provincial averages for fair market value. Below is a description of some of the methods explored and the following table outlines a comparative analysis between the final results and methodology chosen by the Commission and the other methods explored.

Column A – This column contains the arithmetic mean of the full dataset with outliers excluded from the calculation as described in the body of the report (results from Table 5).

Column B – This column contains the arithmetic mean of the full dataset with outliers included in the calculation. This method was not selected because the Commission wanted to conduct calculations in a manner consistent with the adjacent jurisdiction of Maine, USA.

Column C – This column contains the provincial average stumpage rates for the species/product groups weighted by Board region production levels (see “Stumpage Study Methodology”, dated July 2016, pages 9-10). This method was not selected because it required that the Commission assume that all production from a Board region is generated through product specific and transaction-based stumpage types of agreements, which is known to not be the case. Furthermore, there was concern that data may potentially be insufficient at an individual Board region level within a specific species/product group to provide an adequate confidence level for use in weighting.

Column D – For this column, the Commission used proxy data where there was no data collected to apply in the weighting process. The arithmetic mean results of all the data by species/product group was used as proxy data where averages were missing for a particular species/product group or Board region. This method allowed for the inclusion of actual production volumes for the weighting process in areas lacking stumpage data. The weighted provincial average calculated using proxy data is contained in this column. This method was not selected for the same reasons described for Column C.

Column E – This column contains the interquartile mean of the full dataset. Interquartile mean is the average of transactions between the 25th and 75th percentiles (i.e. the middle 50 percent of the distribution). In this method, only the transactions contained in the two inner quartiles were included in the calculation. This method had been used in studies commissioned in the past to determine average stumpage values. The use of this method is typically used as another way to remove outliers from calculations on a dataset. Due to the confidence in the data located below the 25th and above the 75th percentiles, the Commission was of the opinion that these values should be included as they reflect market landscape realities. Therefore, this method of calculation was not selected.

Species/pr oduct Group	A	B	C	D	E
CEDSAW	\$ 19.30	\$ 18.97	\$ 19.58	\$ 19.51	\$ 19.24
HWDPW	\$ 9.62	\$ 9.90	\$ 10.06	\$ 10.02	\$ 9.08
HWDSL	\$ 19.06	\$ 20.08	\$ 22.42	\$ 19.73	\$ 17.51
OSRWB	\$ 4.81	\$ 5.04	\$ 3.22	\$ 4.61	\$ 4.86
OSSL	\$ 9.19	\$ 9.46	\$ 9.09	\$ 9.09	\$ 9.80
PISL	\$ 14.81	\$ 15.05	\$ 15.21	\$ 15.21	\$ 15.08
SPFRWB	\$ 5.81	\$ 5.93	\$ 5.91	\$ 5.91	\$ 5.63
SPFSL	\$ 19.14	\$ 19.25	\$ 18.98	\$ 19.01	\$ 19.21
SPFST	\$ 15.69	\$ 15.73	\$ 15.97	\$ 15.93	\$ 15.62