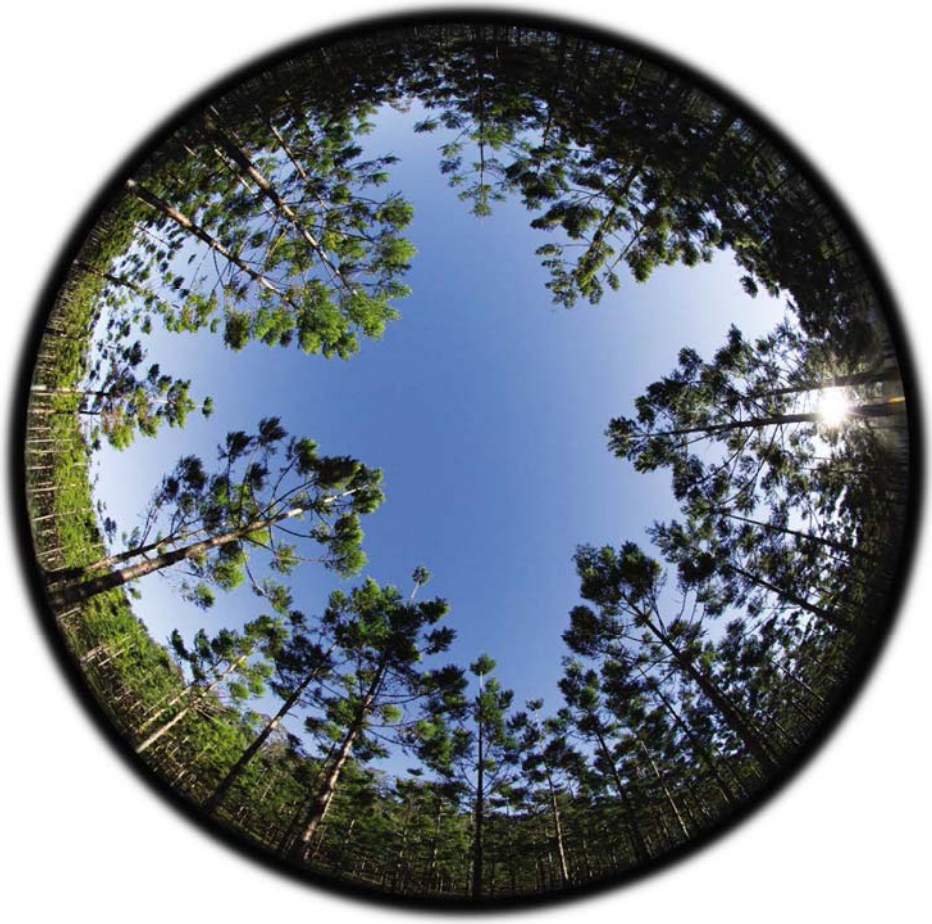
NOVA SCOTIA
Natural Resources

Report on Prices for Standing Timber Sales from Nova Scotia Private Woodlots

for the Period April 1, 2015 through March 31, 2016



September 23, 2016

INTRODUCTION

It is the policy of the Nova Scotia Department of Natural Resources ("NSDNR") to set its Crown land stumpage rates (*i.e.*, the price paid for the right to harvest standing trees on Crown lands) consistent with fair market value. In order to estimate the fair market value of stumpage in the Province, NSDNR commissions periodic surveys of Registered Buyers who routinely purchase stumpage from independent private land owners in a competitive marketplace.

A project to collect and report on private woodlot stumpage prices in the Province was initiated in the summer of 2016. NSDNR commissioned Deloitte LLP ("Deloitte") to conduct a survey of Registered Buyers of softwood sawable products in Nova Scotia for the period April 1, 2015 through March 31, 2016. These Registered Buyers consisted of both mills and independent contractors located across the Province. Deloitte collected detailed information pertaining to Registered Buyers' purchases of private stumpage from independent private woodlot owners in the Province of Nova Scotia. Specifically, Deloitte collected transaction data covering the following products and species:

- *Softwood sawlogs:*
  - Spruce, Pine, and Fir ("SPF")
  - Eastern White Pine ("EWP")
  - Hemlock ("HEM")
  - Red Pine ("RP")
  - Other ("OTHER")

- *Softwood studwood and lathwood:*
  - SPF
  - Eastern White Pine
  - Hemlock
  - Red Pine
  - Other

This report summarizes the results of Deloitte's survey.

DATA COLLECTION AND VALIDATION

Prior to beginning the data collection, NSDNR collaborated with Deloitte to develop procedures for data collection and validation. NSDNR also provided Deloitte with contact information for Registered Buyers of softwood products within Nova Scotia. Deloitte contacted such Registered Buyers and collected the following information from survey participants:

- Registered Buyer Name;
- Seller name;
- Invoice number;
- Transaction date;

- Product species;
- Product category;
- Amount paid;
- Volume;
- Price per unit; and
- County and region of harvest.

Deloitte processed the data as it was returned. Upon receipt of a completed survey, Deloitte scheduled site visits. Through these site visits, Deloitte reconciled survey data with source documents such as scale slips, payment invoices, signed contracts, accounting ledgers, and inventory management records. Deloitte verified physical and electronic source documents.

Prior to conducting the first site visit, NSDNR and Deloitte developed a sampling methodology from internationally recognized financial auditing standards – *9100 Reports on the Results of Applying Specified Auditing Procedures to Financial Information Other than Financial Statements* – and by accounting for the particular characteristics of the data to be tested. Once a survey was received and reviewed, the following three-step approach was applied to develop a testing sample:

1. Generate a random number for each transaction using MS Excel's random number function.

2. Sort the random numbers in ascending order and select the first two transactions per month for buyers of private softwood stumpage of > 50,000 m3 (reported) during the testing period of April 1, 2015 – March 31, 2016; or

   Sort the random numbers in ascending order and select the first transaction per month for buyers of private softwood stumpage of < 50,000 m3 (reported) during the testing period of April 1, 2015 – March 31, 2016.

3. Ensure the randomly generated sample contains:

   a. At least one selection in each county in which the Registered Buyer completed a transaction;

   b. At least one selection for each seller with whom the Registered Buyer completed a transaction.

The second component of Deloitte's testing procedures focused on identifying potential data validity risks associated with data management systems and processes employed by Registered Buyers. Deloitte conducted interviews with respondents' staff during site visits. Questions during these interviews related to items such as:

- Order fulfilment processes, including technology platforms used for order fulfilment;
- Records management processes, including data entry, validation and extraction for use in our survey;

- Records management systems employed; and
- Methodologies to ensure that only relevant transactions were reported.

As part of its testing process, Deloitte also confirmed that:

- The reported transactions were limited to purchases of stumpage by Registered Buyers from unaffiliated private landowners;
- The reported value included only the transaction price for the private stumpage, and excluded the payment of private silviculture fees;[1] and
- The official conversion factors of NSDNR were applied.[2]

Verified surveys were combined into a single dataset to facilitate further analysis.

OVERVIEW OF DATASET

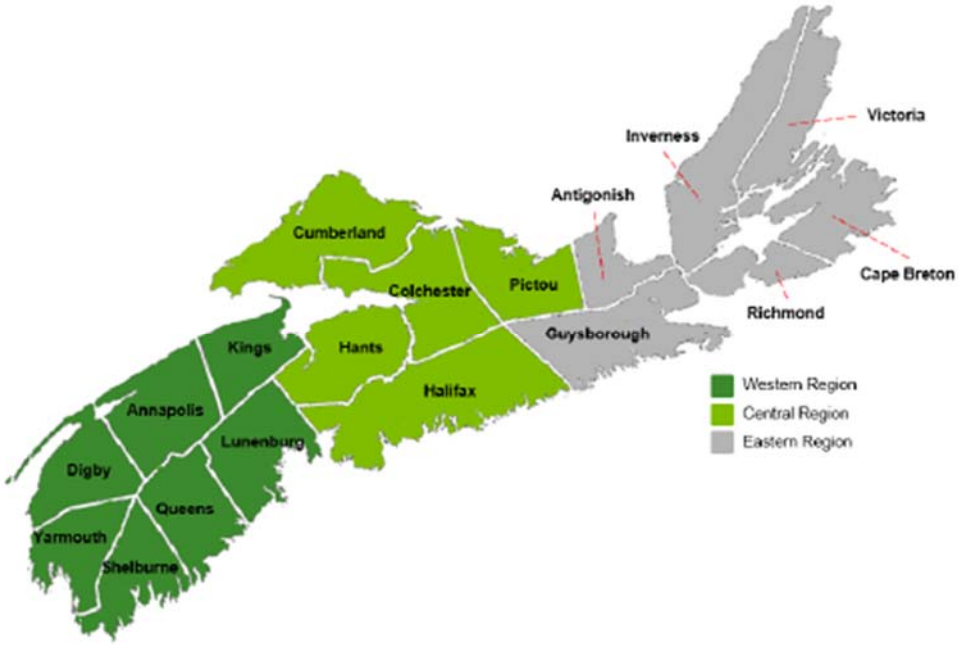
After testing, validating, and formatting the raw survey data, the final sample volume reported by Deloitte was 407,773 m^3 of softwood sawable stumpage purchased across all three regions of the Province.

The composition of each of Nova Scotia's three regions, by county, is presented in **Figure 1** below. This volume of stumpage was purchased through over 5,544 individual transactions during the specified time period. Expressed on a volume basis, NSDNR calculates that the survey covered more than 36 percent of the total volume of private stumpage transactions in Nova Scotia for softwood sawable products during the period from April 1, 2015 through March 31, 2016.

[1] The Forest Sustainability Regulations promulgated pursuant to the *Forests Act* provides that Registered Buyers who purchase more than 5,000 m^3 of primary forest products in a year must contribute \$3.00/m^3 to a Forest Sustainability Fund.

[2] NSDNR's unit conversion table is contained at **Appendix A**.

Figure 1 – Nova Scotia Regional Composition by County



METHODOLOGY AND SURVEY RESULTS

As noted above, the data collected in Deloitte's database included information such as species, region, volume, and total stumpage paid. Because the survey volumes were not a constant share of the total actual harvest volumes in Nova Scotia's three regions, Deloitte employed a methodology whereby (1) the average stumpage price by product category and species was calculated based on the region of harvest reported, and (2) these averages were then reweighted based on actual harvest volumes identified in the NSDNR's Registry of Buyers report for each respective region. NSDNR authorized this approach, as it helped to account for price-by-distance economics inherent in the forestry industry.

After applying regional reweighting, Deloitte next calculated a provincial weighted average stumpage price based on the total volume (m3) harvested for each product category and species. In order to account for potential outliers within the collected data, NSDNR considered the types of trimming methods recognized in nearby jurisdictions, including by the New Brunswick Department of Energy and Resource Development and the Maine Forest Service, and instructed Deloitte to "trim," *i.e.*, disregard, all transactions falling below the fifth and above the ninety-fifth percentiles of the sample ($5^{th}/95^{th}$ percentile method).[3]

To test the robustness and reliability of the dataset, Deloitte assigned each product category and species a confidence interval. The confidence interval was calculated using a 99% confidence level due to the quality of detail afforded by transaction-level data collected from Registered Buyers. The confidence interval is based on the sample mean and the sample standard deviation of the distribution of the sample mean, and represents a range of values within which Deloitte has 99% confidence that the true mean resides. The size of the confidence interval is determined by the variation of the sample (standard deviation) and the size of the sample (number of transactions in the database). The confidence interval is calculated as follows:

$$\text{Confidence Interval} = \mu \pm \left[Z_{\alpha/2} * \left(\frac{\sigma}{\sqrt{n}}\right)\right]$$

Formula Inputs	
μ	Mean stumpage price $/m^3$
$Z_{a/2}$	The critical value of the normal distribution at 99% confidence level (2.576)
σ	Standard deviation of stumpage prices $/m^3$
N	Number of transactions in the sample

The results of the survey are presented in **Table 1** below.

[3] A comparison of results using a volume weighted average of the entire sample, versus a volume weighted average based of the 5th/95th percentile trimming method, is presented at **Appendix B**.

Table 1 – Provincial Private Stumpage Prices, by Product and Species[4]

Product	Species	Unit price ($/m³)	Standard deviation ($/m³)	Confidence interval ($/m³)*
Softwood Sawlogs	SPF	29.95	2.96	± 0.20
	EWP	17.19	1.62	± 0.24
	HEM	15.49	0.75	± 0.14
	RP	14.66	0.25	± 0.12
	HEM/RP/OTHER	14.70	0.77	± 0.14
Softwood Studwood & Lathwood	SPF	27.21	3.59	± 0.16
	EWP	**	**	**
	HEM	**	**	**
	RP	**	**	**
	HEM/RP/OTHER	**	**	**
Softwood Sawables Combined	SPF	27.69	3.55	± 0.13
	EWP	17.03	1.71	± 0.25
	HEM	19.03	3.31	± 0.63
	RP	18.79	0.56	± 0.20
	HEM/RP/OTHER	18.15	2.11	± 0.36

**The confidence interval is calculated using a 99% confidence level due to the quality of data.*

[4] The ** denotes the redaction of data by Deloitte required to protect the confidentiality of survey respondents.

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APPENDIX A

NSDNR UNIT CONVERSION TABLE

Group	Product/Unit	Desc. or Length (ft)	NS Conversion to m^3 (multiply)
Softwood	Sawlog mbfm	Cut to Length	5.663
	Sawlog fbm	Cut to Length	0.005663
	Sawlog tonne	Tree Length	1.167
	Sawlog cord	8	2.322
	Sawlog cord	10	2.265
	Studwood cord	8	2.322
	Studwood tonne	8	1.167
	Studwood m^3(s)	8	0.641
	Studwood cord	10	2.265
	Studwood tonne	1	1.167
	Studwood m^3(s)	10	0.625
	Hemlock tonne	All	1.026
	Larch tonne	All	1.033
	White Pine tonne	All	1.11

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APPENDIX B

COMPARISON OF WEIGHTED AVERAGE PRICES WITH NO TRIMMING AND WEIGHTED AVERAGE PRICES WITH TRIMMING[5]

		Average stumpage price	
Product	**Species**	**All data (no trimming) ($/m³)**	**5th/95th percentile method ($/m³)**
Softwood Sawlogs	SPF	29.89	29.95
	EWP	17.23	17.19
	HEM	15.54	15.49
	RP	14.64	14.66
	HEM/RP/OTHER	14.74	14.70
Softwood Studwood & Lathwood	SPF	27.15	27.21
	EWP	**	**
	HEM	**	**
	RP	**	**
	HEM/RP/OTHER	**	**
Softwood Sawables Combined	SPF	27.64	27.69
	EWP	17.30	17.03
	HEM	19.18	19.03
	RP	18.98	18.79
	HEM/RP/OTHER	18.39	18.15

[5] The ** denotes the redaction of data by Deloitte required to protect the confidentiality of survey respondents.