Canadian Forest Products Ltd.

Reforestation Strategy

Canfor FMA 9900037 2015 Forest Management Plan

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Reforestation Strategy
FMA 9900037 2015 Forest Management Plan

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Introduction

This document details the reforestation strategy that will be implemented to achieve the proposed regenerated yield projections in the *2015 Canfor Forest Management Plan* (FMP). Outlined in this document and the associated Reforestation Strategy Table (Table 2) are activities applied to a harvested opening that should achieve crop tree (site index tree) survival, suitable productivity and meet the proposed forest structure intended in the regenerating stand within the Reforestation Phase, which typically runs to the end of the 14th year after harvest.

Canfor has adopted the following corporate Silviculture Mission:

"…to safely achieve legislated free growing standards in the most cost effective manner possible, while meeting certification, legal requirements and timber supply objectives at the landscape level."

Reforestation Strategy

1. **Natural Sub-Region implications**- The Forest Management Agreement area (FMA) stretches from the lower elevation Dry Mixedwood (DM), through the Central Mixedwood (CM), Lower Foothills (LF), Upper Foothills (UF), and up to the high elevation Sub-Alpine (SA) in the south (Figure 1). The Natural Sub-Regions are detailed in section (3.1.1.2.3) of the FMP document. There is a trend to increasing predominance of pure pine in higher elevations and conversely a trend to spruce aspen mixedwood in lower elevations.

   Natural sub-regions play a role in all silviculture prescriptions, from site prep to planting to the amount of vegetation management that may be required, due to the varying levels of competition and soil types encountered. DM, CM, and LF typically have higher levels of competition and more hygric to sub hyrgric site conditions as compared to UF and SA. Sites with less competition typically can be expected to have higher levels of ingress. Section 8 discusses in more detail how the site preparation, planting and vegetation management prescriptions change with natural sub-regions in mind.

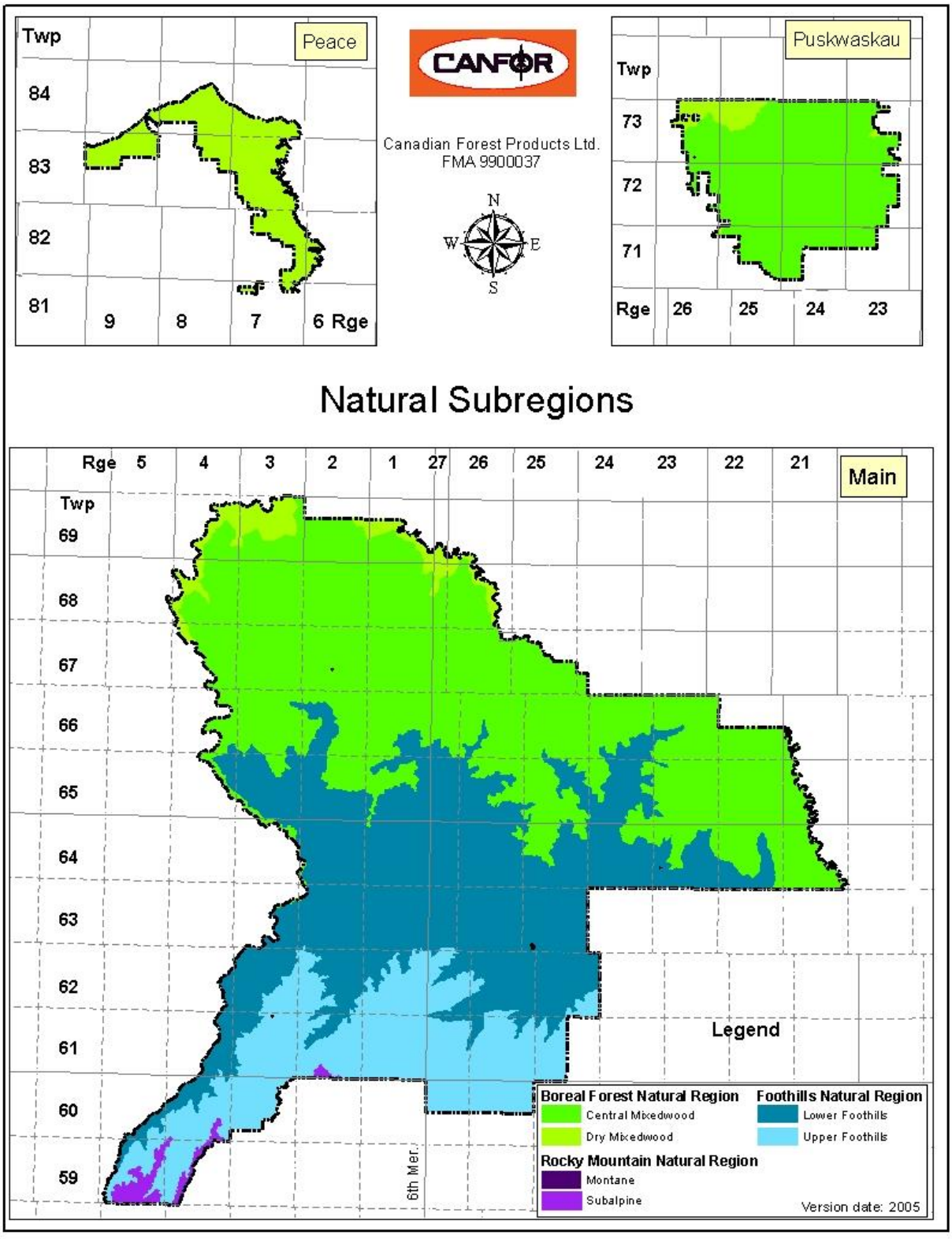

Figure 1. Canfor FMA Natural Sub-regions

2. **Species of trees to be reforested on the landscape**- The intent of Canfor's reforestation strategy is to reforest stands back to the natural species that existed prior to harvest (through balancing) except where indicated otherwise in Table 3.

   The coniferous species that will be harvested include white spruce, lodgepole pine, black spruce and balsam fir. Lodgepole pine in the northern portions of the FMA area has some degree of hybridization with jack pine, but for the purposes of this plan will be called lodgepole pine. The balsam fir in the high elevation sites may transition to alpine fir. The fir species, however, are expected to regenerate through natural methods; therefore the boundary between the two is not relevant for the purposes of this plan. In addition, balsam fir does not have its own regenerated yield curve, as these stands will be transitioned to white spruce as per Table 3.

   The deciduous species that will be harvested include trembling aspen, balsam poplar and white birch. Deciduous species predominantly regenerate naturally; therefore there are no implications to species choices for reforestation. However, deciduous quota holders may choose to plant deciduous species in their deciduous designated openings. (See Section 9 for additional details on deciduous reforestation prescriptions)

   Seven (7) of the ten (10) Provincial base regeneration strata are used in the *2015 Canfor Forest Management Plan* (See Section 6 - Table 4). Three (3) of the base strata are not being used for the following reasons:

   1. The FMA area does not have douglas fir; therefore the douglas fir projection will not be used.
   2. AwPl will not be used because of the lack of area of this species composition; the area in this species composition was amalgamated into natural yield group 9 (PlHw/HwPl).
   3. SbHw will not be used because of the lack of area of this species composition; the area in this species composition was amalgamated into natural yield group 17 (SwHw/SwHwPl)

3. **Seed zones that occur on the FMA area and the corresponding seed supply on hand**- There are two different deployment strategies by which seedlings are planted in harvested openings and they are fully described in the *Forest Genetics Resource Management and Conservation Standards* (FGRMS). One strategy deploys seedlings according to the Forestry Seed Zones of Alberta (reference appendix 7 of the FGRMS). The other strategy deploys seedlings according to Controlled Parentage Programs (CPP) Regions, also known as Breeding Regions (reference appendix 19 of the FGRMS). Seed collected from the forestry seed zones is referred to as "wild" or "stream 1" seed. Seed associated with breeding regions is referred to as "genetically improved", "improved", or "stream 2" seed and can only be collected from approved, established seed orchards.

   The advantage of one over the other is that breeding regions are larger in size allowing greater flexibility in seedling movement and also have an associated

genetic gain to them (increased height assumptions at rotation age, resulting in increased volume and therefore Annual Allowable Cut (AAC)).

Wild seed is collected by seed zone as established in Appendix 7 of the FGRMS and can be planted anywhere within that same seed zone. The seedzones occurring on the FMA area, in order of lowest elevation to highest elevation, are: DM 1.2, DM 1.3, CM 3.4, LF 1.4, UF 1.3 and SA 1.1. (Figure 2), Variances can be requested by the company to the province to plant seed from a different seed zone as long as it meets the transfer criteria as stated in Standard 18.2 of the FGRMS.

Canfor belongs to an approved seed orchard cooperative - Huallen Seed Orchard Company (HASOC), in which genetically improved seed associated with Breeding Regions B1 (lodgepole pine) and G1 (white spruce) are produced. This orchard also produces registerable seed (no genetic gain) for Breeding Region L2 (black spruce) (See Section 4 for additional details). Seed from all three (3) of these breeding regions can be planted across various seed zones as long as it remains within the appropriate breeding region (Figure 3, Figure 4, Figure 5).

DM 1.3 is a small seed zone (20,893 ha) located primarily in the Puskwaskau and Economy North Timber Supply Units. The G1 Breeding Region covers 80 percent of this seedzone. Any block falling within this seed zone not covered by G1, can be covered by applying for a variance to use DM 1.2 seed or, if applicable, the fuzzy boundary rule in Appendix 13 of the FGRMS. The fuzzy boundary rule allows seed from an adjacent seed zone to be deployed without variance provided it is within 1 (one) km and the difference in elevation from point of collection to point of deployment does not exceed 100 meters. Canfor currently has no seed for this seedzone and has no plans for collection for reasons stated above; therefore, for the purposes of this plan, DM 1.3 is not included in Table 1.

SA 1.1 is also a small seed zone (4,378 ha) and is not covered by any breeding region (B1, G1 or L2). This seed zone, in the south end of the FMA area, is comprised of narrow fingers of high elevation and as such, the fuzzy boundary rule, as explained above, is likely not to apply in many cases. Canfor has therefore purchased a small amount of SA1.1 seed to use in openings that will be harvested in this current harvest sequence.

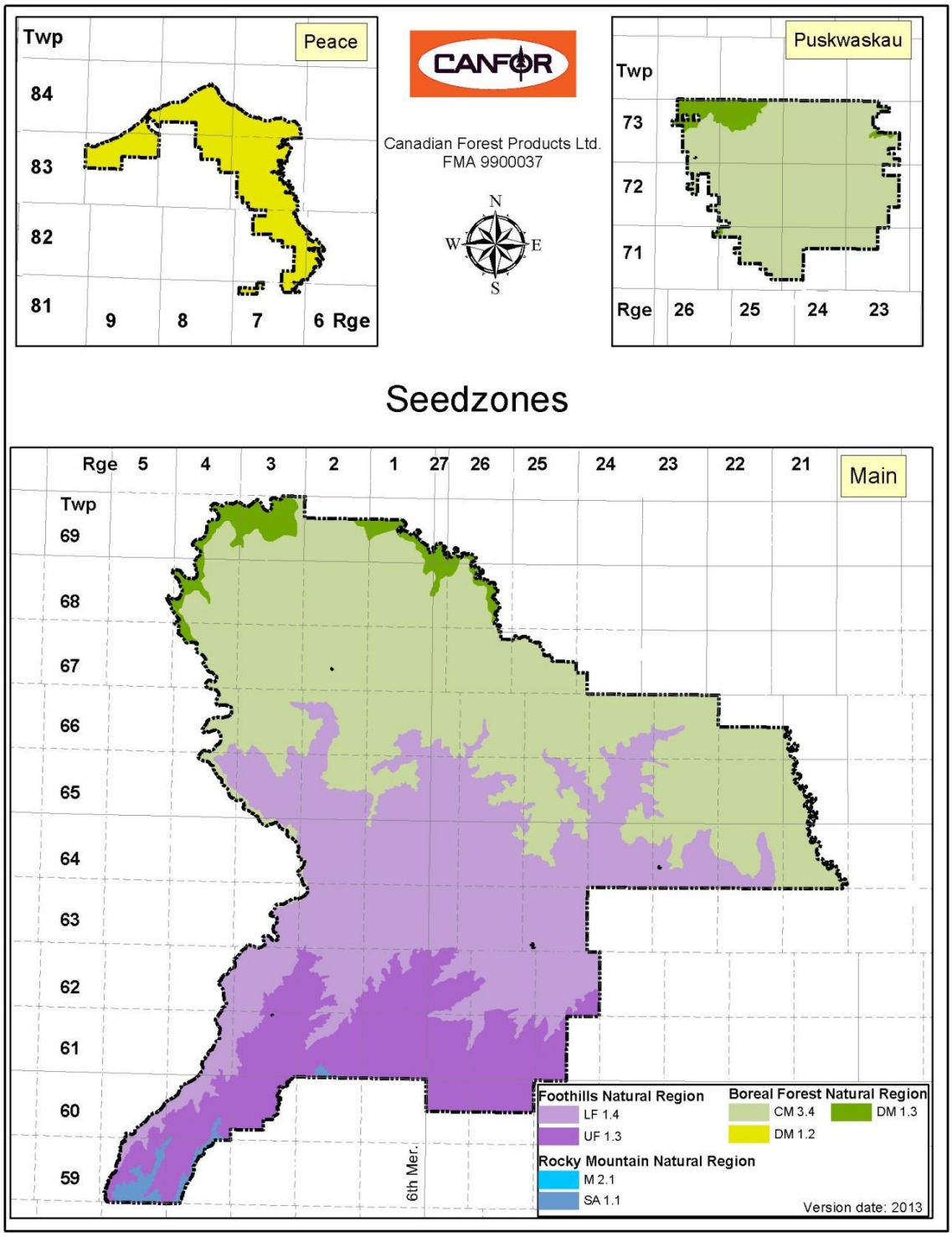

Figure 2. Canfor FMA Seedzones

A review of Canfor's seed supply for FMA 9900037 was conducted by personnel from Alberta Environment and Sustainable Resource Development (AESRD). To that end, Canfor received a letter from the Reforestation Section of AESRD on July 16, 2010 indicating that a shortfall in black spruce was noted in two seed zones (LF 1.4 and SA 1.1). Canfor identified the following two mitigating measures to address the shortfall identified.

1. Canfor has realized seed production from the black spruce seed orchard (Breeding Region L2) from HASOC. The L2 Breeding Region covers seed zones LF 1.4. Therefore, seed collection from this zone will not be necessary.
2. As Canfor continues to concentrate their harvesting in pine stands due to the Mountain Pine Beetle (MPB) epidemic in Alberta, less black spruce stands are expected to be harvested; therefore there will be less demand on that seed supply. This is especially true for black spruce stands in SA 1.1.

These mitigating measures were communicated back to the province in a letter dated July 26, 2010.

It should be noted that in seed zone SA1.1 – only 73 ha of gross area black spruce is present in the FMA area and reforestation of that black spruce may be accommodated through balancing in an alternate seed zone.

Table 1 shows the current amount of potential seedlings for conifer (held by Canfor) and for deciduous (held by Norbord) by seed zone and compares it to what the Spatial Harvest Sequence (SHS) shows will be required by seed zone (pending as of April 30 2015). By comparing these two values, it will identify where a potential shortfall exists. Values for the table were derived from the Alberta Tree Improvement Seed Center (ATISC) and the SHS as follows:

- KG in inventory – from ATISC seed inventory spreadsheet - November 2014
- # seedlings that could be planted with available inventory:
    - First calculate total # of seeds in seedlot - (*KG *%purity*seeds/KG*). These values are provided in the ATISC seed inventory spreadsheet.
    - Then calculate seeds required per cavity to produce a seedling. Canfor has a look up table provided by PRT Nursery that calculates seeds/cavity based on germination % rate on stratified seedlot (provided on ATISC inventory spreadsheet). Seed per cavity ranges from a high of 3.6 (low germination rate) to a low of 1.3.
    - Once these values are calculated the formula to convert Seeds to Seedlings is: *[(Total seeds/seeds per cavity)/Oversow %]*
    - 125% was used for the average Oversow %. This value was supplied to us by PRT Nursery.
- # Ha that could be planted with current inventory
    - This was calculated by using the average stems per ha (sph) planted using the percents in Section 6-Table 4.
    - The formula then is: *# seedlings/sph* to produce # ha that can be planted with available seedlings.

- The last 3 columns relate to the sequence
    - Hectares to be cut by seed zone in next 10 years is derived through a spatial overlay of sequenced stands and seed zone boundaries to determine hectares by seed zone.
    - # of KG of seed required by seed zone for 10 years is calculated by determining # of seedlings (based on Ha) and reversing the calculations used above to arrive back at KG of seed required.

Table 1 (Seed Analysis) indicates a shortage of pine seed in the B1 (stream 2) breeding zone as well a shortage of both pine and spruce in the SA1.1 (stream 1) seed zones. Canfor is a cooperative member of the tree improvement orchard at Huallen (HASOC) and produces seed for the B1 breeding zone (stream 2 seed) annually; therefore, the shortage shown in Table 1 is not a concern for Canfor. In the event that B1 seed not be available, stream 2 seed from the applicable seed zone can be used. Canfor also plans to enter into seed trade agreements with other companies to address shortages in the SA1.1 seed zone.

Table 1. Seed Analysis: Current Inventory versus 10-year Sequence Needs (Based on November 2014 Inventory)

PL	Does Seed zone (stream 1) overlap with breeding region (stream 2)	Kg in inventory (Dec 2014)	# seedlings that could be planted with current inventory	#ha that could be planted with current inventory	Approx# ha to be cut in this seedzone in next 10 yrs	# Seedlings	#kg of seed required for next 10 yrs	#kg of seed collection required for next 10 yrs
B1(Stream2)	B1(Stream2)	15.02	2,001,627	1,668	15,220	18,263,880	155.6	140.00
DM 1.2	No overlap	6.15	712,599	594	266	319,200	3	0.00
CM3.4	10% of area in B1 (fringes and pockets)	33.54	4,238,895	3,532	684	821,388	7	0.00
LF1.4	yes - (minor fingers not in B1)	1070.82	100,550,909	83,792	58	69,720	1	0.00
UF1.3	65% of area in B1	69.60	5,911,152	7,389	3,613	4,335,120	58	0.00
SA1.1	No overlap	0.73	83,156	104	1,215	1,458,000	39	38.00
Grand Total		**1195.12**	**113,415,183**	**96,976**	**21,056**	**25,267,308**	**263.4**	**178**

SW	Does Seed zone (stream 1) overlap with breeding region (stream 2)	Kg in inventory (Dec 2014)	# seedlings that could be planted with current inventory	#ha that could be planted with current inventory	Approx# ha to be cut in this seedzone in next 10 yrs	# seedlings	#kg of seed required for next 10 yrs	#kg of seed collection required for next 10 yrs
G1(Stream2)	G1(Stream2)	151.83	28,568,251	20,406	7,126.70	9,977,380.00	59	0.000
DM 1.2	75% covered in G1	10.55	1,758,913	1,256	0	-	0	0
CM3.4	100% in G1	287.79	35,645,833	25,461	0	-	0	0
LF1.4	95% coverage in G1 (small fringes in South not in)	80.61	11,919,360	8,514	0	-	0	0
UF1.3	minor fringe - essentially NO	41.65	5,975,605	4,268	1649.2	2,308,880.00	16	0
SA1.1	NO OVERLAP	NA			329.4	461,160.00	4	4
Grand Total		**572.44**	**83,867,961**	**59,906**	**9,105**	**12,747,420**	**79**	**4**

SB	Does Seed zone (stream 1) overlap with breeding region (stream 2)	Kg in inventory (Dec 2014)	# seedlings that could be planted with current inventory	#ha that could be planted with current inventory	Approx# ha to be cut in this seedzone in next 10 yrs	# seedlings	#kg of seed required for next 10 yrs	#kg of seed collection required for next 10 yrs
L2 (registered)	L2 (registered)	3.80	1,627,555	1162.539572	279	390,600.00	1.1	0.0
DM 1.2	no	NA	-	-	-		0	0.0
CM3.4	**20% overlap**	3.03	1,334,035	952.8817897	64.1	89,740.00	0.2	0.0
LF1.4	**yes**	covered by L2 seed			0	-	0	0.0
UF1.3	**60% overlap in L2**	2.57	815,014.30	815.0143039	81.5	114,100.00	0.4	0.0
SA1.1	**NO OVERLAP**	0.04	13,537.80	11.28150178	0	0	0	0.0
Grand Total		**9.45**	**3,776,604**	**2930.435666**	**424.6**	**594,440.00**	**1.7**	**0.0**

Deciduous Seed

AW	Seed zone/CPP overlap	March 2015 inventory (g)*	Total seed	# Seedlings (CFGP)	#ha covered with current inventory	Projected ha to be cut in next 10 yrs	Approx Ha that will be roads	# Seedlings for the next 10years	Grams of seed required for next 10 yrs
DM1.3	NA	62.2	435,400	300,276	150	1,597	79.85	159,700	-
CM3.4	NA	84.6	592,200	408,414	204	13,373	668.65	1,337,300	132.70
PB	**Seed zone/CPP overlap**	**March 2015 inventory (g)***	**Total seed**	**# Seedlings (CFGP)**	**#ha covered with current inventory**	**Projected ha to be cut in next 10 yrs**	**Approx Ha that will be roads**	**# Seedlings for the next 10years**	**Grams of seed required for next 10 yrs**
DM1.3	NA	662.8	2,651,200	1,828,414	914	214	10.68	21,350	-
CM3.4	NA	248.0	992,000	684,138	342	5,563	278.15	556,300	-
LF1.4	NA	547.0	2,188,000	1,508,966	754	249	12.46	24,910	-

4. **Tree Improvement**- Canfor follows, and is in compliance with, the *Forest Genetic Resource Management and Conservation Standards* (FGRMS) that governs Controlled Parentage Programs (CPP) (also known as tree improvement programs) in Alberta.

There are three (3) coniferous CPPs active within the FMA area. Ainsworth Engineered Canada LP is also developing a CPP plan for aspen in conjunction with Western Boreal Aspen Corporation.

Canfor has been involved in coniferous tree improvement programs since 1977 when parent selections for the B1 orchard began. Work was also being done by the government of Alberta along with industry partners, to find a site to establish a seed orchard to produce improved seed for B1 and G1 breeding regions (as well as a few other regions not applicable to the 2015 FMP). In 1979, the first progeny test sites for B1 were established in various locations within the B1 breeding region. By 1985, a half-section agricultural site located near Beaverlodge, Alberta, was purchased and a seed orchard was established. In January 1995, the Huallen Seed Orchard Company (HASOC) was formed to buy out the Government of Alberta and form a joint venture agreement with Canfor, Weyerhaeuser, West Fraser, Millar Western and Alberta Newsprint Company to facilitate cost sharing, improve efficiency and realize economies of scale among companies within shared breeding regions.

Canfor participates in the B1 lodgepole pine controlled parentage program, the G1 white spruce controlled parentage program and the L2 black spruce program. The goal for the B1 and G1 programs is to provide a secure source of seed to produce trees with fast growth, good general health, good form, and undiminished wood quality, in addition to providing genetic gain. The L2 program goal is to provide a secure source of black spruce seed.

The B1 Breeding Region orchard is the most advanced of the three controlled parentage programs, in that a second generation orchard has been established (B1 Phase 2). The Phase 1 orchard historically has met seed needs for the region. A recent topping and roguing in 2012, combined with a recently noted conelet abortion issue has resulted in lower than anticipated cone crops in the B1 phase 1 orchard. The B1 phase II orchard is coming on stream with cone crops, so it is anticipated that cone crops should be close to target by 2016 or 2017. The phase II orchard has plans for an immediate expansion to further increase the cone crop for B1 pine. Progeny testing for the B1 program is being done in two phases at a total of seven sites; Canfor is responsible for 2 of these sites. The Controlled Parentage Program (CPP) Plan for the program was approved September 27, 2010.

The G1 Breeding Region orchard has been producing substantial amounts of seed since 2002, and fully meets seed needs for the region. No cone crops have been picked for the past 3 years due to bumper crops collected in previous years. As Table 1 shows, there is over a 10 year supply of seed. Cone crops will resume picking once the orchard is rogued for genetic gain (by 2019). Canfor maintains three of the five progeny test sites for this program. The CPP Plan for this program was approved July 11, 2011.

The L2 Breeding Region orchard began to produce significant quantities of seed in 2009. It currently produces registerable seedlots in accordance with FGRMS. This orchard has met target production in 2012 and continues to produce at target.

Diversity levels for recent seedlots exceed the Effective Population Size (Ne) threshold of Ne=18 established by the FGRMS for unrestricted seedlot registration. The Lodgepole Pine Region B1 (phase 1) 2013 seedlot had an Ne of 91.2, the White Spruce Region G1 2009 (last year a collection was made) seedlot had an Ne of 46.0 and the Black Spruce Region L2 combined 2012/2013 seedlot had an Ne of 50.6.

Ainsworth is part of the aspen AW2 CPP program with Weyerhaeuser Company Limited developed through the Western Boreal Aspen Corp. (WBAC). While the program has been in existence since 1992 and two revisions of CPP plans have been submitted (December 2006 and February 2014), these plans have not been approved, and the program has been focused mainly on research, since there has been no enabling policy for clonal deployment. It is expected that an enabling policy for clonal deployment will come into force in 2015 through a revision of ESRD's FGRMs.

WBAC has been working with ESRD to bring the CPP plans in compliance with FGRMs. A decision from ESRD is expected in early 2015. If the plans are approved, then it is expected to develop a propagation facility at the Tree Improvement Centre in Drayton Valley so that operational deployment could start in 2018.

Because large scale aspen deployment is new in Alberta, the new clonal deployment policy will set a cap of 5,000 ha after 7 years and 15,000 after 14 years of progressive experience with aspen clonal deployment after CPP plans are approved. Given that there are two members in region AW2 (Ainsworth and Weyerhaeuser) it is likely that Ainsworth will be limited to 2,500 ha and 7,500 ha after 7 and 14 years respectively.

Canfor's planting strategy is to plant genetically improved stock within applicable breeding regions on a priority basis of pure conifer (C) designated openings first. Then, given adequate seed supply from the orchard, planting will occur in conifer leading (CD) designated openings, followed by deciduous leading (DC) designated openings.

Canfor currently has enough improved G1 seed in inventory at the Alberta Tree Improvement Seed Center (ATISC) as indicated in Section 3- Table 1 to meet the SHS needs. However, a small shortage of B1 seed is anticipated due to reasons noted above. In order to address this, Canfor is planning on placing a priority on planting B1 improved seed on pure conifer designated openings first. To account for this in the Timber Supply Analysis (TSA), genetic gain is not being applied to yield group 9 (PlAw/AwPl) in the timber supply model, unless it occurs in the caribou management area (Table 3). If additional B1 seed is obtained, then it will be used in the yield group 9 stands and the genetic gain will be applied at the time of the next forest management plan.

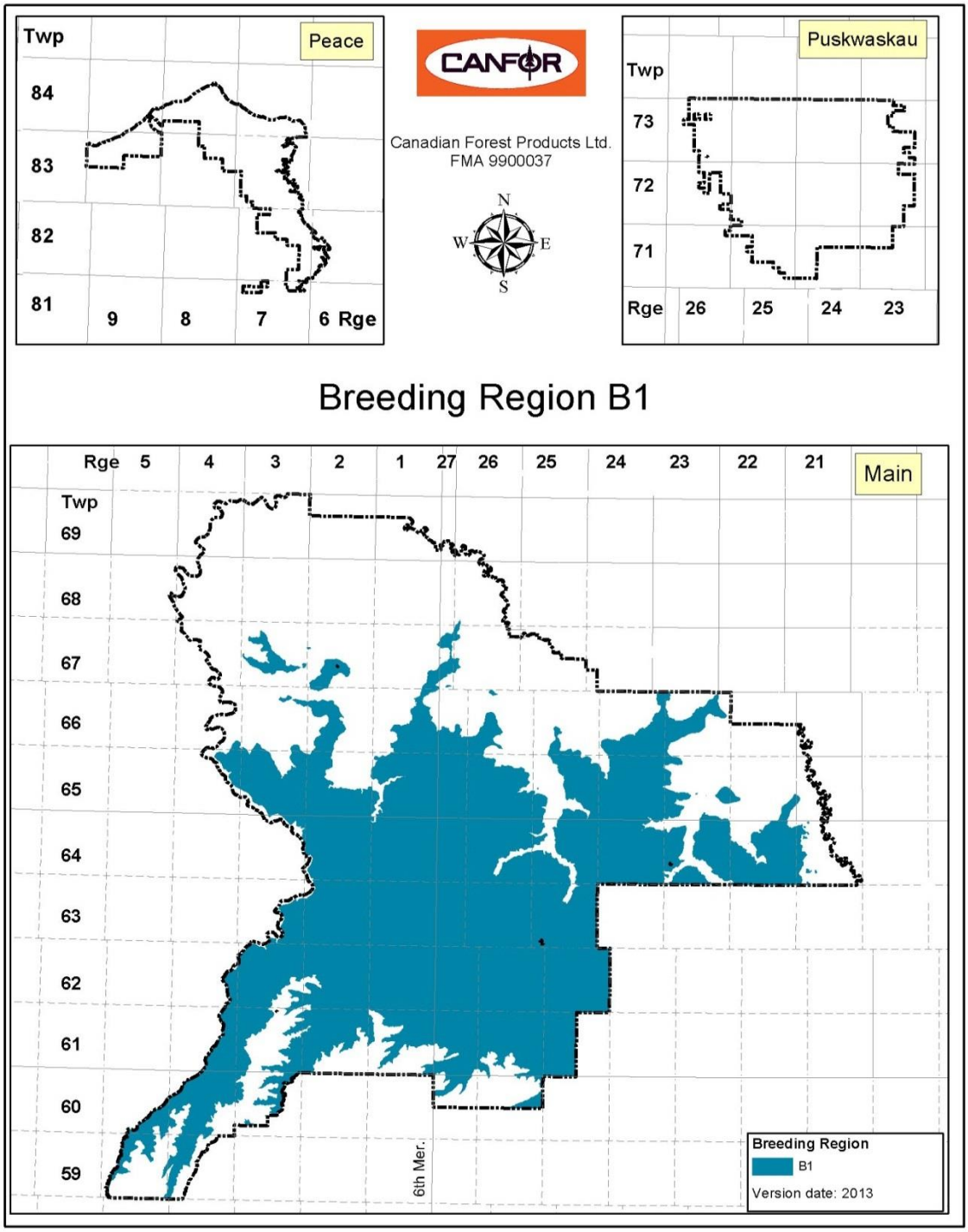

Figure 3. Canfor FMA Breeding Region B1

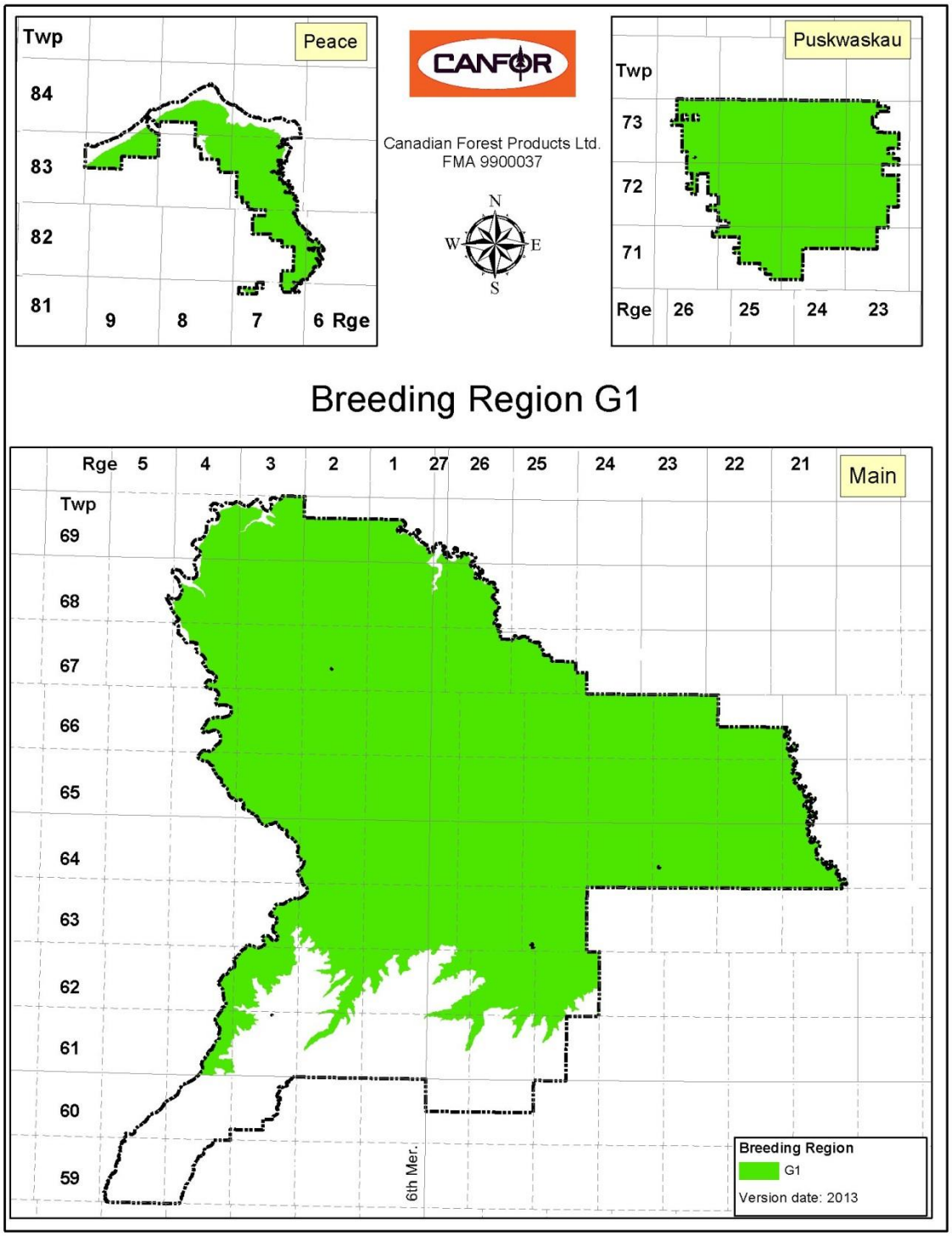

Figure 4. Canfor FMA Breeding Region G1

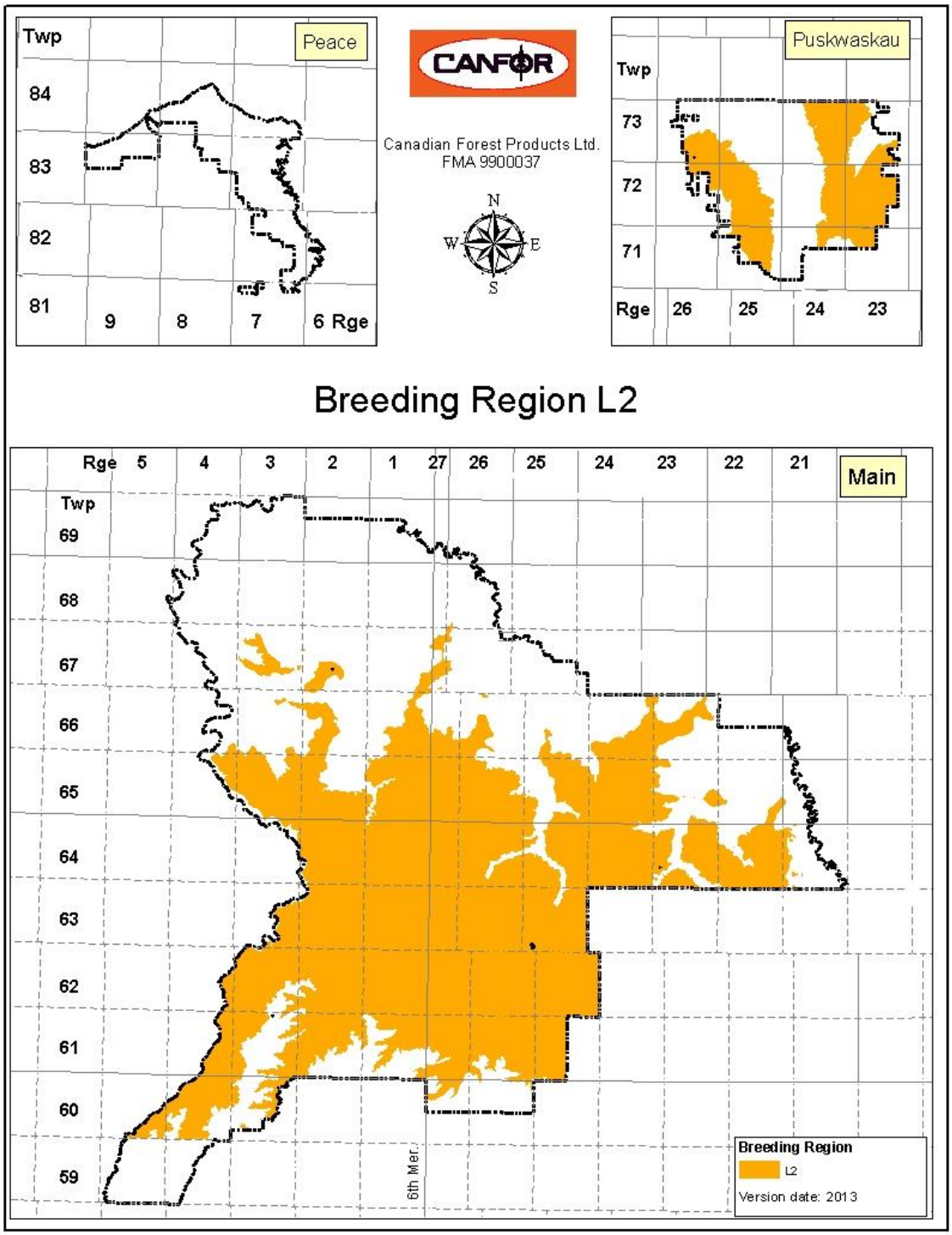

Figure 5. Canfor FMA Breeding Region L2

5. **Secondary timber species volume replacement strategy on the FMP landscape**- *Secondary timber species volume* is the non-leading species portion in a pure stand type. It is recognized that each stand will likely have a small component of either conifer or deciduous in their pure stand counterpart. Canfor's volume replacement strategy is to ensure conifer and deciduous species in pure stands are reforested to meet minimum productivity requirements, (mean annual increment (MAI)) as shown in Table 5 in Section 7.

   All volumes, once harvested, will be replaced back on the landscape.

   - Deciduous content in regenerating stands is typically not a concern, as deciduous regenerates via suckering. Excessive deciduous stocking in conifer leading stands is controlled through the conifer company's stand tending program as described in Section 8 of this document.
   - Coniferous content in pure D stands will be addressed either through the planting of roads, landings, piles, and seismic lines to conifer or through understory avoidance within the harvested opening. Coniferous content in CD or DC stands will be planted throughout the opening. Both approaches are outlined in the FMA Reforestation Strategy Table.

   Deciduous volumes (regardless of stand type) are calculated and offered to the appropriate company during the development of the Final Harvest Plans (FHP). If that company chooses not to accept the volume, and no outside buyer for that volume can be found, the volume may be left standing (if feasible), harvested and piled, or spread so as not to be a hindrance to planting. The volume, however, is tracked and drained from the applicable Annual Allowable Cut (AAC) in the cut control table developed for the General Development Plan (GDP) submitted to the Government annually on or before June 1st.

Table 2. 2015 FMA Reforestation Strategy

Regenerated Yield Projection (leading + secondary species)	Strata Standard (C, CD, DC, D)	Transitions Toward Climax	Natural Yield Curve (r0) Transitions To (r3)		Regenerated Yield Curve Stratum Name	Regenerated Yield Curve Label (Landbase Designation Code)	Stand Structure (Species Proportions)	Limitations to Crop Establishment (Site, Climate)	Silviculture System	Site Prep	Seedling Establishment (includes LFN)	Seedling Density (SPH Target per Species Type)	Reforestation Phase Intervention (Post-seedling establishment within the Refor. Obligation period)
Deciduous	D	No transition anticipated. Stand structure remains predominantly deciduous.	r0_01_b	r3_d_hw1_b	HW	CFPL301	>/=80% deciduous species	Soil compaction during summer harvesting; cold wet soils, vegetative competition, rodent damage, drought, winter desiccation, harvest debris, modification of soil structure, deciduous root damage, insects and disease.	Clearcut	Elevated microsite/de-compaction if compaction is an issue.	Leave-for-Natural suckering of deciduous; May include planting of roads, landings, piles, and seismic lines to conifer or deciduous species; may include coniferous understory avoidance within opening; Conifer may also be planted throughout the block at a low density to achieve natural yield projections	Minimum acceptable deciduous stocking - 3,000 sph; Minimum acceptable coniferous density for roads, landings, piles, and seismic lines -10,00 sph	No intervention anticipated other than monitoring
			r0_01_b-2	r3_d_hw1_b									
			r0_01_b-3	r3_d_hw1_b									
			r0_02_b	r3_d_hw2_b									
			r0_02_b-1	r3_d_hw2_b									
			r0_02_b-2	r3_d_hw2_b									
			r0_02_b-3	r3_d_hw2_b									
			r0_04_b	r3_d_hw4_b									
			r0_04_b-2	r3_d_hw4_b									
			r0_04_b-3	r3_d_hw4_b									
			r0_07_b	r3_d_hw7_b									
			r0_07_b-2	r3_d_hw7_b									
			r0_07_b-3	r3_d_hw7_b									
Hardwood/ Spruce-Basic	DC	No transition anticipated. Stand structure remains a deciduous leading mixedwood.	r0_03_b	r3_dc_hwsx_b	HWSW	CFPL302	>/=50% deciduous species and >/=30% spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, deciduous root damage, insects and disease.	Clearcut	Elevated microsite, chemical spot treatment, discing, or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable deciduous stocking - 2,000 sph. Minimum acceptable coniferous planting density - 1,200 sph - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending, (up to 30% of opening area to maintain conifer) at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_06_dc_b	r3_dc_hwsx_b									
		Transition anticipated to C in Caribou Range and RAD Plan Area.	r0_03_b-1	r3_c_sw_b	SW	CFPL305	>/=80% white spruce leading coniferous species					Minimum acceptable coniferous planting density - 1,200 sph - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_03_b-2	r3_c_sw_b									
			r0_03_b-3	r3_c_sw_b									
			r0_06_dc_b-1	r3_c_sw_b									
			r0_06_dc_b-2	r3_c_sw_b									
			r0_06_dc_b-3	r3_c_sw_b									
Hardwood/Spruce - Genetic	DC	No transition anticipated. Stand structure remains a deciduous leading mixedwood.	r0_03_g	r3_dc_hwsx_g	HWSW	CFPL302- G	>/=50% deciduous species and >/=30% spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, deciduous root damage, insects and disease.	Clearcut	Elevated microsite, chemical spot treatment, discing, or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable deciduous stocking - 2,000 sph. Minimum acceptable coniferous planting density - 1,200 sph TI seedlings - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending, (up to 30% of opening area to maintain conifer) at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_06_dc_g	r3_dc_hwsx_g									
		Transition anticipated to C in Caribou Range and RAD Plan Area.	r0_03_g-2	r3_c_sw_g	SW	CFPL305- G	>/=80% white spruce leading coniferous species					Minimum acceptable coniferous planting density - 1,200 sph TI seedlings - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_03_g-3	r3_c_sw_g									
			r0_06_dc_g-2	r3_c_sw_g									
			r0_06_dc_g-3	r3_c_sw_g									
Hardwood/Early Conifer	**Du**	**Instances may occur where slivers or small stands may be harvested in a portion of an opening to avoid isolation. If harvested, transition anticipated to DC or CD.**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**	**NOT SEQUENCED IN THIS PLANNING PERIOD**
White Spruce/ Hardwood-Basic	CD	No transition anticipated. Stand structure remains a coniferous leading mixedwood.	r0_06_cd_b	r3_cd_swhw_b	SWHW	CFPL303	>/=50% white spruce leading coniferous species and >/=30% deciduous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical spot treatment, discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable deciduous stocking - 1,000 sph. Minimum acceptable coniferous planting density - 1,200 sph - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending, (up to 70% of opening area to maintain conifer) at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_17_b	r3_cd_swhw_b									
		Transition anticipated to C in Caribou Range and RAD Plan Area.	r0_06_cd_b-1	r3_c_sw_b	SW	CFPL305	>/=80% white spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, deciduous root damage, insects and disease.				Minimum acceptable coniferous planting density - 1,200 sph - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_06_cd_b-2	r3_c_sw_b									
			r0_06_cd_b-3	r3_c_sw_b									
			r0_17_b-1	r3_c_sw_b									
			r0_17_b-2	r3_c_sw_b									
			r0_17_b-3	r3_c_sw_b									

Regenerated Yield Projection (leading + secondary species)	Strata Standard (C, CD, DC, D)	Transitions Toward Climax	Natural Yield Curve (r0) Transitions To (r3)		Regenerated Yield Curve Stratum Name	Regenerated Yield Curve Label (Landbase Designation Code)	Stand Structure (Species Proportions)	Limitations to Crop Establishment (Site, Climate)	Silviculture System	Site Prep	Seedling Establishment (includes LFN)	Seedling Density (SPH Target per Species Type)	Reforestation Phase Intervention (Post-seedling establishment within the Refor. Obligation period)
White Spruce/ Hardwood-Genetic	**CD**	**No transition anticipated. Stand structure remains a coniferous leading mixedwood.**	r0_06_cd_g	r3_cd_swhw_g	SWHW	CFPL303-G	>/=50% white spruce leading coniferous species and >/=30% deciduous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical spot treatment, discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable deciduous stocking - 1,000 sph. Minimum acceptable coniferous planting density - 1,200 sph TI seedlings - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending, (up to 70% of opening area to maintain conifer) at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_17_g	r3_cd_swhw_g									
		Transition anticipated to C in Caribou Range and RAD Plan Area.	r0_06_cd_g-2	r3_c_sw_g	SW	CFPL305-G	>/=80% white spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, deciduous root damage, insects and disease.				Minimum acceptable coniferous planting density - 1,200 sph TI seedlings - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_06_cd_g-3	r3_c_sw_g									
			r0_17_g-2	r3_c_sw_g									
			r0_17_g-3	r3_c_sw_g									
Pine/Hardwood-Basic	CD	No transition anticipated Stand structure remains a coniferous leading mixedwood.	r0_09_b	r3_cd_plhw_b	PLHW	CFPL304	>/=50% pine leading coniferous species and >/=30% deciduous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical spot treatment, pile and burn, discing or dragging	Planting including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural seed; Leave-for-Natural suckering of deciduous	Minimum acceptable deciduous stocking - 1,000 sph. Minimum acceptable coniferous planting density -1,100 sph with ingress expected. some mixbag with SW seedlings is expected - average of 20% spruce but up to 50% - site specific.	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending, (up to 70% of opening area to maintain conifer) at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_09_g	r3_cd_plhw_b									
	CD-Caribou	Transition anticipated to C in Caribou Range and RAD Plan Area.	r0_09_b-1	r3_c_pl_b	PL	CFPL306	>/=80% pine leading coniferous species				Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural seed; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous planting density -1,100 sph with ingress expected. Some mixbag with SW seedlings is expected - average of 20% spruce but up to 50% - site specific.	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_09_b-2	r3_c_pl_b									
			r0_09_b-3	r3_c_pl_b									
Pine/Hardwood-Genetic	CD-Caribou	Transition anticipated to C in Caribou Range and RAD Plan Area.	r0_09_g-1	r3_c_pl_g	PL	CFPL306-G	>/=80% pine leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical spot treatment, pile and burn, discing or dragging	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural seed; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous planting density -1,200 sph of TI seedlings -site specific planting may be pure Pine or mixbag with an average of 20% spruce but up to 50% - site specific.	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_09_g-2	r3_c_pl_g									
			r0_09_g-3	r3_c_pl_g									
White Spruce pure or leading-Basic	C	Stand structure remains predominantly coniferous. Fb+Other regenerates to Sw	r0_05_b	r3_c_sw_b	SW	CFPL305	>/=80% white spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical broadcast treatment, discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous planting density - 1,200 sph - site specific planting may be pure SW or mixbag of SW and PL and/or SB. (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_05_b-1	r3_c_sw_b									
			r0_05_b-2	r3_c_sw_b									
			r0_05_b-3	r3_c_sw_b									
		No transition anticipated. Stand structure remains predominantly Sw coniferous.	r0_15_b	r3_c_sw_b									
			r0_15_b-1	r3_c_sw_b									
			r0_15_b-2	r3_c_sw_b									
			r0_15_b-3	r3_c_sw_b									
			r0_16_b	r3_c_sw_b									
			r0_16_b-1	r3_c_sw_b									
			r0_16_b-2	r3_c_sw_b									
			r0_16_b-3	r3_c_sw_b									
White Spruce pure or leading - Genetic	C	Stand structure remains predominantly coniferous. Fb+Other regenerates to Sw	r0_05_g	r3_c_sw_g	SW	CFPL 305-G	>/=80% white spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical broadcast treatment, discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous planting density - 1,200 sph TI seedlings - site specific planting may be pure SW or mixbag of SW and PL (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_05_g-2	r3_c_sw_g									
			r0_05_g-3	r3_c_sw_g									
		No transition anticipated. Stand structure remains predominantly Sw coniferous.	r0_11_sw_g	r3_c_sw_g									
			r0_11_sw_g-2	r3_c_sw_g									
			r0_11_sw_g-3	r3_c_sw_g									
			r0_14_sw_g	r3_c_sw_g									
			r0_14_sw_g-2	r3_c_sw_g									
			r0_14_sw_g-3	r3_c_sw_g									
			r0_15_g	r3_c_sw_g									
			r0_15_g-2	r3_c_sw_g									
			r0_15_g-3	r3_c_sw_g									
			r0_16_g	r3_c_sw_g									
			r0_16_g-2	r3_c_sw_g									
			r0_16_g-3	r3_c_sw_g									
Pine pure or leading-Basic	C	No transition anticipated. Stand structure remains predominantly Pl coniferous.	r0_08_b	r3_c_pl_b	PL	CFPL306	>/=80% pine leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical broadcast treatment, dragging, discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural seed; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous planting density -1,000 sph on average with ingress expected. Easier sites as low as 750 , with densities planned for 950 or 1.200. some mixbag with SW seedlings is expected - average of 20% spruce but up to 50% - site specific.	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
			r0_08_b-1	r3_c_pl_b									
			r0_08_b-2	r3_c_pl_b									
			r0_08_b-3	r3_c_pl_b									
			r0_10_b	r3_c_pl_b									
			r0_10_b-1	r3_c_pl_b									
			r0_10_b-2	r3_c_pl_b									
			r0_10_b-3	r3_c_pl_b									
			r0_11_b	r3_c_pl_b									
			r0_11_b-1	r3_c_pl_b									
			r0_11_b-2	r3_c_pl_b									
			r0_11_b-3	r3_c_pl_b									

Regenerated Yield Projection (leading + secondary species)	Strata Standard (C, CD, DC, D)	Transitions Toward Climax	Natural Yield Curve (r0) Transitions To (r3)		Regenerated Yield Curve Stratum Name	Regenerated Yield Curve Label (Landbase Designation Code)	Stand Structure (Species Proportions)	Limitations to Crop Establishment (Site, Climate)	Silviculture System	Site Prep	Seedling Establishment (includes LFN)	Seedling Density (SPH Target per Species Type)	Reforestation Phase Intervention (Post-seedling establishment within the Refor. Obligation period)
Pine pure or leading-Genetic	**C**	**No transition anticipated. Stand structure remains predominantly Pl coniferous.**	r0_08_g r0_08_g-1 r0_08_g-2 r0_08_g-3 r0_10_g r0_10_g-1 r0_10_g-2 r0_10_g-3 r0_11_pl_g r0_11_pl_g-1 r0_11_pl_g-2 r0_11_pl_g-3 r0_14_pl_g r0_14_pl_g-1 r0_14_pl_g-2 r0_14_pl_g-3	r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g r3_c_pl_g	PL	CFPL306-G	>/=80% pine leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical broadcast treatment, dragging, discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous planting density -1,200 sph TI seedlings - minimal ingress expected. May mixbag PL and SW (range from 10-50% mixbag)	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
Black Spruce pure or leading	C	No transition anticipated. Stand structure remains predominantly Sb coniferous.	r0_12_b r0_12_b-1 r0_12_b-2 r0_12_b-3 r0_14_sb_b r0_14_sb_b-1 r0_14_sb_b-2 r0_14_sb_b-3	r3_c_sb_b r3_c_sb_b r3_c_sb_b r3_c_sb_b r3_c_sb_b r3_c_sb_b r3_c_sb_b r3_c_sb_b	SB	CFPL307	>/=80% black spruce leading coniferous species	Cold wet soils, vegetative competition, drought, rodent damage, winter desiccation, harvest debris, modification of soil structure, insects and disease.	Clearcut	Elevated microsite, chemical broadcast treatment,discing or pile and burn	Planting of entire block including roads, landings, piles, and seismic lines to conifer; Leave-for-Natural suckering of deciduous	Minimum acceptable coniferous stocking of 1,200. Mix bag planting - Black spruce leading species plant with pine and or white sprue - site specific. Most sites mix plant @ 80/20 species split and others up to a 50/50 species split.. All site specific.	Monitoring for vegetation expression at year 2-4. Chemical Stand Tending at year 3-5 as required. Fill plant early (yr 3-5) if warranted from stand tending observations. Post establishement outcomes at yr 5-8 may precipitate fill plant or stand tending interventions. Final monitoring for stand productivity at yr 9-11, followed by chemical stand tending, if needed.
Roads, Landings, and Burn Piles	Same as block	Same as block	Same as block natural yield curve	Same as block transition	Same as block	Same as block	Same as block	modification of soil structure, compaction, Cold wet soils, harvest debris, vegetative competition, drought,, winter desiccation, and rodent and insect damage	Clearcut	decompaction on summer roads as warranted, roll back of fines for erosion control, Pile and burn debris from landings/decks, inblock roads may be site prepped in conjunction with block as available, chemical stand tend	Planting of conifer on all roads, landing and burn piles in C, CD, & DC openings; Leave-for-Natural suckering of deciduous or planting of deciduous and/or conifer seedlings in deciduous blocks.	Minimum acceptable stocking as per block requirements	Same as block

Column Explanations/expectations:

1. Regenerated Yield Projection Taken from *"Yield Projection Guidelines for Alberta" (the Alberta Forest Planning Standard)*

2. Strata Standard: Alberta uses C, CD, DC and D as an active label/designation for pure and mixedwood stands, showing species group leading. The Regenerated Yield Trajectory is commonly translated into one of these strata standards.

3. Transitions Towards Climax: Will the regenerated stand move through another stand structure before ending up at what's projected? May have implications on future cut calculations, balancing and initial silviculture prescriptions.

4. Natural Yield Curve Transitions To: Taken from the approved TSA, as part of the productive landbase reconciliation and translation of approved inventory into a natural yield curve. Record the yield curve (by appropriate label) and which regenerated yield curve it is projected to transition to (Ex.: Hwd Pure to Hwd/coniferous)
-First column is the natural stand yield curve of the stand before harvest
-Second column is the managed stand yield curve that the stand transitions to after harvest

Yield Curve Name Definitions
r0 -refers to the natural stands being harvested (ie: r1 are all blocks harvested prior to 1991; r2 are all blocks from March 1, 1991 to May 1, 2010; and r3 are all blocks harvested from May 1, 2010 and all blocks harvested into the future)

01 -refers to natural yield group # (ie: YG #1)

b or g-refers to whether the stand is in a breeding region (genetic applies) - (b= base, g= genetic)

1,2,3 - refers to the caribou zone that the stand is in. If there is no number indicated then it is assumed that the stand is outside the caribou management area.

5. Regenerated Yield Curve Stratum Name: Record each of the regenerated yield curves using the Base 10 labelling protocol (Ex.: Deciduous, Hardwood/Pine, White Spruce/Hardwood, etc.)

6. Regenerated Yield Curve Label: Once the TSA is approved, ESRD will assign landbase designation codes that will coincide with each of the approved regenerated yield curves that the harvested polygons will transition to. Populate this column with each of those landbase designation codes coinciding with the appropriate Stratum Name in Column 2 (Ex.: DMIW1202, WEYG1405)

7. Species Proportions: The target proportion of coniferous and deciduous in the regenerated stand based on a standard or productivity objective.

8. Climatic/Site Limitations: The factors in climate and on the site that could significantly increase the risk of NOT reaching establishment of the regenerated stand (survival) or the regenerated yield objective (productivity). This will contribute to the justification (good science) for the treatments chosen.

9. Silviculture System: Could be clearcut, shelterwood, seed-tree, partial cut, understory protection. Choosing a silviculture system strategy should be about working with the regenerative silvics of the species to be reforested, operational delivery logistics and productivity objectives.

10. Site Prep: Operational strategies to alleviate site or climatic limitations and/or species to be established. Could be raised bed, drag, mixing, piling and sometimes chemical.

11. Seedling Establishment: The operational strategy to introduce the seedling to the site. Includes planting, artificial seeding and *Leave-for-Natural* (LFN).

12. Seedling Density: An operational strategy that is applied to achieve full site coverage (stocking/density targets) in the initial stages of regeneration in order to reduce the effects of mortality on the objective. May also be a target set as a minimum objective reached during the *Reforestation Phase* (first 14 years after harvest) and used as an early target in the new Reforestation Standard of Alberta (RSA) objective, a surrogate measure of early productivity.

13. Reforestation Phase Intervention:

- Δ The Reforestation Phase is Year 0 to Year 14.
- Δ In the Reforestation Phase there is the Establishment Stage and a Performance Stage.
- Δ The objective in the establishment phase (yrs 4-8) is to achieve a minimum coniferous and/por deciduos tree height and stocking % in all strata - as per
- Δ The objective in the performance phase (yrs 12-14) is to meet or exceed current FMP coniferous
- Δ stand tending strategy and options are detailed in Canfors Vegetation Management Strategy (VMS)

6. **Forest stands transition assumptions or projections that will affect periodic stand composition over the Reforestation Phase**- Harvested stands transition from their natural yield group to regenerated stratum as detailed in Table 3 for both base and genetic yield curves. (See discussion in Section 4 regarding genetic (tree improvement) management strategies.)

The pure pine and white spruce leading strata, as well as the DC- Sw strata (yield group 3) are divided into base (B) and genetic (G) stratum for the purpose of yield curve assignment to account for the use of genetically improved seedlings (Table 3). As previously discussed in Section 4, improved stock is only used in the B1 (lodgepole pine) and G1 (white spruce) breeding regions. Breeding regions do not cover the entire FMA; therefore, all natural yield groups, with the exception of the Pure Aw and the PlAw/AwPl natural yield groups may transition to either a base or genetic regenerated yield curve as shown in Table 3.

It should be noted that for the purpose of this plan, yield group 5 (Fb + oth) regenerates to a spruce yield curve due to the small amount of area associated with this yield group. As well, yield group 6 (deciduous stand with significant coniferous understory- Du) will not be harvested until it transitions to a mature CD or DC stand. Refer to Section 10 for how this yield group will be managed operationally.

In addition, Table 3 demonstrates that CD and DC stands in the Little Smoky and A La Peche Caribou Management Area will transition to pure C as a strategy to manage alternate prey habitat. By reducing deciduous browse species, (through chemical stand tending practices) the prevalence of alternate prey should decrease, thus decreasing the wolf population. Timber supply analyses were completed to ensure that there is no significant impact to the deciduous AAC over the planning horizon due to this management decision.

All transitions shall be monitored annually through balancing and reporting in the Annual Operating Plan (AOP) as well as reported in the 5 year Forest Stewardship Report.

Table 3 Yield Group Transition Table

Natural Yield Group		Regenerated Stratum		Caribou Management Area	
Code	Description	Base	Genetic	Base	Genetic
1	AW+(S)-AB	D-Hw1-B		D-Hw1-B	
2	AW+(S)-CD	D-Hw2-B		D-Hw2-B	
3	AW/SW/PBSW/BWSW	DC-HwSx-B	DC-HwSx-G	C-Sw-B	C-Sw-G
4	BW/BWAW+(S)	D-Hw4-B		D-Hw4-B	
5	FB+OTH	C-Sw-B	C-Sw-G	C-Sw-B	C-Sw-G
6	H+(S)/S	CD-SwHw-B/ DC-HwSx-B	CD-SwHw-G/ DC-HwSx-G	C-Sw-B	C-Sw-G
7	PB+(S)	D-Hw7-B		D-Hw7-B	
8	PL/PLFB+(H)	C-Pl-B	C-Pl-G	C-Pl-B	C-Pl-G
9	PLAW/AWPL	CD-PlHw-B		C-Pl-B	C-Pl-G
10	PLSB+OTH	C-Pl-B	C-Pl-G	C-Pl-B	C-Pl-G
11	PLSW/SWPL+(H)	C-Pl-B	C-Pl-G/ C-Sw-G	C-Pl-B	C-Pl-G/ C-Sw-G
12	SBLT(G)	C-Sb-B		C-Sb-B	
13	*SBLT/LTSB(M/F/U)*	*removed from landbase*			
14	SBPL/SBSW/SBFB	C-Sb-B	C-Pl-G/ C-Sw-G	C-Sb-B	C-Pl-G/ C-Sw-G
15	SW/SWFB+(H)-AB	C-Sw-B	C-Sw-G	C-Sw-B	C-Sw-G
16	SW/SWFB+(H)-CD	C-Sw-B	C-Sw-G	C-Sw-B	C-Sw-G
17	SWAW/SWAWPL	CD-SwHw-B	CD-SwHw-G	C-Sw-B	C-Sw-G

Table 4. Transition Percent of Natural Yield Groups into the Provincial Base Regeneration Strata

Natural Yield Groups		Deciduous CFPL0301	Hardwood/ Spruce CFPL0302	White Spruce/ Hardwood CFPL0303	Pine/ Hardwood CFPL0304	White Spruce pure or leading CFPL0305	Pine pure or leading CFPL0306	Black Spruce pure or leading CFPL0307
1	AW+(S)-AB	100.0						
2	AW+(S)-AB	100.0						
3	AW/SW/PBSW/BWSW		81.7			18.3		
4	BW/BWAW+(S)	100.0						
5	FB+OTH					100.0		
6	H+(S)/S			83.2		16.8		
7	PB+(S)	100.0						
8	PL/PLFB+(H)						100.0	
9	PLAW/AWPL				49.6		50.4	
10	PLSB+OTH						100.0	
11	PLSW/SWPL+(H)					44.1	55.9	
12	SBLT/LTSB(G,M,F)							100.0
14	SBPL/SBSW/SBFB					64.2	23.7	12.1
15	SW/SWFB+(H)-AB					100.0		
16	SW/SWFB+(H)-CD					100.0		
17	SWAW/SWAWPL			74.3			25.7	

Table 4 demonstrates how the 17 yield groups are combined into the seven (7) provincial base regeneration strata being used in this FMP. It further shows the percent transition within the various yield groups when the transition is split between two or more strata. This split is either the result of the caribou strategy or a split between breeding regions.

Yield groups 11 and 14 are mixed conifer types where the transition split is the result of allocating between two or more separate breeding regions. When breeding regions (B1, G1 and L2) overlapped, the table used the G1 breeding region (spruce - CFPL 305) as the default for the yield group to transition to. The splits are to take advantage of deployment of improved seedlings into the appropriate breeding regions. In practice, the deployment strategy will be confirmed in the field to determine which tree species would be the best choice for that opening, thus identifying which regeneration strata the opening will be reforested as. For example, yield group 11 shows that potentially 44.1% of the sequenced area will transition to spruce leading strata whereas 55.9% will transition to pine leading strata.

Yield groups 3, 6, 9, and 17 are mixedwood yield groups where the transition split is the result of the caribou management strategy to transition mixedwoods to pure conifer types when those yield groups occur in the caribou management area. For example, yield group 9 shows that potentially 49.6% of the sequenced area will remain in the pine hardwood strata, whereas 50.4% occurs in the caribou management area and will transition to the pure pine strata. Please note that even though yield group 6 (understory) is not sequenced in this period; it is included in this table for those rare instances where stands may be included to avoid isolation.

7. **Decision process used for silviculture prescriptions**- There are two recent developments that have changed how decisions are made for silviculture treatments for both coniferous and deciduous species:

- First, new standards: In 2005 work began on developing Alternative Regeneration Standards (ARS) to provide a quantitative, science-based link between managed stand yields assumed in a company's FMP and reforestation standards. In 2010, this approach became the new provincial standard and was renamed the Reforestation Standard of Alberta (RSA). This move allowed silviculturists to better align their reforestation strategies (through crop planning) to achieve desired FMP growth targets, referred to as Mean Annual Increment (MAI). This exercise of using crop planning to achieve MAI targets is facilitated through the use of an approved growth and yield modelling program called GYPSY.
- Second; Canfor developed its Corporate Silviculture vision that is stated in the introduction.

This vision, combined with the new RSA standards has resulted in a paradigm shift. Canfor is working with the GYPSY growth model (as mentioned above) to model not only the MAI targets, but to incorporate cost effective treatments (reforestation practices) while still maintaining growth targets.

All stand types on the FMA area have both conifer and deciduous mean annual increment (MAI) targets for regenerating stands. MAI targets for regenerating stands harvested as of May 1, 2014 (the effective date of the 2015 FMP) are shown in Table 5 below.

Table 5. MAI Targets for Regenerated Yield Curves

REGEN STRATUM	DESCRIPTION	BCG	MAIN GROUP	RSA (15/10/30/TL)	
				MAI_CON	MAI_DEC
C_PL_B	PURE CONIFER - PINE LEADING - BASIC	C	CON	3.10	0.27
C_SB_B	PURE CONIFER - SB LEADING - BASIC	C	CON	1.56	0.00
C_SW_B	PURE CONIFER - SW LEADING - BASIC	C	CON	2.37	0.45
CD_PLHW_B	PINE-HARDWOOD MIXEDWOOD - BASIC	CD	CON	2.43	1.20
CD_SWHW_B	WHITE SPRUCE-HARDWOOD MIXEDWOOD - BASIC	CD	CON	1.95	0.91
DC_HWSX_B	HARDWOOD-SPRUCE MIXEDWOOD - BASIC	DC	DEC	1.30	2.01
D_AW_AB_B	PURE DECIDUOUS - ASPEN LEADING - AB DENSITY - BASIC	D	DEC	0.17	2.37
D_AW_CD_B	PURE DECIDUOUS - ASPEN LEADING - CD DENSITY - BASIC	D	DEC	0.06	2.99
D_BW_B	PURE DECIDUOUS - BIRCH LEADING - BASIC	D	DEC	0.07	2.44
D_PB_B	PURE DECIDUOUS - POPLAR LEADING - BASIC	D	DEC	0.07	2.12
C_PL_G	**PURE CONIFER - PINE LEADING - GENETIC**	**C**	**CON**	**3.23**	**0.27**
C_SW_G	**PURE CONIFER - SW LEADING - GENETIC**	**C**	**CON**	**2.48**	**0.45**
CD_SWHW_G	**WHITE SPRUCE-HARDWOOD MIXEDWOOD - GENETIC**	**C**	**CON**	**2.02**	**0.91**
DC_HWSX_G	**HARDWOOD-SPRUCE MIXEDWOOD - GENETIC**	**DC**	**DEC**	**1.40**	**2.01**

MAI results are derived from performance surveys conducted between years 12 and 14. Once the performance survey data is compiled using the G&Y model (GYPSY), strata specific MAIs are calculated and reported. Some openings may contain more than one stratum; in these cases the strata are rolled up to opening level MAIs for reporting into ARIS (Alberta regeneration information system). Strata specific MAIs will be compiled on a five year average to compare against FMP targets to assess the company's alignment of their reforestation program to the FMP growth targets. If any outages are evident, the company will make adjustments to their reforestation practices to improve growth performance of managed stands (continuous improvement).

8. **Coniferous Reforestation Prescriptions**- Crop planning (utilizing the growth and yield model – GYPSY) is a new tool that Canfor has utilized as part of developing new regenerated yield curves. As discussed above, crop planning allows the silviculturist to input their reforestation strategies and see the MAI outcomes. By manipulating planting density, ingress assumptions, top height and age inputs, one can determine which strategies produce the optimum MAI to meet Canfor's silviculture vision. All assumptions used in the crop planning for each stratum are documented in Appendix N of the *2012 Forest Management Plan Growth and Yield* document. Canfor's conifer reforestation approach is detailed below.

- **Seed collection**:
  Canfor has a considerable amount of wild seed inventory (Table 1). Potential shortfalls are identified in Table 1 and new wild collections may be required. Stands with good phenotypes will be identified as candidate sites for any wild collections required. Improved seed is obtained annually through cone collections at HASOC and is an important seed source for the company.

- **Site Preparation**:
  Harvested openings are visited by the silviculture supervisor to view post-harvest site conditions. Site visits, combined with pre-harvest ecological site information and wet areas mapping lidar technology, are used to determine what, if any, type of site preparation is required. It is preferred to conduct site preparation in the winter immediately following harvesting to facilitate the spring or summer planting program. Due to the emphasis on cost effective treatments, a minimum number of hectares (such as 10 ha) should be identified prior to conducting a site preparation program. Timely planting of harvested openings (within 10 months of harvesting) plus early vegetation management control (year 3 or 4) are other effective means of managing the competition on the site to ensure a successful plantation.
    - Mechanical site preparation such as mounding or ripping is used where there is a need to create elevated microsites to provide suitable sites for seedling establishment. Limiting factors such as high water table, poorly drained sites, cold soils, or high slash loads may dictate the need for this type of site prep.
    - Drag site preparation, another form of mechanical site preparation, may be used on low competition pine sites that are accessible in the summer to disperse cones across the opening to facilitate natural regeneration, providing there is adequate cone presence.

- Piling (windrow Burning) – Piling is a technique whereby slash is piled within a cutblock by a "cat" in order to provide additional plantable spots for reforestation. This technique is used where logging slash disposal operations have not been effective in providing sufficient plantable spots to permit effective reforestation.
- Chemical site preparation may be used in treatment of rich sites to facilitate a successful plantation where competition will hinder tree establishment. The use of Imazapyr (Arsenal®) as a spot treatment to create indiscrete mixedwoods may become a common tool, prior to planting. (See *Canfor's Vegetation Management Strategy* (VMS) [discussed below in stand tending] for more details on the use of this tool).

- **Seedling Establishment:**
  Planting of good stock, early in the life of the cutover, is an important part of a ensuring successful seedling establishment.
  - All sites will be assessed to determine ingress potential and planting densities may be adjusted to meet current RSA stocking density requirements. The FMA Reforestation Strategy Table (Table 2) refers to minimum stocking densities.
    - For deciduous species, minimum stocking density is always based on LFN strategies.
    - For conifer species, minimum stocking density is always based on planting density. Lower planting densities assume that ingress potential is high enough to still meet RSA stocking requirements.
  - Planting trees early often requires ordering trees from the nursery prior to assessing all sites. Using the performance of past blocks and local knowledge, Canfor has developed a strategy to prescribe stock size and density based on the sub-regions that the blocks are located to order trees. Sub-regions are divided into two categories based on the amount of competing vegetation and ingress expected after harvest. Sub-regions CM 3.4, DM 1.2, LF 1.4 typically have higher levels of competition and sub-regions UF 1.3 and SA 1.1 typically have less competition. Sites with less competing vegetation typically can expect more ingress; therefore, smaller stock and lower densities can be planted. Each sub-region, therefore, has a strategy based on the difficulty of reforestation.

- **Monitoring**:
  All C, CD, & DC openings will be monitored in the fall between years 2 and 4 and again between years 9 and11 to determine if stand tending options (competition issues) or fill plants (coniferous stocking shortfalls) need to be employed to achieve reforestation objectives as defined in the FMA Reforestation Strategy Table (Table 2).
  - Fill plants may be scheduled either on their own, after a stand tending treatment, or following results of an establishment survey.

- **Stand tending**:
  Stand tending may be required on C, CD, and DC openings to ensure the survival of the planted trees at a very early age (typically years 3 or 4), and somewhat later for productivity reasons (years 9-11). Sites are assessed using monitoring surveys to determine how much and where stand tending may need to occur. Stand tending is used to manage the mix of deciduous and coniferous species, as well as controlling reed grass competition early on. Canfor's historic average for stand tending has been approximately 70% of the harvested area. Some areas receive a broadcast treatment while others receive a discretionary treatment ranging from 10-85%. With the inclusion of the caribou management strategy to transition CD and DC stands to a pure C stand, the percent average for stand tending may increase.
    - Canfor has written a Vegetation Management Strategy (VMS) which describes various stand tending techniques and a process for developing a vegetation management prescription based on stand objectives (FMP reforestation projection), competition thresholds (presence/absence of reedgrass, deciduous species) and treatment appropriateness (terrain, block configuration, amount of retention, presence/absence of braided streams, critical wildlife habitat and other environmental sensitivities). Any vegetation management program undertaken by Canfor will follow the strategies as outlined in the most current VMS 2015 edition (approval pending).
    - Overview flights are conducted in June the year following stand tending treatments to assess efficacy of treatment as well as ensuring all treatments occurred within prescribed areas (i.e. no OTAs (off target application)) . Results of this review are reported to AESRD in a formal report.

- **Regulated Surveys**:
  As per the Reforestation Standards of Alberta (RSA), all openings will have establishment and performance surveys completed. Results from establishment surveys may prompt stand tending or fill plant requirements.

The FMA Reforestation Strategy Table (Table 2) shows how the above treatments will be applied to different stand types (strata).

9. **Deciduous reforestation prescriptions**- Deciduous stands, for the most part, re-establish themselves through leave for natural methods; most often suckering, although some natural re-seeding may occur as well. In order to ensure successful regeneration of the harvested areas Norbord's deciduous reforestation approach is detailed below;

- **Pre Harvest Assessments:**
  Norbord conducts Pre-harvest Assessments (PHA) in order to determine, primarily, the season of harvest. Plant and soil information is gathered and used to determine the optimal season of harvest so that successful natural regeneration can occur following harvesting.

- **Seed collection**:
  Norbord has a deciduous wild seed inventory (Table 1). Potential shortfalls are currently being reviewed and new wild collections will be established to eliminate any shortfalls. Although the Company is involved in a Tree Improvement Program, the Program remains in a research phase with a Controlled Parentage Program currently being developed. Therefore, improved seed is neither available nor approved for usage on crown land.

- **Site Preparation**:
  Areas in harvested openings that are declared NSR are visited by the silviculture forester to determine why natural regeneration did not occur. Historically, soil disturbance has been a factor and site preparation has been utilized to prepare raised sites for planting. Site preparation is normally carried out in the late fall and early winter, prior to heavy frost, to facilitate a spring planting program.
    - Mechanical site preparation such as mounding is used where there is a need to create elevated microsites to provide suitable sites for seedling establishment. The mounds increase soil temperature in cold and poorly drained soils and the clay cap deters vegetation establishment for a period of time allowing seedling establishment. Mounding density is targeted at 1,400 stems/ha.
    - Drag site preparation, another form of mechanical site preparation, has been used in the past to divide heavy slash loads and allow direct sunlight to penetrate and warm mineral soil improving the potential for natural regeneration.

- **Planting:**
  Planting of good stock, onto site prepared mounds as soon as conditions permit in the spring, is an important part of a successful reforestation program.
    - All sites are assessed to determine vegetative ingress potential and planting densities may be adjusted to meet current RSA stocking density requirements. The FMA Reforestation Strategy Table (Table 2) refers to minimum stocking densities.
      - For deciduous species, minimum stocking density is always based on LFN strategies when suckering is the silvicultural treatment.
      - Norbord utilizes deciduous species for road planting with a planting density of approximately 2,000 stems/ha. This aids in the establishment of trees where natural regeneration is not sufficient.
      - If deciduous seedlings are planted on site prepared mounds a planting density of 1,400 stems/ha is utilized.
    - Planting deciduous seedlings requires the ordering of trees from the nursery prior to assessing all NSR sites. Sites are assessed for vegetative competition, moisture availability, etc. Balsam poplar (Populus balsamifera) is normally planted on reclaimed roads due to its hardy nature and its' lack of a less palatable species for ungulates. The species

is also planted on mounds on low wet sites. Trembling aspen (Populus tremuloides) are normally targeted for planting on mounds on drier sites.

- Balsam poplar planted on roads is 412B 1+0 with a target density of 2,000stems/ha.
- Balsam poplar planted on mounds can be either 412A 1+0 or 512A 1+0 with the latter stock type targeted for sites which may provide competition from lesser vegetation earlier. Planting density is normally 1,400 stems/ha on mounded sites.
- Trembling aspen have historically been grown as a 412A stock type for either roads or mounds. This species has not been grown as of late for reforestation purposes due to the better performance of Balsam poplar on roads and due to the limited amount of site preparation in the past several years.

- **Regulated Surveys**:
  As per the Reforestation Standards of Alberta (RSA), all openings will have establishment and performance surveys completed. Results from establishment surveys may prompt site preparation activities with planting requirements.

  Tolko would have similar reforestation strategies in terms of preharvest assessments, site preparation and regulated surveys. Tolko's planting strategy may vary in terms of stock size. Any significant outages would be detailed in their Annual silviculture AOP.

10. **Coniferous understory management strategy**- Significant coniferous understory occurs mainly in stands designated as Du in Canfor's current Alberta Vegetation Inventory (AVI). These stands have been assigned to yield group 6, to facilitate the management of this valuable understory as growing stock for future CD or DC stands. These stands are not sequenced for harvesting in this FMP until the conifer understory is merchantable thus there are no multiple entries planned. Canfor and deciduous companies have committed to consider operational opportunities where companies may gain access to these stands in the future. This would likely involve a multiple entry harvest scenario and development of a new yield curve. However, instances may also occur where slivers or small stands of Du are included in a portion of a harvested opening to avoid isolation. When this occurs, there are two (2) methods of treatment that can be employed: understorey protection or clear-cut and reforest to the associated regeneration yield projection (see FMA Reforestation Strategy - Table).

11. **Enhanced Forest Management (EFM) strategies**- Although the Canfor Silviculture Vision speaks to meeting the timber supply objective, and not enhancing it, Canfor also recognizes the increasing constraints that are being placed on the landbase due to other industries, Mountain Pine Beetle, and species at risk. At this time, aside from the Tree Improvement Program mentioned in Section 4, Canfor is not proposing any specific EFM strategies. With that being said, treatments of potentially productive brushy lands may be pursued to mitigate pressures from the constraints stated above. Prior to pursuing this type of work, the Province will be notified and Canfor will submit any required plans.