

Fort St. John Pilot Project

Mixedwood Management Guidelines

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Mixedwood Management Guidelines under the Fort St. John Pilot Project SFMP

I. GUIDELINE OBJECTIVES

The guidelines are designed to provide foresters with the direction for choosing and managing reforestation pathways that will produce successful mixedwood stands at the landscape level and meet the commitments made in the Sustainable Forest Management Plan (SFMP). It will also be an evolving document that can incorporate new ideas, science and methodologies, as they become better known.

The objective of this mixedwood management strategy is:

- To describe the method for classifying and tracking forest types for forest management purposes.
- To describe some possible methods that will be implemented to achieve the desired future forest conditions and forest types described in the SFMP.

II. BACKGROUND

In the SFMP, Section 4.7 (Reforestation Strategy) states that the participants must declare to reforest an area within a cutblock as a coniferous area, a deciduous area or a mixed wood area. The prescribing and implementing foresters are responsible to ensure stocking on the site is managed to provide forest establishment sufficient to meet the landscape level targets. This section also says that the short-term mixedwood management strategy will be achieved primarily through reforestation strategies that maintain **separate deciduous and coniferous strata**. The reforestation guideline will involve approaches that stratify the area to be reforested into discrete deciduous and coniferous strata.

Boreal mixedwood forests will be sustained by managing forest type distribution as per Section 6.1. Section 6.1 indicates the percent distribution of forest type (deciduous, deciduous mixedwood, conifer mixedwood, conifer) >20 years old by landscape unit.

III. CLASSIFYING AND TRACKING FOREST TYPES

In accordance with the Fort St. John Pilot Project Regulation (FSJPPR) and SFMP, the participants will declare to reforest the cutblock as a coniferous area, a deciduous area, or a mixedwood area in the Site Level Plan by incorporating the appropriate stocking standards. The mixedwood forest type area will be further defined into deciduous leading or coniferous leading mixedwoods.

A. Initial Cutblock Classification

The following process will be used to categorize a cutblock into a forest type class:

Prescribing foresters will review the gross volume for a grouping of blocks such as in a Timber Sales Licence or Timbermark grouping. This grouping of blocks may be larger if more blocks are ready to be submitted for declaration and are in close vicinity (for example, blocks managed by the same participant but being harvested under different licenses). The source of the volume statistics shall be the timber cruise block-method compilation summary. Forest Types shall be classified according to the percentage of gross volume by species type. The species types are **coniferous** and **deciduous**. The tree species included in each species group, and the corresponding cruising codes, are listed in the following table.

SPECIES TYPE	TREE SPECIES	CRUISE COMPILATION CODE
Coniferous	White spruce (<i>Picea glauca</i>) Black spruce (<i>Picea mariana</i>) Lodgepole pine (<i>Pinus contorta</i>) Subalpine fir (<i>Abies lasiocarpa</i>) Tamarack (<i>Larix laricina</i>)	S S PL B L
Deciduous	Trembling aspen (<i>Populus tremuloides</i>) Balsam poplar (<i>Populus balsamifera</i>) Paper birch (<i>Betula papyrifera</i>)	AT AC E

If the leading species type in the block contains greater than 75% of the gross volume, it shall be considered 'pure' Forest type – either 'pure' deciduous or 'pure' coniferous. If the species types are between 25% and 75% of the gross volume, the block shall be classified as a 'mixedwood' Forest type – either deciduous-leading or conifer-leading mixedwood.

B. Defining Initial Area targets

The process for defining area targets is designed to give prescribing foresters a method for assigning the original declarations on a Standard Unit (SU). The areas determined in this original forest type declaration will form the baseline proportions in each ledger population described in section C below for future balancing. This process for defining the area targets is described below:

- If the block is considered pure coniferous (>75% conifer), then 100% of the NAR will be tallied toward coniferous stand management.
- If the block is considered pure deciduous (>75% deciduous), then 100% of the NAR will be tallied toward deciduous stand management.
- If the block is considered a conifer leading mixedwood site (50 to 75% coniferous), then minimum of 51% of the NAR is tallied toward coniferous stand management and a maximum of 74% of the NAR is tallied toward coniferous stand management.
- If the block is considered a deciduous leading mixedwood site (50 to 75% deciduous), then minimum of 51% of the NAR is tallied toward deciduous stand management and a maximum of 74% of the NAR is tallied toward deciduous stand management.

Once the areas have all been accounted within the grouping of blocks, the prescribing foresters will stratify standard units (SU), assign the appropriate SU forest types, assign stocking standards and develop silviculture regimes for each cutblock designed to achieve the required area targets determined above.

C. Ledger System for Balancing Forest Types Over Time

In accordance with the Fort St. John pilot project SFMP landscape level reforestation strategy, the process for tracking the declaration of the forest type areas determined above needs to be flexible enough to allow Professional Foresters to exercise their professional judgment at the cutblock level to vary regimes and/or make corrective actions as required to achieve the landscape level targets.

This concept will require participants to maintain a ledger or tracking system to ensure forest type groups are maintained on the landscape within the scope of the participants' management. The ledger or tracking system should maintain a history of the original declarations as determined above. The original declarations will form the baseline proportions for balancing future area exchanges of conifer and deciduous strata. The ledger or tracking system must also track future reclassifications to ensure the original baseline proportions, as determined at the Standard Unit level (original forest type declaration), are being maintained. Progress will be tracked internally and on an annual basis.

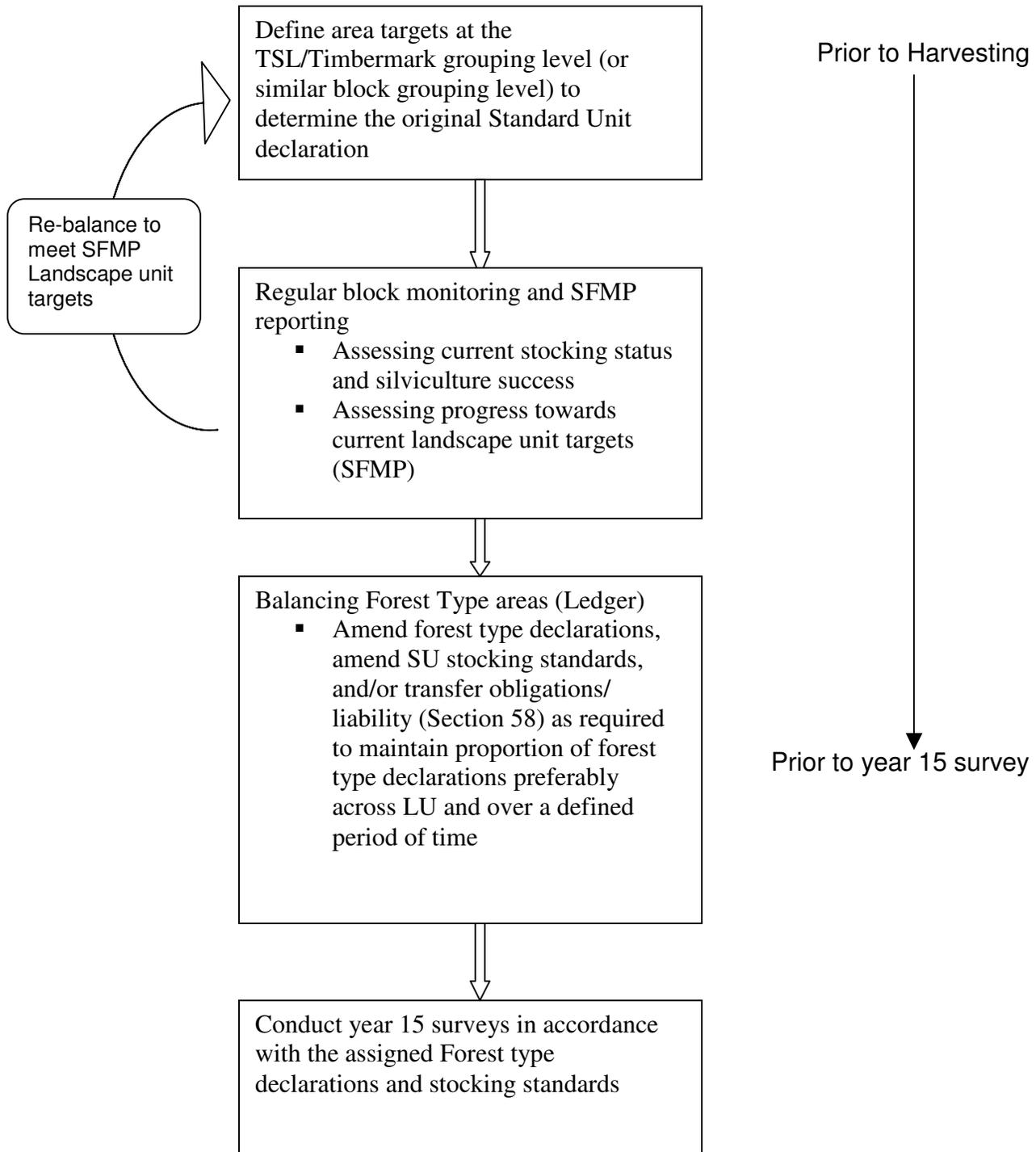
The population of standard units to be balanced should be within a defined period of time, using the harvesting commencement dates, and preferably within the same landscape unit. However, if there are not suitable areas within the landscape unit to exchange, the balancing of forest types may occur within adjacent landscape units or across the TSA provided the exchanges will not

result in a landscape unit exceeding the target ranges described in the SFMP. The following general principles will be used to evaluate suitable areas for conducting a reforestation declaration exchange:

- Areas considered for exchange should have a similar site index.
- Areas considered for exchange should be verified in the field to ensure they are ecologically suitable for species changes.
- Exchanges between blocks in as close proximity as operationally feasible should be considered first prior to balancing areas across the TSA.
- Areas to be exchanged should consider the operational logistics and economics associated with establishing a different crop tree species on site.
- Area exchanges must occur between areas of similar ages as described below.
- Once standard units are declared well growing, they will not be eligible for exchange, but will remain in the population for intimate mixedwood percentage calculations.

The population of blocks will include all blocks harvested since November 15, 2001 (start of the FSJPPR), and the population of blocks upon which the intimate mixture proportion is based will not contain those with a harvest start date greater than 15 years in the past (applies beyond 2016). It is preferable that the balance be maintained across each managing participant's population of blocks and areas of liability. If managing participants would like to exchange blocks and liability for the purpose of balancing forest type areas, this exchange must be done in writing in accordance with Section 58 (Assignability) of the Fort St. John Pilot Regulation. The reclassification of forest type areas, whether done through balancing individual participant's blocks or through exchange of blocks, must be completed prior to the year-15 MSQ survey for those blocks. See figure 1 below for a summary of the overall process.

Figure 1: Forest Type Declaration and Balancing Process



IV. PROPOSED METHODS OF REFORESTATION

The commitment for the term of the current SFMP regarding intimate mixtures of conifer and deciduous is to manage intimate mixtures on ten percent of the harvested boreal mixedwood landbase as operational trials. To put this in context, during the term of SFMP #1 the Participants collectively harvested over 16,000 ha of forested lands. Of this area, over 5000 ha was from stands classified by the percentage of net merchantable volume by species as being either conifer leading or deciduous leading mixtures. This equated to over 500 ha of harvested area with commitments to manage towards intimate mixtures. It is difficult to forecast whether similar amounts of area will be managed for intimate mixtures over the term of SFMP#2 given the adjustment to gross volumes rather than net merchantable volumes as a determining factor. As well, the population of blocks considered within the management regime timeframe is expanding which will have an impact on selection decisions.

Managing for intimate mixtures as operational trials will take on a slightly different focus during the term of this SFMP and beyond. The question is not as uncertain what should be attempted operationally in the field or what might be the expected future result. There is a significant amount of research and literature that has provided a better understanding of those issues, much of which has been collected across the boreal mixedwood forests of Canada, and more specifically in northern BC and Alberta. The issue that needs to be operationally tested more fully is the regeneration standards themselves. It appears that there continues to be an overemphasis toward addressing an issue at a stand level that would be better addressed at the landscape level.

The Participants' are attempting to scope out how mixedwoods might be assessed on a landscape level during this SFMP. In the interim, the current reforestation standards will be utilized and tested. However, there should be enough flexibility to adjust stand-level plans in response to variation in early stand development (e.g., poor survival of plantations, poor establishment of aspen, etc.) (Comeau *et al.* 2005). For the purpose of the final reforestation assessment, discrete strata of conifer would fall in the applicable 15-year population for the conifer MSQ surveys. Preferably, discrete deciduous areas would be surveyed at the same 15-year period. Assessment procedures for discrete deciduous strata will be conducted using the current free growing survey procedures until an MSQ type assessment for deciduous areas is available. Growth model trial runs are currently being completed on deciduous species so a MSQ type assessment for deciduous should be available in the near future.

Silviculture is used to direct a stand from its current condition to a desired future stand condition (Ontario Ministry of Natural Resources, 2003). To ensure a stand develops along a desired pathway, action may need to be taken before, during, and after harvest. Boreal mixedwood management often involves silviculture intervention, and in some cases repeated intervention (Ontario Ministry of Natural Resources, 2003).

The issue of boreal mixedwood management is made more complex when the desire is to prescribe site specific treatments that attempt to emulate natural disturbances and processes. Emulating natural change in species composition and stand structure is driven somewhat through understanding stand development stages. The classic natural successional pathway on boreal mixedwood sites is a change from shade-intolerant hardwood species to more shade-tolerant conifer species (Ontario Ministry of Natural Resources, 2003) However that is but one, of many stand composition types found on these sites along the successional pathway continuum.

There are a number of literature papers that have described this pathway continuum for boreal mixedwood sites (Lieffers *et al.* 1996, Ontario Ministry of Natural Resources, 2003, Comeau *et al.* 2005.)

The key message in Table 1 is that Current State equates to current condition and based on the silviculture treatments prescribed may produce the Outcome or desired future forest condition.

Table 1: From Hawkins, C. 2003. Innovative Mixedwood Strategies for the Dawson Creek TSA. [Modified from Figure 2 in (Lieffers *et al.*,1996)]

Current State	First Treatment	Secondary Treatment	Outcome
1. Deciduous or Deciduous Coniferous (vigorous)	A) Clearcut (suckering) B) Late understory plant C) Early understory plant with wind protection	Understory protection Understory protection	Deciduous or Deciduous-Coniferous Stands are horizontal mixes of coniferous patches and these are of different age. Stands are horizontal mixes of coniferous patches and deciduous patches and these are of different age.
2. Deciduous or Deciduous Coniferous (breaking up)	A) Clearcut (suckering) B) Understory site preparation and plant C) Clearcut, site preparation, plant	Understory protection Vegetation management	Deciduous Stands are horizontal mixes of coniferous patches and deciduous patches and these are of different age. Coniferous or Coniferous-Deciduous (Mixture)

<p>3. Coniferous or Coniferous-Deciduous</p>	<p>A) Clearcut (suckering)</p> <p>B) Clearcut, site preparation, plant</p> <p>C) Clearcut, site preparation, plant</p> <p>D) Shelterwood</p> <p>E) Leave seed clusters</p> <ul style="list-style-type: none"> ▪ leave for natural ▪ site preparation <p>F) Group selection</p>	<p>Vegetation management</p> <p>Removal cut</p>	<p>Deciduous or Deciduous/Coniferous</p> <p>Deciduous/Coniferous (Mixture)</p> <p>Coniferous or Coniferous-Deciduous</p> <p>Coniferous or Coniferous-Deciduous</p> <p>Deciduous-Coniferous (Mixture)</p> <p>Deciduous-Coniferous (Mixture)</p> <p>Stands are small patches of intermixed deciduous and coniferous but the patches are of different ages.</p>
<p>4. Overstory Deciduous or Deciduous Coniferous Understory Coniferous (short even-aged)</p>	<p>A) Understory protection</p>		<p>Stands are horizontal mixes of coniferous patches and deciduous patches and these are of different age.</p>
<p>5. Overstory Deciduous or Deciduous Coniferous Understory Coniferous (tall even-aged)</p>	<p>A) Understory protection with wind protection</p>		<p>Stands are horizontal mixes of coniferous patches and deciduous patches and these are of different age.</p>
<p>6. Overstory Deciduous or Coniferous Understory Coniferous (uneven-aged)</p>	<p>A) Understory protection with wind protection</p> <ul style="list-style-type: none"> ▪ Tall understory cut 		<p>Stands are horizontal areas of young deciduous between patches of all-aged coniferous, leading to selection system.</p> <p>Stands are horizontal mixes of coniferous patches and deciduous patches and these are of different age.</p>

7. Overstory Coniferous Deciduous or Coniferous Understory (uneven-aged)	A) Understory protection with wind protection <ul style="list-style-type: none"> ▪ Tall understory cut B) Single tree selection		Stands are horizontal areas of young deciduous between patches of all-aged coniferous. Stands are horizontal mixes of coniferous patches and deciduous patches and these are of different age. Coniferous (all-aged)
8. Overstory Coniferous Deciduous or Coniferous (partly uneven-aged) Understory Coniferous (scattered pockets of advance growth)	A) Irregular shelterwood removal cuts		Coniferous or Coniferous Deciduous

Strategies for managing mixedwoods have been described under three general headings, depending on whether the desired stand condition is 1) a mosaic of single species groupings, 2) an intimate mixture (i.e. a mixture with a more-or-less horizontally distribution of spruce and aspen) that develops into two stories that are suitable for two stage harvesting, or 3) an intimate mixture that develops into a single story of co-dominants that is suitable for one-stage harvesting (Comeau *et al.* 2005).

To produce the desired future forest condition requires silviculture as mentioned previously. Further to the point however is that it is a silviculture suite of treatments that potentially is required, which could include the silvicultural system employed, the stand tending treatments and the regeneration standards being targeted towards.

The participants of the Fort St. John Pilot Project have employed a number of different tactics to produce desired future stand conditions over the period of the first SFMP. It is expected over the period of SFMP #2, the Participants will continue to exercise these tactics with the opportunity to introduce other approaches.

These tactics have been employed with the objective of producing a mosaic of **single species groupings:**
"Large scale" un-mix the mix (each block will be managed for pure conifer or pure deciduous),

- 1) Utilization of a conventional clearcut silvicultural system applied on a stand to be managed as pure deciduous regenerated back naturally to deciduous with the expectation of a final harvest age at rotation of 60-70 years (Comeau, 2007).
- 2) Utilization of a conventional clearcut silvicultural system applied on a stand to be managed as pure coniferous; regenerated by artificial means primarily planting of primarily spruce and/or lodgepole pine at 1200-1600 stems per hectare, site preparation is optional, vegetation management through herbicide application or manual brushing, with the expectation of a final harvest age at rotation of 100-110 years (Comeau, 2007).

"Small scale" un-mix the mix (divide blocks into discrete strata of pure conifer and pure deciduous),

- 1) Conventional clearcut silvicultural system applied on a stand considered a deciduous leading mixedwood site to be managed to produce a mosaic of single species groupings. Consider for this example a 60% deciduous, 40% coniferous segregation. The deciduous stand will be regenerated naturally to deciduous. The conifer stand will be regenerated by artificial means, primarily planting of primarily spruce and/or lodgepole pine at 1200-1600 stems per hectare, site preparation is option, vegetation management through herbicide application or manual brushing. Both stands will be managed with the expectation of a final harvest age at rotation of 100-110 years (Comeau, 2007).
- 2) Conventional clearcut silvicultural system applied on a stand considered a coniferous leading mixedwood site to be managed to produce a mosaic of single species groupings. Consider for this example a 60% coniferous, 40% deciduous segregation. The deciduous stand will be regenerated naturally to deciduous. The conifer stand will be regenerated by artificial means primarily planting of primarily spruce and/or lodgepole pine at 1200-1600 stems per hectare, vegetation management through herbicide application or manual brushing. Both stands will be managed with the expectation of a final harvest age at rotation of 100-110 years (Comeau, 2007).

These tactics have been employed with the objective of producing **two-story intimate mixtures** (Comeau *et al.* 2005)

Strip Clearcutting (Comeau *et al.* 2005)

- 1) Applicable to primarily a stand considered as pure deciduous or deciduous leading mixedwood site. The primary consideration is that there are sufficient numbers of healthy, vigorous spruce understory 2-7m tall. The harvest method is clearcut with a single-pass system. Unharvested wind buffers are retained every 50m or less within the stand, with the strips oriented perpendicular to the predominant wind direction. Skid trails are laid out a certain distance apart. Along the skid trails, the feller buncher is expected to harvest the aspen for an expected width on either side of the skid trail. There is a certain percentage of aspen that is not harvested as a result because it is unreachable (Liefers and Grover 2004). The skid

trails may be allowed to regenerate naturally to deciduous or regenerated by artificial means primarily planting of primarily spruce and/or lodgepole pine at 1200-1600 stems per hectare, vegetation management, if required is through spot herbicide application or manual brushing. The resulting stand will be managed with the expectation of a final harvest age at rotation of 100-110 years.

The “Do-Nothing” approach (Comeau *et al.* 2005)

- 2) This tactic is applicable to almost every current existing stand condition. A conventional clearcut harvest system is employed. Site preparation is optional, but is a consideration for early seedling survival. Stand is typically regenerated by artificial means, primarily planting spruce at 1200-1600 stems per hectare. After planting, no further treatments are considered. Due to the delayed growth of the conifer under the anticipated deciduous canopy, the rotation age is extended. The resulting stand is managed with the expectation of a final harvest age at rotation of 130-140 years.

Tending strips or large circles of spruce (Comeau *et al.* 2005)

- 1) This tactic is applicable to almost every current existing stand condition. A conventional clearcut harvest system is employed. Site preparation is optional, but is a consideration for early seedling survival. Alternating strips of spruce and deciduous are created by artificially planting spruce at spacing densities that equate to 1200-1600 stems per hectare in linear strips and leaving unplanted strips between them. There is a consequence of scale between what might be considered discrete species grouping and an intended intimate mixture. Current practice has considered 25m or less in terms of strip width to be included within intimate mixtures. The width of the strips will determine the relative proportions of spruce and deciduous in the mixture. Brushing the strips to maintain the deciduous free area is important. This may be achieved by chemical or manual brushing treatments. Harvest rotations are divided into two passes. The first pass is a conventional clearcut of the deciduous strips at 60-70 years. These strips are then allowed to naturally regenerate to deciduous. The second harvesting pass is to remove both the deciduous and coniferous strips at a final harvest rotation age of 130-140 years (Comeau, 2007).

With regard to managing large circles of spruce, a conventional clearcut harvest system is employed. Site preparation is optional, but is a consideration for early seedling survival. Stand is typically regenerated by artificial means, primarily planting spruce at 1200-1600 stems per hectare. When the regenerating stand is approximately five years old, a chemical brushing treatment by aerial application in a process called “pulse spraying” is undertaken. The on/off nature of the treatment creates a typical deciduous-free circle 12-15 feet in diameter. The distribution and

density of the circles will determine the relative proportions of the spruce and deciduous in the mixture (Comeau *et al.* 2005).

These tactics have been employed with the objective of producing **one story intimate mixtures** (Comeau *et al.* 2005)

Tending Individual Spruce (Comeau *et al.* 2005)

- 1) This tactic is applicable to almost every current existing stand condition. A conventional clearcut harvest system is employed. Stand is typically regenerated by artificial means, planting at low densities of 400-600 stems per hectare. The principle focus is to remove aspen within a specified radii of each planted crop tree by manual cutting or selective herbicide treatments. The resulting stand will be managed with the expectation of a final harvest age at rotation of 90-100 years (Comeau, 2007).

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