9. OKANAGAN IFPA – NATURAL STAND YIELD TABLE ADJUSTMENT OPTIONS

Memo

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To: Glen Dick
From: René de Jong, Gord Lester
cc:
Date: November 15, 2002
Project:
Location: P:\Okanagan IFPA\oki-005\Reports\AAC application Jan 31 2003\Appendix V\App-V_JST appendix V main.doc
Re: Okanagan IFPA – Natural Stand Yield Table Adjustment Options

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Glen,

As you are aware, we have been examining the process to adjust the current inventory using the results of the Phase 2 VRI project. Initial efforts based on the Fraser Protocol have provided what appears to be very optimistic results, which we have reviewed with the MOF / MSRM and other consultants. We are aware that concerns with using the Fraser Protocol have been raised before, but that no process is currently available to replace it.

As a result, we have been encouraged to explore alternative approaches and provide options for the decision maker. Three options to adjust natural stand yield tables over the unadjusted base case bracket the current problem, and are recommended to be included in the current timber supply analysis.

1. Fraser Protocol:
   - This reflects current MOF policy, where adjusted ages and heights are used to generate new VDYP curves (accounting for attribute error), which are then adjusted by volume adjustment ratios (accounting for model error), to arrive at an current inventory adjustment of approximately 10%.

2. Proportional 10% increase over unadjusted VDYP curve:
   - A 10% volume adjustment is applied proportionally to all VDYP curves across all age classes, based on the average inventory adjustment

3. Volume adjustment regression
   - A volume adjustment regression (developed by JS Thrower and Associates) based on the VRI phase 2 data, is used to predict adjusted volume as a function of stand age, volume, and diameter attributes.

Following meetings with the MOF / MSRM, it was clear that no one answer is correct, but rather each option needs to be examined for technical and biological suitability. Some of these concerns are summarized in the following table.

Adjustment Method	Uncertainty / risk with method
Fraser Protocol	Age and height adjustments impact SI, potentially resulting in unrealistic growth projections.
10% proportional volume adjustment	Assumption of constant volume adjustment over all age classes is contrary to data trends, which suggest different adjustment ratios are present at different ages. Applying a proportional adjustment ratio results in increasing volume differences over time.
Volume adjustment regression	Volume adjustments follow expected trends, being highest for the younger stands, and least for the older stands. Application of the volume adjustment regression directly to VDYP curves may potentially under-estimate future growth, by applying an equation fit from static measurements, to predict future change

To quantify the differences between each volume adjustment option, we obtained the average 'analysis-unit-based' VDYP curves from TFIC[10], and generated average 'TSA-based' VDYP curves for each option. Comparisons of current inventory estimates and future growth were then made to help evaluate the suitability and potential risks of each volume adjustment option.

Current Inventory

All volume adjustment options generally approximate the expected change in current volume. To confirm this, the volume at the average age for each analysis unit was averaged across all analysis units, to approximate the average current inventory. While the 'proportional 10%' and regression options are referenced to the unadjusted ages, the Fraser Protocol is referenced to the adjusted volume at the adjusted age, relative to the unadjusted volume at the unadjusted age. The observed higher current volume adjustment ratio for the Fraser Protocol (18%) is partially explained by the level of resolution of using age class data to the nearest 10year class from the VDYP curves (eg., if adjusted ages were five years younger the current adjustment ratio would be 1.08, suggesting that subtle shifts in adjusted ages due to rounding errors can have dramatic effects on reported volumes).

Table 1. Volume and volume adjustment ratios by volume adjustment option, at current inventory age.

Current Age (yrs)		Net Merch Volume (m3/ha) and (volume adjustment ratio)			
Unadjusted	Adjusted	Unadjusted	Fraser Protocol	10% Increase	Regression
127	104	236 (1.0)	279 (1.18)	260 (1.1)	261 (1.1)

[10] All comparisons are based on vdyp curvs generated by TFIC for each analysis unit, using weighted average height, age, and volume adjustment ratios, provided by K. Sherman November7-8, 2002.

Current Inventory projected 50 years

To evaluate the effect of how volume changes over time, the average age of each analysis unit was incremented by 50 years. This comparison helped illustrate the varying effect that each option had on future inventories. While the adjusted volume ratios for the proportional 10% option remained fixed at the expected 10%, the ratio for the Fraser Protocol increased to 1.32, while the regression option decreased to approach the level of unadjusted inventory volumes. With the regression option, trends are consistent with what the VRI data suggests. Conversely, the impact of volume adjustment ratios increasing over time (with the Fraser Protocol) leads to added future uncertainties with this option.

Table 2. Volume and volume adjustment ratios by volume adjustment option, projected 50 years.

Current Age + 50 (yrs)		Net Merch Volume (m3/ha) and (volume adjustment ratio)			
Unadjusted	Adjusted	Unadjusted	Fraser Protocol	10% Increase	Regression
177	154	325 (1.0)	430 (1.32)	358 (1.1)	333 (1.02)

Growth

The average VDYP curve across all analysis units was computed to compare the mean annual increment (MAI) at 50, 100, 150, 200, and 250 years for each of the volume adjustment options. The Fraser Protocol generated the highest MAI across all ages greater than 50 years. The volume adjustment regression generated the highest MAI at the youngest ages, and then approached the unadjusted VDYP curve at ages beyond approximately 100 years.

Table 3. Mean annual increment by volume adjustment option, based on average of all analysis units.

Period (years)	MAI averaged across all analysis units (m^3/hr/yr)			
	Current Unadjusted	Fraser	10% increase	Regression eqn
0 - 50	1.1	1.9	1.2	2.3
0 – 100	2.1	3.1	2.3	2.3
0 – 150	2.0	2.9	2.2	2.0
0 – 200	1.8	2.5	1.9	1.8
0 - 250	1.6	2.2	1.7	1.6

Average VDYP Curves

The average VDYP curves were plotted for the different volume adjustment options, to illustrate the impact of each volume adjustment option over time. For reference, the average current ages of all analysis units (unadjusted and adjusted) are also included for reference. Note that volumes interpreted at these reference ages do not match those listed in table 1, since table 1 is based on the average volume taken from the average age of each analysis unit and then averaged overall, while figure 1 represents an average volume of all analysis units by age class.

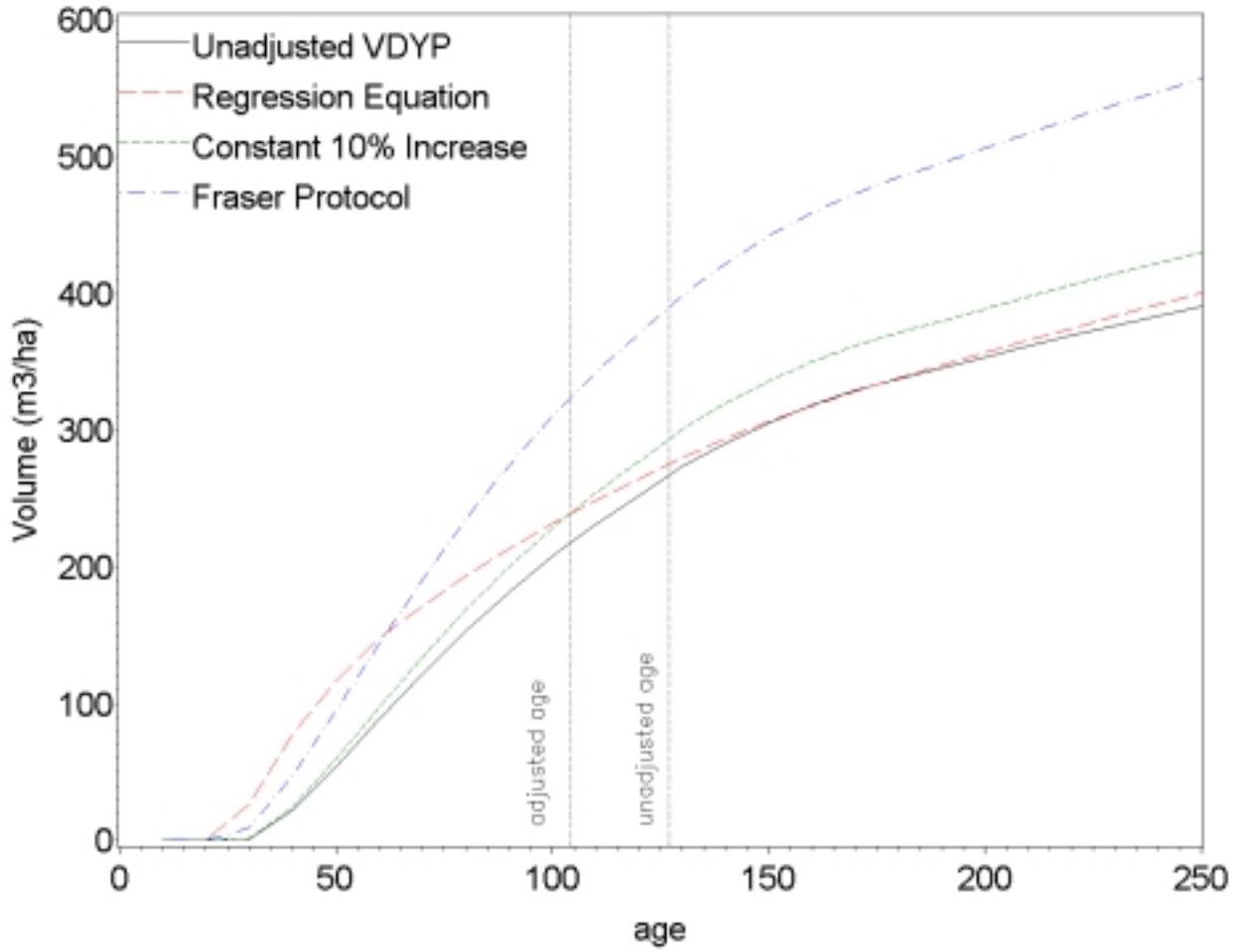

Figure 1. Comparison of average VDYP curve of each volume adjustment option. Location of current inventory ages included for reference.