Regeneration Lag Assessment

1. Definition

Regeneration lag is the time (number of growing seasons, expressed in years) required for a new stand of trees to initiate growth following harvest. The regeneration lag is the time a harvested area remains fallow without regenerating trees. Incorporated in the regeneration lag is the assumption that new growth that meets management requirements is part of regeneration lag assessment.

The following items are discussed below:

1. General Methodology that Applies to All Regenerating Areas;
2. Eligible Harvest Areas;
3. Management Strategy Determination;
4. Regeneration Lag Determination; and
5. Results and Discussion.

2. General Methodology that Applies to All Regenerating Areas

The regeneration lag assessment used the timing of historical reforestation activities and the regeneration survey status as the basis for establishing the regeneration lag assumed in the timber supply analysis (TSA). The analysis of regeneration lag assessment is based on data available on May 1, 2009, the effective date for Weyerhaeuser Grande Prairie FMA Net Land Base Assignment.

A regeneration lag by BCG strata was calculated using the following methodology:

1. The harvest area management strategy and status were assigned on the basis of reforestation treatment documents and regeneration status in the silviculture records (ARIS database).

2. Individual harvest areas within a stratum were assigned a regeneration lag according to the Rules for Regeneration Lag Assignment to Harvest Areas (version 8).

3. When multiple treatment entries exist in the ARIS database, the only the last treatment was used to define treatment date, whereas all ARIS treatment records within the first two[1] years following skid clearance were used to assign a management strategy.

4. Where both establishment and performance survey results exist in the ARIS database, only establishment surveys were used for analysis. In most cases the most recent establishment survey was used, however, previous “SR” surveys were examined where the latest survey was “SR” and occurred outside of the legislated survey window.

5. The individual harvest area regeneration lag values were averaged using area weighting.

6. The regeneration lag for the stratum is the area-weighted average value. The regeneration lag value is calculated to a tenth of a year for inclusion in TSA assumptions. Depending on the means of input to the TSA this may have to be rounded; if this is the

[1] In a number of cases this time-since-harvest horizon was expanded to three years. These cases are described in more detail below.

case then round up to the nearest whole number of years, i.e. a calculated value of 5.6 for a given strata would be input into the timber supply model as 6. The calculated raw non-rounded value is presented in the analysis report.

3. Eligible Harvest Areas

1. Definitions for post-harvest broad cover groups described in the TSA were used to group harvest areas by broad cover group (BCG) strata (CX, CD, DC, and DX). A regeneration lag was calculated for each broad cover group used in the TSA.

2. Alberta Regeneration Standard strata were assumed to align with equivalent post-harvest broad cover groups used in the TSA.

3. Only areas harvested on or after March 1, 1991 were used in the regeneration lag assessment.

4. Reforestation responsibility codes A2, AN, and AA were removed.

5. Table 1 summarizes eligible harvest area grouping rules and the regeneration lag assessment periods. This is the date that corresponds to the regeneration survey window per the Timber Management Regulation. For BCG strata CX, CD, and DC the block selection period of regeneration lag assessment ends 8 years before effective date of land base assessment (May 1, 2009). For BCG stratum DX the block selection period regeneration lag assessment ends 5 years before effective date of land base assessment.

Table 1. Eligible Harvest Area Groups based on Skid Clearance Dates

Broad Cover Group Strata	Harvest Areas Used in Regeneration Lag Assessment (Skid Clearance Dates)	ARIS Data Source (Disposition Numbers)
CX, CD, DC	March 1, 1991 to April 30, 2001	FMA6900016
DX	March 1, 1991 to April 30, 2004	FMA6900016, DTLG150003, DTLG910002 DTLG910003, DTLG910005, DTPG910001

4. Management Strategy Determination

1. The management strategies for harvest areas are defined as the treatments that were applied to 60 percent or more of the harvest area. Eligible treatments are planting, seeding, site preparation or leave for natural (LFN). Planted or seeded categorization takes precedence over site preparation. Site preparation takes precedence over LFN.

2. Generally, the timeline for management strategy determination includes only those treatments completed within two years of harvest (skid clear date). This window was expanded to three years for blocks in which treatment was initiated within two years of harvest, but at the end of two years less than 60 percent of the area was treated, if the same treatment continued in the third year and resulted in at least 60 percent of the harvest area being treated after the third year.

3. Application of points (1) and (2) resulted in a management strategy determination for 2,454 of 2,553 (96% of) harvest areas. Individual ARIS records were screened for the remaining 99 blocks to determine whether the default “LFN” strategy should be overwritten. The final distribution of management strategies is shown in Table 2.

Table 2. Management Strategy Assignment for Eligible Harvest Openings

Management Strategy	Number of Openings	Harvested Area (ha)
LFN	750	24,065
Site Preparation	67	1,628
Seeded/Planted	1,736	44,833

5. Regeneration Lag Determination

1. The last qualifying treatment date was determined by using the most recent silvicultural treatments (planting, seeding, or site preparation) applied to 20 percent or more of the harvest area.

2. Table 2 was used to determine an initial regeneration lag value for all harvest areas based on the date of last qualifying treatment.

3. The initial regeneration lag value for each opening was modified for harvest areas in the LFN management strategy by setting a minimum value from Table 3. The value from Table 2 was overwritten with the value from Table 3 where the time since treatment was less than the values in Table 3.

4. Regeneration lag values for harvest areas with “NSR” or “CSR” status at the time of establishment survey were adjusted for failure, as shown in Table 4. This calculation assumed that NSR blocks are rarely without trees; existing regeneration is retained in re-treatment activities. Regeneration lag values for NSR harvest areas are based on the assumption that initially a portion of the block is successfully established and the remaining portion will be successfully established following the establishment survey:

    a. If stocking was less that 50% or the status was recorded in ARIS as “RTD”, the block was assumed to be require re-treatment. A regeneration lag of 7 or 10 years was applied as shown in Table 4.

    b. If stocking was at least 50%, the regeneration lag value was calculated by a weighted sum of the regeneration lags for NSR and SR proportions of the block. For example, a block was planted to pure conifer 2 years after harvest. The establishment survey found the block to be 70% SR. Therefore, this particular block’s regeneration lag would be (6*(1- 0.7)) + (2*0.7) = 3.2 years.

    c. If the stocking was at least 80% (CSR blocks in the DX stratum only), the regeneration lag was set to 3.

    d. If the regeneration lag from (a) or (b) was less than that calculated from Table 2 / Table 3, the value from Table 2 / Table 3 was retained.

5. In the final step, the regeneration lag values in “SR” and “CSR” harvest areas were adjusted to account for survey timing. The timing of the most recent establishment survey was compared to strata-specific survey window, and a penalty of 1 year of regeneration lag applied for each year late in surveying. Note that this calculation considered that all surveys were due at the end of the timber year eight years after the end of the timber year in which skid clearance was achieved (i.e. April 30) for CX, CD, and DC strata, and five years after the end of the timber year in which skid clearance was achieved for DX strata. In keeping with the July 1 annual threshold, surveys conducted in May or June of the following timber year did not add a penalty year.

a. Where most recent establishment survey in the ARIS data was “SR” and late, previous survey records were examined and survey timing penalties adjusted (downwards) where earlier “SR” establishment surveys were located.

6. In summary, the regeneration lag values calculated for each harvest area account for the time since last treatment, silviculture management strategy, regeneration survey result, and regeneration survey timing. This process, schematically, is as follows:

TREATMENT TIMING *(base)* → ***STRATEGY*** *(set minimum lag for LFN, add two years for Site Preparation)* → ***SUCCESS*** *(set minimum lag for NSR and CSR subject to modification for percent stocking)* → ***SURVEY TIMING*** *(penalize late surveys)*

Table 2. Regeneration Lag Assignment based on time since treatment

Timeline	Regeneration Lag Values	
Last Treatment Date	From Skid Clearance date to the following year’s June 30	For each subsequent July 1 reached without a treatment
Regeneration Lag Value	0*	+1 for each year*

*Two (2) years were added to the regeneration lag value if the last qualifying treatment or the management strategy was site preparation.

Table 3. Regeneration Lag Minima* for LFN Harvest Openings

Timeline and Regenerating Strata				
Regeneration Strata	DX	DC	CD	CX
Regeneration Lag Value	1	2	4	5

Table 4. Regeneration Lag Assignment for NSR and CSR blocks

Block Status	Regeneration Lag Values
NSR <50% Stocked	CX, CD, and DC blocks use 10 years DX blocks use 7 years
NSR ≥50% Stocked	NSR portion - CX, CD, and DC blocks use 10 years - DX blocks use 7 years SR portion
CSR ≥80% Stocked	DX blocks use 3 years

6. Results and Discussion

The adjusted final lag times for all blocks in each stratum were analyzed and area-weighted mean of lag time are presented in Table 5.

Table 5. Regeneration lag statistics

Strata	Number of blocks	Area (ha)	Mean (year)	95% CL for the mean		Standard deviation
				Lower	Upper	
CX	1518	42,059.9	2.49	2.35	2.63	14.85
CD	437	10,442.1	1.92	1.69	2.15	12.04
DC	2	37.9	3.59	-2.66	9.84	3.03
DX	596	17,986.6	1.70	1.56	1.84	9.74

Coniferous (CX) harvest areas have an average fallow period of 2.5 years after harvesting (Table 5). The 95% confidence limits for the mean in this stratum are from 2.35 to 2.63 years. Conifer-leading mixedwood (CD) harvest areas are fallow for 1.92 years and pure deciduous (DX) harvest areas are fallow for 1.7 year. Note that DC blocks were under-represented in the sample: two openings totaling 37.9 ha. Data in this stratum is not sufficient to make any conclusions. Instead, the DX regeneration lag may be applied to future DC harvest areas.

Compared to CX and CD harvest areas, the regeneration lag value in DX harvest areas seems high (only 0.2 years shorter than the CD harvest areas). Analyses of the data indicated that the changes in assessment policy had contributed to the high lag time for deciduous harvest areas. For example, under the rules used in the previous DFMP, DX openings with an LFN management strategy and "SR" or "CSR" status at establishment survey would have zero or one year lag time for skid clearance in the winter and summer, respectively (Appendix D.5, 2007). In comparison, the new rules used a lag value of one year for SR blocks and three years for CSR blocks in the deciduous stratum (Appendix, government rules). In addition, lag time for all SR blocks that were either planted, seeded, site preparation or LFN management strategy would be added a period of penalty time if the first passed survey date was outside of the survey window (Appendix, SRD rules). As a result of these two policy changes, lag time has increased considerably in DX blocks: from 0.9 year using previous rules to 1.7 years with new rules.

7. References

SRD Guidelines for Regeneration Lag Assessment

Regeneration Lag Data - Version 8.0.doc