Non-Industrial Private Non-Participation Scenarios

Crown Lands Forest Model Online Reporting & Statistics For Potential Wood Supply (v2010.6)

This report presents the results of an analysis carried out to look into the potential supply impacts of greater levels of non-participation than has traditionally been used for supply estimation in Nova Scotia.

Version 1.3
5/9/2011

1 Introduction

The potential supply estimates within this report were developed to provide insight into the potential wood supply effects of decreased participation in commercial forest management by non-industrial private land owners in Nova Scotia.

The analysis is based on up-to-date forest inventory and growth and yield estimates from the Nova Scotia Crown Lands Forest Modeling (CLFM) database (v2010.6) in combination with simple supply estimation techniques to gain preliminary insight. The analysis was carried out using the CLFM web-based reporting routines that allows the user to select numerous geographic themes (owner, region, etc...) and adjust key assumptions such as the non-industrial private non-participation level. The specific online report used in this analysis is titled "Harvest, Inventory and Potential Supply Summary" and is described in more detail in Appendix III.

The last provincial wood supply review conducted in 2005 used a 15% fixed non-participation rate for non-industrial private lands. In 2005 there was also an exploratory analysis preformed that incorporated an ownership turnover rate. Under this analysis land is not permanently removed yet 15% remains in a non-participation state at all times as stands are randomly added and removed according to the turnover assumptions. The 2005 analysis used a 15 year ownership turnover rate. That approach resulted in significantly less impacts to supply as compared to the fixed removal approach. Under a dynamic formulation all lands remain eligible for harvest yet there is a supply cost associated with delays to optimal harvest timing. This impact is less than when it is assumed that a fixed 15% is never eligible to be harvested. The analysis described in this report uses a fixed percent removal method as the model used currently does not have the flexibility to address the dynamic non-participation formulation.

This analysis of non-participation levels is highly sensitive to the proportion of working[a] forest identified as non-industrial private. The CLFM database currently identifies the non-industrial private as the balance of private land remaining after the holdings of the major industrial owners (NorthernPulp, Irving, AbitibiBowater and Wagner) are removed. This approach is different than what is used by the Registry of Buyers (RoB) as they would not consider Wagner to be in the industrial tenure class, as they don't have an industrial processing facility. This is an important consideration when comparing supply estimates to the RoB harvest statistics. The current CLFM database indicates the non-industrial private land tenure represents 50% of the total forest landbase in the province and 56% of the working[a] forest landbase (Figure 1 and Figure 2).

[a] Working forest landbase is the proportion of the forested landbase considered available for conventional forest management planning after policy and operational restrictions are applied (i.e. protected areas, water coarse buffers, steep slopes, IRM-C3, oldgrowth, etc.).

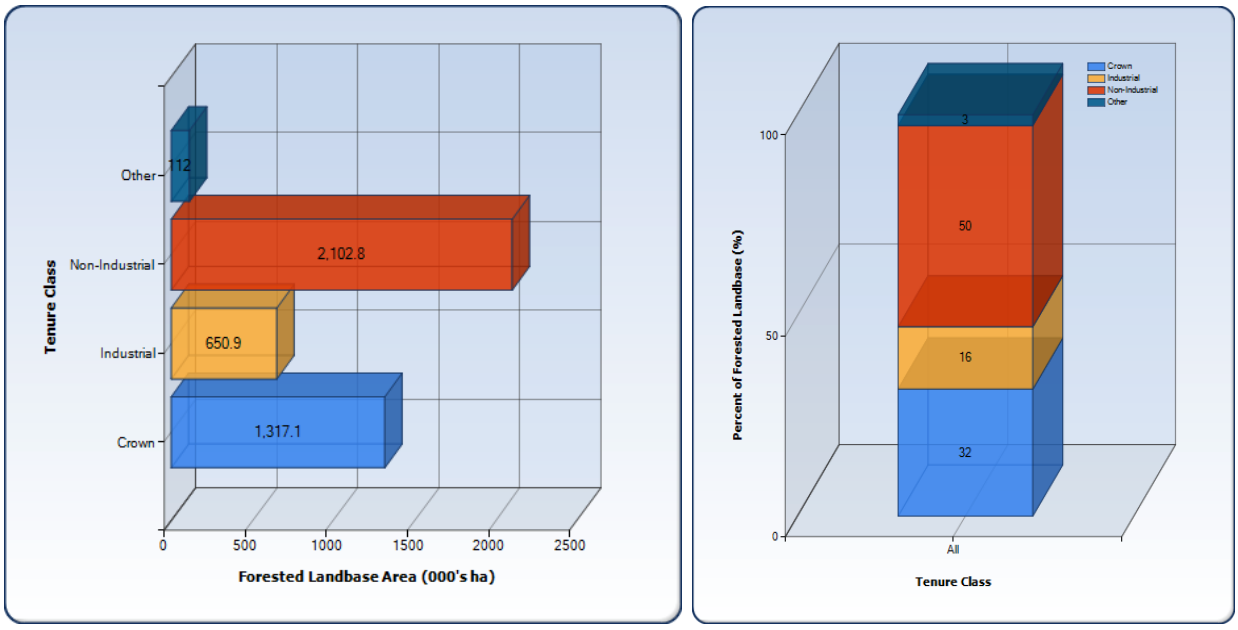

Figure 1. Forested Landbase Area Distribution by Tenure Class.

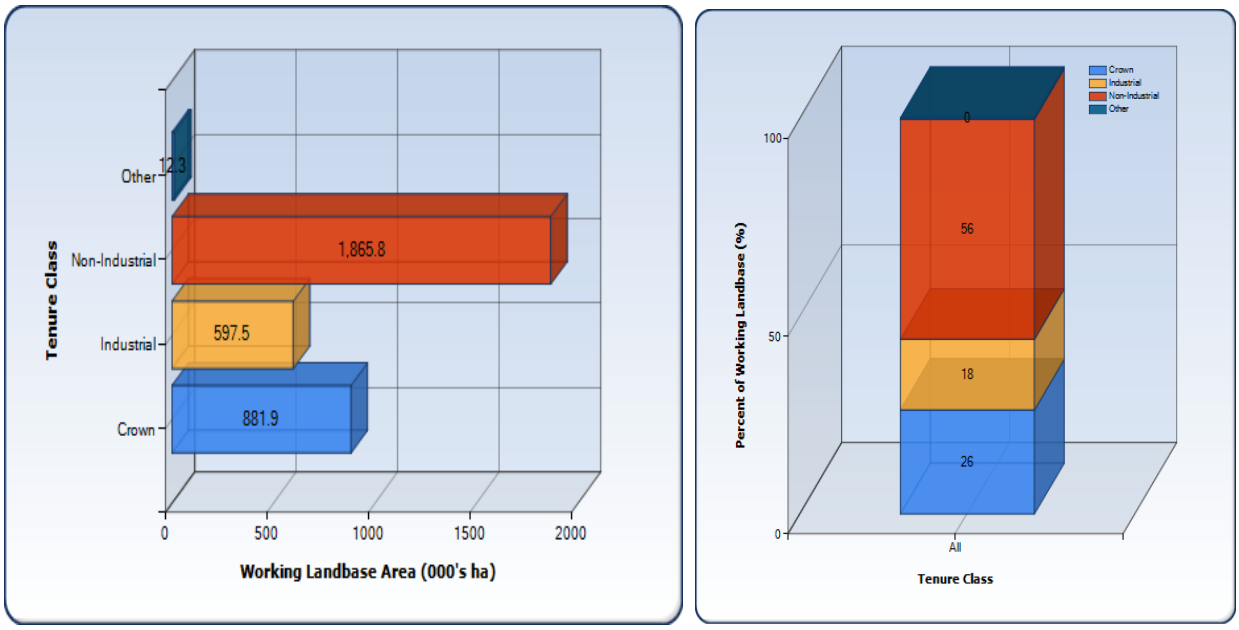

Figure 2. Working Landbase Area Distribution by Tenure Class.

2 Results

The "Harvest, Inventory and Potential Supply Summary" online reporting tool was run using four different scenarios for non-industrial non-participation:

1. 0% Fixed – An initial run that establishes a supply estimate without any non-participation effects.
2. 15% Fixed – This base level represents the tradition level of non-participation used for potential supply estimation in NS.
3. 25% Fixed – This represents an increase in non-participation by 10 percentage points.
4. 40% Fixed – This represents an increase in non-participation by 25 percentage points.

The resulting summary reports are presented in Appendix I for each of the four scenarios. The results show the impacts to both the provincial supply and to just the non-industrial private picture. Appendix II provides a glossary to further explain the information within each data row within the reports. In addition Appendix III gives a more detailed description of the report itself.

3 Scenario Results Summary

The 15% non-participation level for the non-industrial private land tenure class resulted in an 8.4% impact to overall provincial supply estimate (Table 1, Figure 3, Figure 4). Increasing the non-participation level to 25% and 40% resulted in further decreases to provincial supply with impacts of 14.0% and 22.4% respectively.

For the softwood and hardwood sub - components of the supply estimate, the percentage impact varies from the total with the softwood being slightly less and the hardwood being slightly higher (Table 1). This is indicating the non-industrial private landbase has a relatively higher proportion of hardwood forests / inventory relative to the overall provincial balance.

Table 1. Provincial – level potential supply impacts by non-participation scenario.

Provincial-Level	**Non-Participation Scenario**			
Supply Indicators	**0.0%**	**15.0%**	**25.0%**	**40.0%**
Softwood (millions of m^3/yr)	5.4	5.0	4.7	4.2
Impact Percentage	***0.0%***	***8.2%***	***13.6%***	***21.8%***
Hardwood (millions of m^3/yr)	2.8	2.6	2.4	2.1
Impact Percentage	***0.0%***	***8.7%***	***14.6%***	***23.3%***
Total (millions of m^3/yr)	**8.2**	**7.5**	**7.1**	**6.4**
Impact Percentage	**0.0%**	**8.4%**	**14.0%**	**22.4%**

Initial observations of the results indicated that under the given formulation there is a constant ratio in provincial supply impacts linked to the proportion of working forest within the non-industrial landbase and any associated non-participation rate. The CLFM database indicates a non-industrial landbase of ~1.87 million ha which is 56% of the provincial working landbase area (3.36 million ha) (Figure 2). As such, every percentage increase in non-participation is having 0.56% impact on the provincial supply estimate. For example the 15% non-participation shows an 8.4% provincial – level supply impact which is equivalent to the product of the non-participation rate multiplied by the landbase proportion (15 * 0.56 = 8.4). This general rule provides a convenient method to describe and further estimate percentage supply impacts of additional non-participation levels.

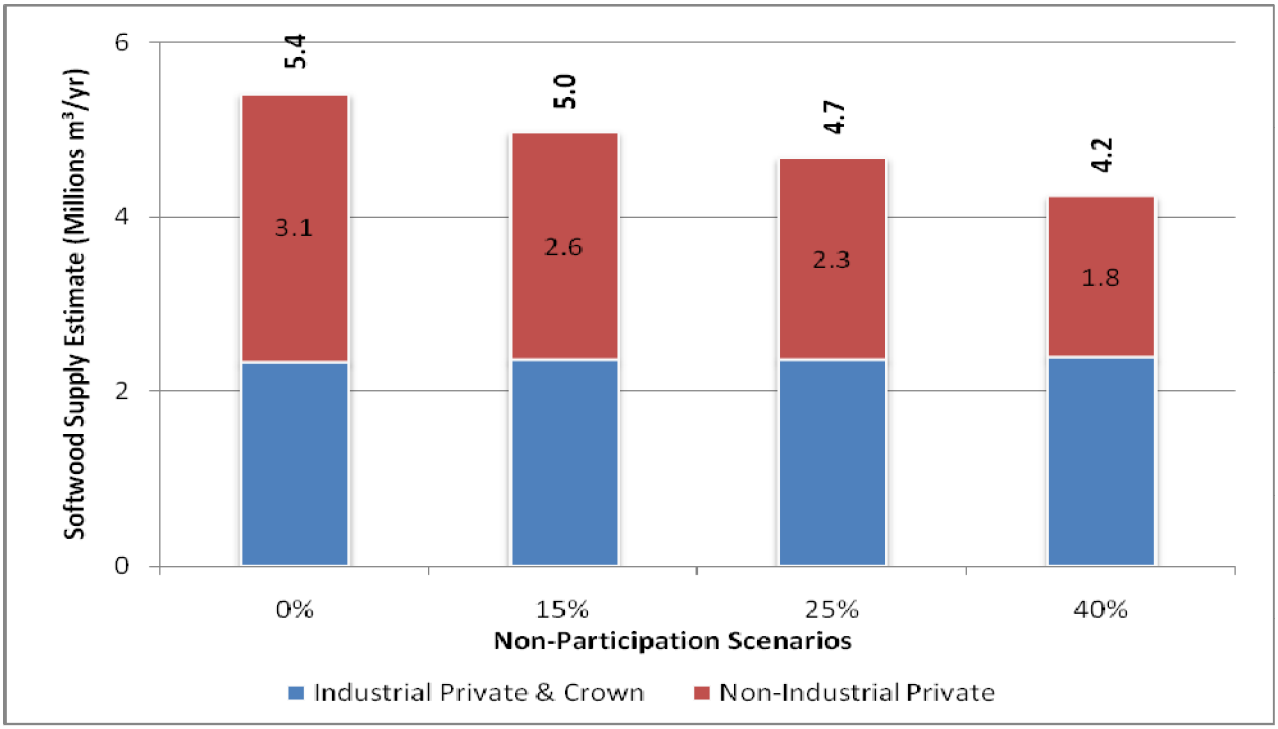

Figure 3. Provincial - level softwood supply estimate by non-participation scenario.

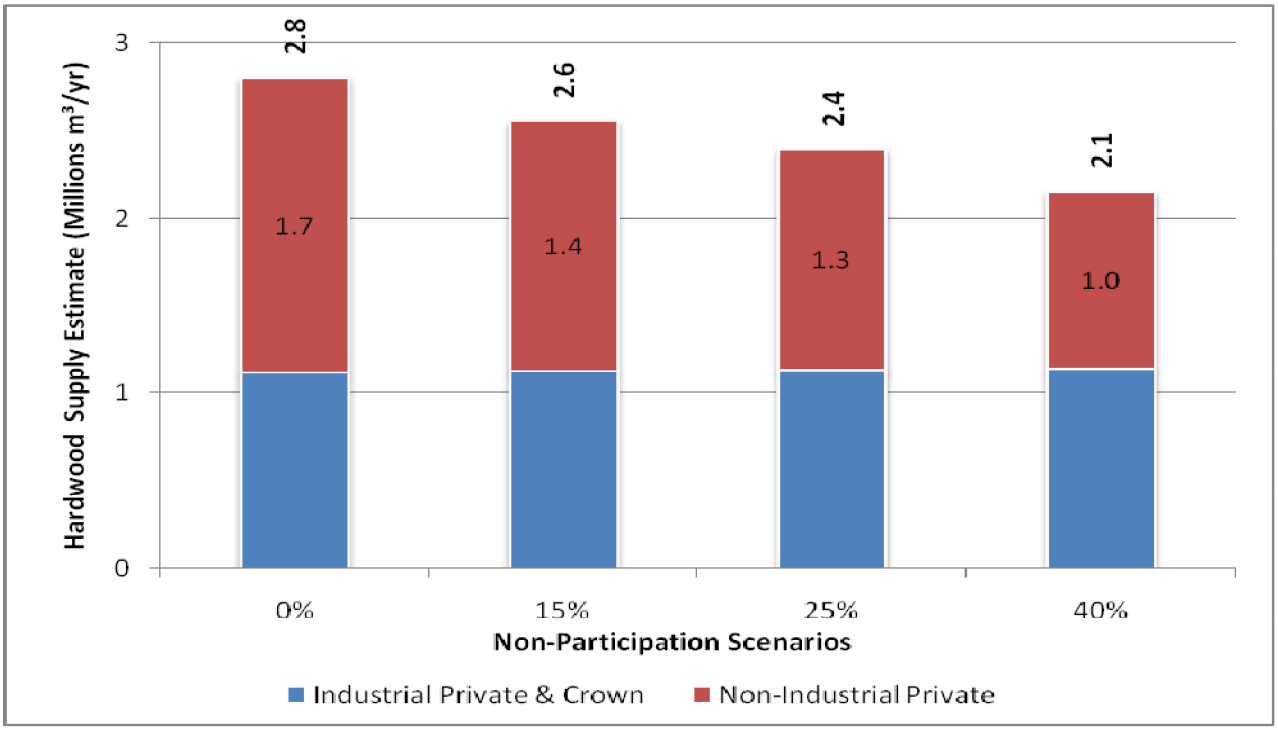

Figure 4. Provincial - level hardwood supply estimate by non-participation scenario.

4 Other Considerations

Below is a list of key considerations to make note of when interpreting analysis results:

- The simple estimation techniques employed are relatively weak at capturing the supply implications of existing forest condition as described in Appendix III. Additional drawbacks to this simplified estimation method is the absence of consideration for potential future shifts in forest productivity, tradeoffs associated with other non-forest values, as well as economics, product markets, all of which need to be considered when interpreting results. The approach is designed for generating quick ballpark supply estimates as opposed to a detailed forest projection analysis that can more appropriately address these issues in the design of long-term management plans.
- The non-industrial land tenure class excluded the Wagner lands yet the Registry of Buyers harvest statistics do consider Wagner as non-industrial. Therefore higher reported harvests relative to the supply estimates are to be expected.
- The fixed non-participation approach is based on a fixed percentage area removal where all forest types get reduced by the same percentage. This results in an approximate 1-to-1 relationship between percentage area removal and the percentage supply impact. In the case where the non-participating proportion is biased to specific segments of the inventory then this relation would deteriorate. For example if the non-participating portion is biased to mature or higher productivity land than a 15% non-participation level will have a larger supply impact (> 15%).

Appendix I. "Harvest, Inventory and Potential Supply Summary" Reports For Each Non-Participation Scenario

Scenario 1: Fixed 0% Non-Participation[b]

CROWN LANDS FOREST MODEL

Online Reports & Statistics

Report Generated: April 08, 2011 at 3:17 PM

CLFM Database Version: 2010.6

Harvest, Inventory & Potential Supply Summary

Unit: Millions Summary	Provincial			Non-Industrial Private		
Category	Softwood	Hardwood	Total	Softwood	Hardwood	Total
1 Landbase (LB) Area Summary						
Total Forested (ha)	n/a	n/a	4.183	n/a	n/a	2.103
LB Restrictions (%)	n/a	n/a	-19.73	n/a	n/a	-11.27
Avail LB (ha)	**n/a**	**n/a**	**3.358**	**n/a**	**n/a**	**1.866**
2 Inventory Estimate (IE) Summary						
Avail IE (m^3)	**184.39**	**107.78**	**292.17**	**103.3**	**63.67**	**166.97**
Av Yld (m^3/ha)	**54.92**	**32.1**	**87.02**	**55.36**	**34.13**	**89.49**
3 Supply Estimate (SE) (Long Run Sustained Yield)						
Non-Particip (%)	0.00	0.00	0.00	0.00	0.00	0.00
Avail SE (m^3/yr)	**5.419**	**2.802**	**8.222**	**3.076**	**1.683**	**4.759**
Av Prd (m^3/ha/yr)	**1.61**	**0.83**	**2.45**	**1.65**	**0.90**	**2.55**
Av Age (yrs)	**n/a**	**n/a**	**60.18**	**n/a**	**n/a**	**60.22**
Av Ha (000's ha/yr)	**n/a**	**n/a**	**55.79**	**n/a**	**n/a**	**30.99**
4 Harvest Statistics (HS) From Registry of Buyers Reporting[1]						
2009 (m^3/yr)	3.514	0.613	4.127	n/a	n/a	n/a
2005-2009 (m^3/yr)	4.503	0.642	5.145	n/a	n/a	n/a
2000-2009 (m^3/yr)	4.981	0.762	5.742	n/a	n/a	n/a
HS Diff (m^3/yr)	**0.439**	**2.041**	**2.479**	**n/a**	**n/a**	**n/a**

[1] Registry of Buyers statistics are not comparable to CLFM statistics at the non-industrial private tenure level.

[b] Appendix II provides a glossary to further explain the information within each data row within the reports.

Scenario 2: Fixed 15% Non-Participation[c]

CROWN LANDS FOREST MODEL

Online Reports & Statistics

Report Generated: April 08, 2011 at 3:17 PM

CLFM Database Version: 2010.6

Harvest, Inventory & Potential Supply Summary

Unit: Millions Summary Category	Provincial			Non-Industrial Private		
	Softwood	Hardwood	Total	Softwood	Hardwood	Total
1 Landbase (LB) Area Summary						
Total Forested (ha)	n/a	n/a	4.183	n/a	n/a	2.103
LB Restrictions (%)	n/a	n/a	-19.73	n/a	n/a	-11.27
Avail LB (ha)	**n/a**	**n/a**	**3.358**	**n/a**	**n/a**	**1.866**
2 Inventory Estimate (IE) Summary						
Avail IE (m^3)	**184.39**	**107.78**	**292.17**	**103.3**	**63.67**	**166.97**
Av Yld (m^3/ha)	**54.92**	**32.1**	**87.02**	**55.36**	**34.13**	**89.49**
3 Supply Estimate (SE) (Long Run Sustained Yield)						
Non-Particip (%)	-8.19	-8.76	-8.43	-15.00	-15.00	-15.00
Avail SE (m^3/yr)	**4.976**	**2.557**	**7.532**	**2.614**	**1.431**	**4.045**
Av Prd (m^3/ha/yr)	**1.62**	**0.83**	**2.45**	**1.65**	**0.90**	**2.55**
Av Age (yrs)	**n/a**	**n/a**	**60.18**	**n/a**	**n/a**	**60.22**
Av Ha (000's ha/yr)	**n/a**	**n/a**	**51.14**	**n/a**	**n/a**	**26.34**
4 Harvest Statistics (HS) From Registry of Buyers Reporting[1]						
2009 (m^3/yr)	3.514	0.613	4.127	n/a	n/a	n/a
2005-2009 (m^3/yr)	4.503	0.642	5.145	n/a	n/a	n/a
2000-2009 (m^3/yr)	4.981	0.762	5.742	n/a	n/a	n/a
HS Diff (m^3/yr)	**-0.005**	**1.795**	**1.790**	**n/a**	**n/a**	**n/a**

[1] Registry of Buyers statistics are not comparable to CLFM statistics at the non-industrial private tenure level.

[c] Appendix II provides a glossary to further explain the information within each data row within the reports.

Scenario 3: Fixed 25% Non-Participation[d]

CROWN LANDS FOREST MODEL

Online Reports & Statistics

Report Generated: April 08, 2011 at 3:22 PM

CLFM Database Version: 2010.6

Harvest, Inventory & Potential Supply Summary

Unit: Millions Summary Category	Provincial			Non-Industrial Private		
	Softwood	Hardwood	Total	Softwood	Hardwood	Total
1 Landbase (LB) Area Summary						
Total Forested (ha)	n/a	n/a	4.183	n/a	n/a	2.103
LB Restrictions (%)	n/a	n/a	-19.73	n/a	n/a	-11.27
Avail LB (ha)	**n/a**	**n/a**	**3.358**	**n/a**	**n/a**	**1.866**
2 Inventory Estimate (IE) Summary						
Avail IE (m^3)	**184.39**	**107.78**	**292.17**	**103.3**	**63.67**	**166.97**
Av Yld (m^3/ha)	**54.92**	**32.1**	**87.02**	**55.36**	**34.13**	**89.49**
3 Supply Estimate (SE) (Long Run Sustained Yield)						
Non-Particip (%)	-13.65	-14.60	-14.05	-25.00	-25.00	-25.00
Avail SE (m^3/yr)	**4.680**	**2.393**	**7.073**	**2.307**	**1.262**	**3.569**
Av Prd (m^3/ha/yr)	**1.62**	**0.83**	**2.45**	**1.65**	**0.90**	**2.55**
Av Age (yrs)	**n/a**	**n/a**	**60.18**	**n/a**	**n/a**	**60.22**
Av Ha (000's ha/yr)	**n/a**	**n/a**	**48.04**	**n/a**	**n/a**	**23.24**
4 Harvest Statistics (HS) From Registry of Buyers Reporting[1]						
2009 (m^3/yr)	3.514	0.613	4.127	n/a	n/a	n/a
2005-2009 (m^3/yr)	4.503	0.642	5.145	n/a	n/a	n/a
2000-2009 (m^3/yr)	4.981	0.762	5.742	n/a	n/a	n/a
HS Diff (m^3/yr)	**-0.301**	**1.631**	**1.330**	**n/a**	**n/a**	**n/a**

[1] Registry of Buyers statistics are not comparable to CLFM statistics at the non-industrial private tenure level.

[d] Appendix II provides a glossary to further explain the information within each data row within the reports.

Scenario 4: Fixed 40% Non-Participation[e]

CROWN LANDS FOREST MODEL

Online Reports & Statistics

Report Generated: April 08, 2011 at 3:24 PM

CLFM Database Version: 2010.6

Harvest, Inventory & Potential Supply Summary

Unit: Millions Summary Category	Provincial			Non-Industrial Private		
	Softwood	Hardwood	Total	Softwood	Hardwood	Total
1 Landbase (LB) Area Summary						
Total Forested (ha)	n/a	n/a	4.183	n/a	n/a	2.103
LB Restrictions (%)	n/a	n/a	-19.73	n/a	n/a	-11.27
Avail LB (ha)	**n/a**	**n/a**	**3.358**	**n/a**	**n/a**	**1.866**
2 Inventory Estimate (IE) Summary						
Avail IE (m^3)	**184.39**	**107.78**	**292.17**	**103.3**	**63.67**	**166.97**
Av Yld (m^3/ha)	**54.92**	**32.1**	**87.02**	**55.36**	**34.13**	**89.49**
3 Supply Estimate (SE) (Long Run Sustained Yield)						
Non-Particip (%)	-21.83	-23.36	-22.48	-40.00	-40.00	-40.00
Avail SE (m^3/yr)	**4.236**	**2.148**	**6.384**	**1.845**	**1.010**	**2.855**
Av Prd (m^3/ha/yr)	**1.62**	**0.82**	**2.44**	**1.65**	**0.90**	**2.55**
Av Age (yrs)	**n/a**	**n/a**	**60.18**	**n/a**	**n/a**	**60.22**
Av Ha (000's ha/yr)	**n/a**	**n/a**	**43.39**	**n/a**	**n/a**	**18.59**
4 Harvest Statistics (HS) From Registry of Buyers Reporting[1]						
2009 (m^3/yr)	3.514	0.613	4.127	n/a	n/a	n/a
2005-2009 (m^3/yr)	4.503	0.642	5.145	n/a	n/a	n/a
2000-2009 (m^3/yr)	4.981	0.762	5.742	n/a	n/a	n/a
HS Diff (m^3/yr)	**-0.745**	**1.386**	**0.641**	**n/a**	**n/a**	**n/a**

[1] Registry of Buyers statistics are not comparable to CLFM statistics at the non-industrial private tenure level.

[e] Appendix II provides a glossary to further explain the information within each data row within the reports.

Appendix II. Supply Summary Table Glossary

Online Reports & Statistics

Glossary for Harvest, Inventory & Potential Supply Summary Table

Unit: Millions Summary Category	Description
1 Landbase (LB) Area Summary	
Total Forested (ha)	Total forested area in millions of ha
LB Restrictions (%)	Percentage of forested area designated as unavailable for conventional harvest planning based on various policy and operational factors (i.e. protected areas, water coarse buffers, steep slopes, IRM-C3, oldgrowth, etc.)
Avail LB (ha)	**Forested area considered available for conventional forest management planning (after policy and operational restrictions are applied (i.e. protected areas, water coarse buffers, steep slopes, IRM-C3, oldgrowth, etc.)) in millions of ha**
2 Inventory Estimate (IE) Summary	
Avail IE (m^3)	**Estimated available inventory following policy and management related adjustments in millions of m^3**
Av Yld (m^3/ha)	**Estimated average yield of available inventory per unit area of working landbase**
3 Supply Estimate (SE) (Long Run Sustained Yield)	
Non-Particip (%)	**Supply is adjusted for anticipated levels of non-industrial private non-participation**
Avail SE (m^3/yr)	**Estimated available sustainable supply following policy and management related adjustments in millions of m^3/yr**
Av Prd (m^3/ha/yr)	**Estimated average productivity level of forest per unit area of working landbase (adjusted for non-participation)**
Av Age (yrs)	**Estimated average rotation age at time of harvest in years**
Av Ha (000's ha/yr)	**Estimated average amount of area harvested annually in thousands of ha**
4 Harvest Statistics (HS) From Registry of Buyers Reporting	
2009 (m^3/yr)	Most recent years reported harvest statistics in millions of m^3/yr
2005-2009 (m^3/yr)	5-year average of annual reported harvest statistics in millions of m^3/yr
2000-2009 (m^3/yr)	10-year average of annual reported harvest statistics in millions of m^3/yr
HS Diff (m^3/yr)	**Difference between the potential supply estimate and the 10-year average harvest level from provincial harvest statistics (source: Registry of Buyers Annual Reports) in millions of m^3/yr**

Appendix III. Supply Report Summary

Summary/Description of Analysis:
This analysis procedure is designed to provide strategic forest level information relevant to policy design and impact assessment. This analysis provides integrated information on:

1) Area and Yield Statistics
2) Potential Supply Estimates
3) Actual Reported Harvest Statistics

This preliminary analysis of the impacts of policy in relation to potential supply and actual harvest statistics is based on the latest version of the Crown Lands Forest Model (CLFM v2010.6).

Landbase
The analysis begins with a quantification of the forest area that is compatible with the objective of supplying fiber. In CLFM terminology this portion of the landbase is referred to as the working landbase. The working landbase is the proportion of the forested landbase considered available for conventional forest management planning after policy and operational restrictions are applied (i.e. protected areas, water coarse buffers, steep slopes, IRM-C3, oldgrowth, etc.).

Growth Estimate
The second component of the analysis is the estimation of current and future yields across the forest. This analysis utilized the base CLFM natural and managed stand growth forecasts as of July 2010. For natural stands the system uses age-based empirical growth forecasts that are derived from the NS inventory Permanent Sample Plot (PSP) data. Plantation forecasts come from the NS Growth and Yield (GnY) Model which is based on separate research PSP data collected from forest management treatments across NS. The GnY model is also used to forecast the natural stand growth response for the precommercial thinning, commercial thinning and selection harvest treatments.

Supply Estimate
The third component was estimating potential supply given the available area and projected yields. For this analysis a relatively simple estimation approach was chosen to gain preliminary insight in a timely fashion, with the understanding that more refinement will come with more focused analysis projects. This step is typically carried out in a forest projection model (The CLFM is designed to work with the Remsoft forest planning environment) yet this analysis uses some basic techniques to estimate supply independently of a full scale projection analysis.

This supply estimate is based on a combination of two independent techniques for estimating supply. Long Run Sustainable Yield (LRSY) also sometimes referred to as Long Term Sustained Yield is the theoretical estimates of a maximum sustainable supply attainable once a regulated forest state has been achieved and all stands are harvested at an optimal mean annual increment (MAI) or rotation age. The LRSY calculation ignores the current condition of the forest yet by using the Von Mantels calculation the LRSY is adjusted for current state of the inventory. Several of the key weaknesses in this estimation method is the absence of consideration for potential future shifts in forest productivity, tradeoffs associated with other non-forest values, as well as economics, product markets, all of which need to be considered when interpreting the results. Future forest planning will ultimately address these issues in the design of long-term management plans.

To address some of these weaknesses, this process provides the flexibility to specify simple adjustments for other operational and policy factors that could significantly affect estimated supply such as:

1) Future forest productivity gains by major land tenure class (Crown, Industrial Private, Non-Industrial Private); this refers to a investment in forest management to regenerate natural forests to higher productivity levels (reforestation and density management). A default gain of 20% was used that assumes that investment levels reflected in the current forest will be maintained into the future.
2) New forest management policy under development for Crown land: A default 10% reduction was applied against predictions on Crown to account for new policies such as ecosystem-based management, new protected areas, etc.
3) Small private non-participation was initially set at a default of 15%.
4) Operational Losses: Supply is adjusted for an average operational-level recovery factor associated with operational issues such as spatial constraints, wildlife clumps, unmapped stream buffers, etc; 2% was used as a default estimate.
5) Operational Losses: The supply is adjusted for conventional harvest losses such as cull, wastage, insect, disease, etc. The calculation uses default estimates of 2% for softwood and 5% for hardwood.

Harvest Statistics

To round out the analysis picture the inventory and supply estimates are linked to the Registry of Buyers annual reporting database. This provides additional context on actual supply utilization within units of interest. The statistics look at the latest reported harvest (softwood and hardwood) within the unit as well as the 5 and 10 year averages.