**PEACHLAND WATERSHED PROTECTION ALLIANCE**

**2021 Okanagan Timber Supply Review - Comments on the Discussion Paper**

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**SUMMARY OF CONCERNS**

1. Hydrologists have informed the Chief Forester that a minimum adjacency requirement of five metres in height is required in community watersheds. While the base case used a six- metre height, licensees are not legally required to adhere to this. We request that the Chief Forester forward the hydrologists concerns to the land-use planners (and those reviewing FRPA) and provide recommendations in the AAC determination for licensees to adopt at least a 5-metre adjacency requirement and restrict cutblock size to 40 hectares in community and fisheries sensitive watersheds.
2. We are concerned that the ±10% sensitivity analysis for existing and managed stand yield predictions does not account for the uncertainty associated with the VRI, VDYP7 projections, and TASS/TIPSY projections. We request the Chief Forester adopt a precautionary approach due to the uncertainty associated with these.
3. The Chief Forester is reliant on the Mature Inventory Audit analysis and Young Stand Monitoring analysis to assess the adequacy of the data for use in the AAC determination. We are concerned that the TSR and AAC determination processes are continuing while the VRI statistical adjustment, Mature Inventory Audit analysis and Young Stand Monitoring analysis are currently undergoing a statistical review.
4. We request an opportunity to comment on the VRI and growth projections once the statistical reviews have been completed and made public.
5. We are concerned that losses to Armillaria root rot are not being adequately accounted for, particularly given how the losses are accounted for in the Arrow and Kamloops TSAs.
6. We are concerned the best available information is not being used for the Mature Inventory Audit analysis. An explanation as to why all of the VRI data is not being used should be provided.
7. We are concerned the best information available is not being used to assess managed stand yield projections and losses to forest health. We request that the Stand Development Monitoring data also be used.
8. Due to the lack of realized gain trials, we feel that genetic gain should be used in a sensitivity analysis. A rationale must be provided if the Chief Forester wants to include genetic gain in the base case.

**INTRODUCTION**

The Forest Planning and Practice Regulation offers inadequate protection to community watersheds as any measures to limit the impact of harvesting on the timing and flow of water to the waterworks or to water quality cannot unduly reduce the timber supply. Our understanding of unduly is a reduction in the allowable annual cut (AAC) greater than six percent.

The timber supply review (TSR) process increases the risk to community watersheds with its emphasis on economic considerations that lead to maximizing the AAC while being constrained by the current legal framework that favours harvesting over all other resource values; legally established land use objectives that usually represent only a small subset of objectives specified in outdated land use plans; and demonstrated forest management practices that favour the most economical harvesting methods that tend to be the most ecologically destructive, particularly in the case of salvage harvesting.

The TSR and AAC determination processes often use the term “best available information” to describe the data and information used without including an assessment of the quality or adequacy of the data. As a result, the uncertainty associated with the AAC determination is not adequately addressed.

In fact, the AAC determination process uses the concept of uncertainty to exclude or ignore factors that could potentially lower the AAC, such as climate change, while at the same time ignoring the uncertainty in factors that enable an increase or simply increase the AAC, such as natural and managed stand growth estimates, genetic gain estimates for select seed and the increased productivity assigned to managed stands.

Federal guidelines recommend a precautionary approach be taken in the absence of full scientific certainty.

*“The application of precaution is distinctive within science-based risk management and*

*is characterized by three basic tenets: the need for a decision, a risk of serious or*

*irreversible harm and a lack of full scientific certainty”*

AAC determinations require a decision; carry a risk of serious or irreversible harm to local economies and to ecosystems; and most certainly lack full scientific certainty.

In contrast, the chief forester has stated that “no responsible AAC determination can be made solely on the basis of a precautionary response to uncertainty with respect to a single value” but provides no justification for this statement.

Our comments on the Discussion Paper will focus on:

1. Community watersheds
2. The uncertainty with the Vegetation Resources Inventory (VRI) and existing (natural) and managed stand growth projections.

Given that the VRI and growth projections form the basis of the AAC determination, the uncertainty associated with them requires a precautionary approach be taken for the AAC determination.

The basis for the comments in this submission is documented in more detail in a report submitted to the Inventory Review Panel. It can be downloaded from this website: [Forestry isn't sustainable, folks - Forests - Focus on Victoria](https://www.focusonvictoria.ca/forests/26/)

A couple of general comments about the public input process:

1. A Technical Report that provides a detailed description of the data, assumptions and simulations is produced as part of the TSR process. We requested this report to help formulate comments only to be informed it is not released until after the AAC determination has been made. In the future, a preliminary Technical Report should be provided with the Discussion Paper.
2. Some questions were not answered in time for this report due to limitations in FLNRO staff time. A final date for submitting questions and an estimated response time should be provided to ensure all questions are responded to.

**COMMUNITY WATERSHEDS**

The discussion paper indicates the base case used a constraint in community watersheds that a

maximum of 30% of the THLB can be less than six metres in height. It was based on the

hydrologists recommendations that the current legislated adjacency rules are inadequate for

hydrological recovery. This seems mostly symbolic as licensees must only follow what is legislated in the Forest Planning and Practices Regulation.

The sensitivity analysis that approximated current adjacency rules resulted in a 2.6 percent reduction in the short-term AAC and a 0.7% increase in the long-term AAC. Adopting the hydrologists’ recommendations would not unduly reduce the timber supply.

The most current letter of expectation from the Minister to the Chief Forester specifies that for

AAC determinations:

*Where the cumulative effects of timber harvesting and other land based activities indicate a risk to natural resource values, the process should identify those risks for consideration in land-use planning.*

We asked the following question, but did not receive a response:

*Has the Chief Forester informed the land-use planners (and those reviewing FRPA) of the hydrologists concerns about legislated adjacency requirements in community and fisheries sensitive watersheds?*

*If so, is a copy of the Chief Forester’s report to land-use planners available?*

The final AAC determination should include:

* At the very least, a recommendation from the Chief Forester that licensees incorporate a minimum five metre adjacency height in community and fisheries sensitive watersheds. At best, this recommendation could be extended to all other watersheds.
* A recommendation that openings be restricted to a maximum size of 40 hectares in community and fisheries sensitive watersheds, including salvage harvests and natural-disturbance-based management regimes.
* An appendix containing the document submitted by the Chief Forester to land-use planners (and those reviewing FRPA) describing the hydrologists’ concerns about hydrological recovery and adjacency rules. It should be noted that based on the sensitivity analysis, adopting the hydrologists’ recommendations would not unduly reduce the timber supply.

**UNCERTAINTY IN THE VRI AND GROWTH PROJECTIONS**

We are concerned that the uncertainty associated with the VRI and growth projections is not being properly accounted for in the TSR and AAC determination processes with a sensitivity analysis of ± 10% for existing and managed stand yields.

A recent review of growth and yield modelling systems in British Columbia (B.C.) indicates we are not alone in our concerns about growth models. A couple of extracts from the report:

*There are needs not currently met with the BC GY models. The main GY gaps identified by users were i) yield curves for complex stands including stands with mixtures of species, ages, vertical layers, and horizontal arrangements; ii) improved modelling of growth response to silvicultural treatments including genetic gain, fertilization, and patch harvesting; and iii) growth following disturbance agents including fire, insects, and disease.*

*Some of the people surveyed suggested all MFLNRO&RD staff should have some level of training and competency with GY models. Some level of biometrics training should be required of FAIB staff. Specifically, staff need training in the development and use of TIPSY and VDYP. FAIB should have a biometrician who provides advice.*

**VDYP7**

The Variable Density Yield Projection (VDYP7) model, using photo-interpreted values as input, is used to assign volume to existing stands in the VRI. The assignment of volumes may be enhanced or replaced by LiDAR in the future, but this is not the case for the current Okanagan TSA AAC determination. VDYP7 is also used to project existing stand volume into the future.

**Model Calibration**

Section 8.2.2 of the data package indicates VDYP7 was calibrated using 52,000 temporary sample plots (TSPs) and 9,300 permanent sample plots (PSPs). TSP data were used to calibrate yield (volume per hectare) functions and PSP data were used to calibrate the basal area growth functions used for inventory projection.

From 1997 to 2002, the Forest Analysis and Inventory Branch (FAIB) undertook a major project to validate and correct the PSP database that had become corrupted due to outdated databases and data validation software. A large backlog of PSP data, much of which was obtained from industry, was also added to the PSP database. A data request in 2003 revealed that FAIB did not use the validated PSP data for VDYP7 calibration but had inadvertently used the corrupt and out-of-date data from 1997. The data request also revealed stand volume had been incorrectly calculated for much of the data.

In a 2004 meeting, the FAIB VDYP7 modeller confirmed the incorrect PSP data had been used but insisted the stand volume calculation problem had been corrected. FAIB only offered a verbal explanation and refused to provide the data to substantiate their claim. A subsequent freedom of information (FOI) request in 2015 revealed that FAIB did not keep a record or copy of the PSP data used in the VDYP7 calibration.

Concerns related to VDYP7 projections include:

* Many corrections were made to the classification of stand layers in the data which would affect the VDYP7 growth functions which are fit by stand layer.
* The validated 2002 data would have an addition 10 to 20 years of growth information per sample plot than the out-of-date 1997 data.
* The backlog of data missing from the 1997 data had most of the new breast height age and height measurements collected to Forest Productivity Council (FPC) standards that were to be used to calculate site index top FPC standards.
* Currently, there are no data to assess VDYP7 yield projections or determine the uncertainty associated with the yield projections.

The VDYP7 website also falsely claims that VDYP7 was validated using 2,700 audit plots. VDYP7 documentation indicates the audit data were used to develop adjustment factors for a beta release of VDYP7. A 2015 FOI request revealed that FAIB has no record of VDYP7 validation with audit data.

It is disconcerting that FAIB continues to provide incorrect information on the calibration of VDYP7 to users.

**VRI Statistical Adjustment and Mature Inventory Audit**

The VRI and VDYP7 were designed to be used together with statistical adjustments made to the photo-interpreted VDYP7 input variables (age, height, basal area, and stems per hectare) and VDYP7 predicted volume using VRI ground plot data.

This process seems to have been abandoned and replaced by a Mature Inventory Audit (MIA) that could possibly be used to adjust volume if required.

A statistical adjustment was completed in 2011 but not in time for use with the 2012 Okanagan TSA AAC determination. Data available for the statistical adjustment included 224 plots of which 109 were VRI plots established in 2002 with 31 of these remeasured in 2006, 48 were new VRI plots established in 2006, 20 were Change Monitoring Inventory (CMI) plots established in 2006, and 15 were mountain pine beetle (MPB) focus plots established in 2006. It was determined that only original (not remeasured) VRI plots should be used in the analysis (109 + 48 = 157 plots). It was later determined that the statistical adjustment should not include pine stands. Omitting the 26 pine plots and another 20 that were missing data or could not have volumes generated with VDYP7 left 103 plots for the statistical adjustment. The results indicated that the VRI underestimated the non-pine inventory by 19%.

The current Okanagan TSA TSR process is not using the 2011 VRI statistical adjustment. Instead, a MIA using what appears to be the 48 VRI and 15 MPB Focus plots established in 2006 (somehow this ended up being 64 plots) and 32 CMI plots established in 2015 is used. No reason is given for excluding the VRI plots established in 2002 or the CMI plots established in 2006. The VRI and CMI plots are analysed separately and FAIB has interpreted the results of both analyses as indicating no volume adjustment is required.

Questions have been raised as to the validity of the statistical analysis used in the MIA analysis and it, along with the interpretation as to whether a volume adjustment is required, is currently undergoing a review by a qualified biometrician.

While one might interpret the difference between the 2011 VRI statistical adjustment and the current MIA as an indication of uncertainty and question as to whether the best available information has been used in the MIA analysis, we will have to wait for the results of the statistical review to determine if any of the analyses are valid or whether new analyses are required.

It should be noted that the VRI statistical analysis and MIA analysis only apply to the existing stand volumes at the time of plot measurement. There are no data to assess the volume predictions. Ideally, the VRI data should be used to make any adjustments and the CMI data should be used to assess the uncertainty associated with the adjusted volumes. Since the CMI program is relatively new, there will not be sufficient re-measured plot data to assess growth projections for decades.

Our concern at this point is the TSR and AAC determination processes are proceeding before the statistical review of the analysis the Chief Forester relies on to determine the adequacy of the data for use in the AAC determination has been completed.

We do expect to have a chance to comment on the VRI once the statistical review has been completed and made public.

**Stands Affected by Mountain Pine Beetle**

A recent initiative was undertaken to make modifications to VDYP7 that will enable it to project independent layers for stands affected by MPB.

Our questions on what data are to be used for this and how it will be validated were not answered as the modifications are not expected to be completed for a couple of years.

As a result, the projection of MPB affected stand volume will be done on ad hoc basis with the current version of VDYP7. This will most certainly add a degree of uncertainty, but as mentioned above, there are no remeasured sample plot data with which to assess the degree of uncertainty in yield predictions.

**TASS/TIPSY**

The Table Interpolation for Stand Yields (TIPSY) is used to produce managed stand yield tables. TIPSY is not a growth model but is a growth and yield program that provides user friendly access to managed stand yield tables produced by the Tree and Stand Simulator (TASS).

**Recent Changes in TASS/TIPSY**

The 2019 release of TIPSY v4.4 indicates the ±10% sensitivity analysis that has been used for decades in the TSR process does not adequately represent the uncertainty associated with TASS/TIPSY yield projections.

The following table compares the volume differences between TIPSY v4.3 and TIPSY v4.4 at age 100 for species that have changed. TIPSY input for all species is:

* Site index 20.0 metres.
* 1,600 stems per hectare planted.
* Regeneration delay of 0 years.
* OAF 1 of 0.85 and OAF 2 of 0.95.

|  |  |  |
| --- | --- | --- |
| **Species** | **Volume per Hectare (m3/ha)** | **Difference (%)** |
| **TIPSY v4.3** | **TIPSY v4.4** |
| **TASS****Version** | **Total** | **Merch.****12.5+** | **TASS****Version** | **Total** | **Merch.****12.5+** | **Total** | **Merch****12.5+** |
| Bl | 2.05.24b | 481 | 441 | 3.01.15W | 417 | 376 | -13.3 | -14.7 |
| Fd | 2.05.24b | 415 | 375 | 2.07.73WS | 338 | 286 | -18.6 | -23.7 |
| Lw | 2.05.24b | 409 | 368 | 2.07.73WS | 334 | 282 | -18.3 | -23.4 |
| Pl | 2.05.24f | 438 | 401 | 3.01.13W | 529 | 485 | 20.8 | 20.9 |
| Sw | 2.05.24b | 496 | 457 | 3.01.15W | 439 | 399 | -11.4 | -12.7 |

As the right columns in the table indicate, the volume for every species has changed by far more than ±10%.

**Young Stand Monitoring Analysis**

The Young Stand Monitoring (YSM) program collects data on stands between the ages of 15 and 50 and is used to assess TASS/TIPSY managed stand yield projections. As with the CMI data, the program is relatively new and there is no remeasured YSM sample plot data. As such, the Young Stand Monitoring analysis can only assess TIPSY estimates at the time of plot measurement and there are no data to assess yield projections with.

Comparisons of TASS/TIPSY volumes to ground plot data have an additional problem in that TASS/TIPSY determines tree volume differently than the ground plot compilation. Comparisons of TASS/TIPSY projections must account for the differences in individual tree volume estimation.

The current YSM analysis for the Okanagan TSA indicates that managed stand yields are not overestimated and may in fact be underestimated.

As with the MIA analysis, questions have been raised as to the statistical validity of the YSM analysis and it too is now undergoing a statistical review by a qualified biometrician.

Our concern at this point is the TSR and AAC determination processes are proceeding before the statistical review of the analysis the Chief Forester relies on to determine the adequacy of the data for use in the AAC determination has been completed.

We do expect to have a chance to comment on the managed stand yields once the statistical review has been completed and made public.

**Stand Development Monitoring Data**

Stand Development Monitoring (SDM) data were collected in stands 15 to 50 years old in the Okanagan TSA. This data has not been used in the TSR process to assess TASS/TIPSY yield predictions or forest health issues.

Version 1 of the SDM program used a different methodology to collect forest health data than the YSM program. The YSM program collects data on all forest health agents present and will require plot remeasurements over time to assess the impact on tree growth and survival. In the meantime, impact is being estimated from an office in Victoria for use in the current TSR and AAC determination processes. The SDM data only recorded a forest health agent if the field person felt it would have an impact on tree survival or growth at the time of future harvest. In this case the impact has already been estimated by someone in the field looking directly at the tree. While the YSM methodology will provide better information over time for model development, the SDM methodology most likely provides better information for use in the current TSR and AAC determination processes.

Excluding the use of SDM data raises the questions as to whether the best available information is being used in the TSR and AAC determination processes.

**Genetic Gain of Select Seed**

The genetic gain from select seeds is used in the base case analysis.

Current estimates for genetic gain are based on progeny trials which may not provide a realistic estimate. Realized gain trials are required to assess the actual genetic gain under operational conditions.

To date, there are only published results on realized gain trials for coastal Douglas-fir at ages 12 and 20.

Our concern is that genetic gain is being included in the base case with no assessment of the uncertainty associated with the projected gains.

Genetic gain should only be modelled as a sensitivity analysis. If the Chief Forester wants to include it in the base case scenario, the Chief Forester will have to provide some rationale as to why it should be included.

**Armillaria Root Rot**

In the previous AAC determination, OAF 2 for Douglas-fir was increased by 5% to account for losses due to Armillaria root rot. The Chief Forester requested that work be done to refine this estimate.

Section 8.6 of the data package indicates the work requested by the Chief Forester in the last AAC determination was not done and once again the managed stand OAF 2 for Douglas-fir was increased by 5% to account for armillaria root rot. This would result in an additional 5% reduction in volume at age 100 due to Armillaria.

TIPSY contains Armillaria custom OAF reductions for Douglas-fir in the ICH that are much higher than this:

* A low level of incidence is a 30% reduction in volume at age 100.
* A medium level of incidence is a 46% reduction in volume at age 100.
* A high level of incidence is a 63% reduction in volume at age 100.

In contrast, work was done in the Arrow TSA to quantify the losses to Armillaria root rot. Results indicate a reduction of 17% for all conifers in addition to the standard OAF 1 and 2 reductions of 10 and 5%. Although it was not applied in the base case for the 2017 AAC determination, the chief forester determined that not accounting for armillaria resulted in a 12% over-estimation in the long-term harvest level.

Similarly, the 2016 Kamloops AAC determination applied the TIPSY medium level custom OAF reduction for Armillaria to Douglas-fir in the ICH.

Our questions on what percentage of Douglas-fir leading existing and future managed stands at time 100 of the base case projection are in the ICH and what is the basis for the pathologists’ recommendation to increase OAF 2 by only 5% were not answered.

In addition, the data package also indicated a sensitivity analysis would use the clumped spatial distribution in TIPSY for Douglas-fir in the ICH. This appears to not have been done and our question as to why not was not answered.

Our concern is that while losses to Armillaria root rot are using the best available information in the Arrow and Kamloops TSAs, the best information available is being ignored in the Okanagan TSA.