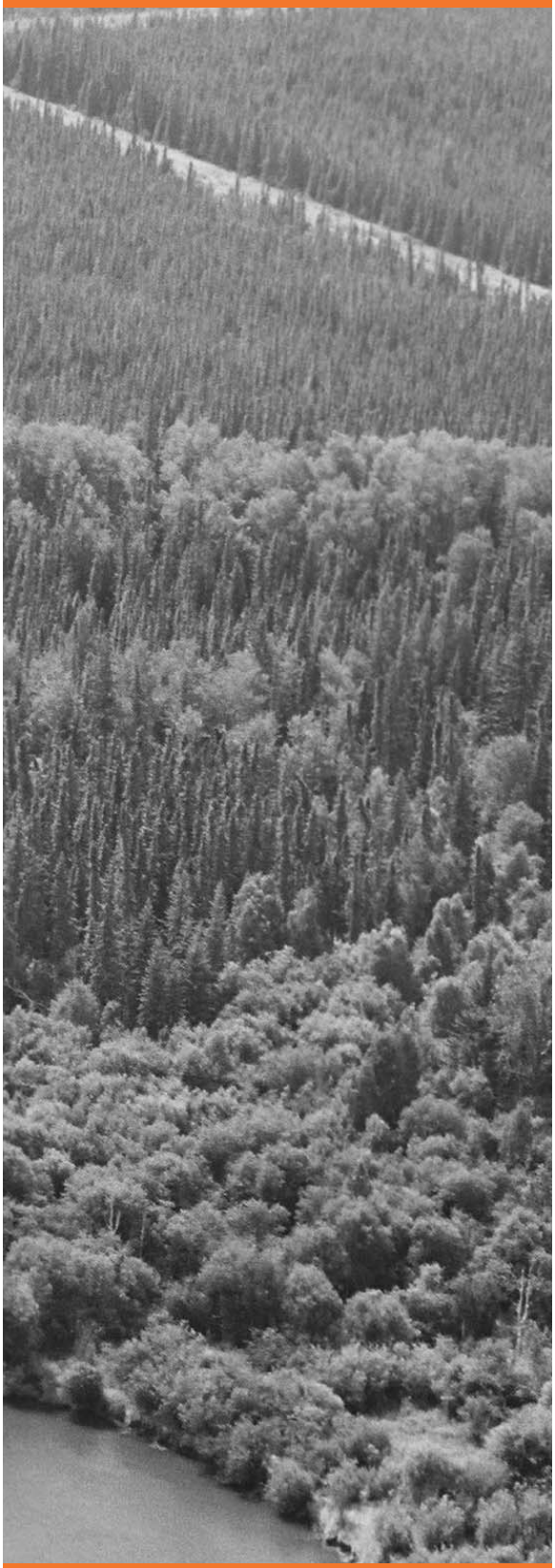


DFMP

B.

Appendix B

Seral Stage Maintenance Strategy

APPENDIX B LATE SERAL STAGE MAINTENANCE STRATEGY

B.1 INTRODUCTION

This appendix describes the strategy, developed in consultation with SRD, to address the maintenance of biodiversity and species habitat. A coarse filter approach was taken as an initial step. In this approach, management objectives have been formulated to maintain the distribution of late seral stages across the FMA landbase. This initial strategy will be refined as more science becomes available.

Guiding principles for developing this strategy were that it had to be:

- Scientifically defensible, given the current knowledge base, and recognize the unique nature of the FMAs (i.e. geographically dispersed, fragmented and surrounded by agricultural land);
- Empirically measurable and auditable by regulatory agencies;
- Operationally feasible.

B.2 BACKGROUND

A review of the literature and consultations with SRD staff revealed that:

- Both quality and quantity of late seral stage area are key components in a management strategy;
- Retention targets should be specific to a defined forest area.

Four main questions form the basis of this strategy:

1. What are the defining features of a late seral stage stand?

Stand structure is the key indicator that identifies when a stand has progressed into a late seral stage. Late seral stage structure includes both vertical and horizontal characteristics in the stand. Some of the defining structural features include multi-layered canopies, large snags and coarse woody debris, gaps in the canopy and anti-gaps (areas of extreme density), large living trees for the species and site and thickets of understorey vegetation. Although stand age is an indicator of late seral stage, it functions primarily as a proxy measure of the onset of late seral stage characteristics.

2. What portions of the landbase should be included in the strategy?

Late seral stage maintenance is a landscape issue that includes all portions of the forested landbase. The strategy must consider the landscape in its entirety (both operable and non-operable areas).

3. How can high quality late seral stage be defined and how much high quality late seral stage currently exists on the landscape?

Key characteristics associated with quality include (ranked in order of priority):

- Distance to a riparian buffer (closer is better);
- Distance to roads (further away is better; the edge effect created by a road decreases the effective interior forest of the late seral stage stand; as well, road corridors allow easy access by predators);
- Distance to other reserve areas (connectivity to these areas is desired);
- Size of the stand (a larger stand provides more interior forest);
- Stands in the "Whitemud Bottle Neck" (sufficient cover in this area is important since it is a wildlife corridor);
- Stand complexity (complex stands provide more structure);

- Stand height (taller stands typically have more vertical structure);
- Diversity of stand cover types (late seral stage should represent all stand cover types);
- Stand Shape (less edge results in more interior forest).

4. What amount of late seral stage should be maintained?

A unifying approach to selecting late seral stage maintenance targets does not exist. Alternatives include prescribing "set" percentages or approximating the natural range of variability that has been observed. Targets selected should be specific to the defined forest area.

B.3 PROBLEM STATEMENT

The primary question is, how should Tolko Industries Ltd. and Buchanan Lumber retain late seral stages in an effort to maintain biodiversity and wildlife habitat within their forest management areas?

B.4 METHODS

To address the problem, the following four questions were investigated:

1. What are the defining features of a late seral stage stand?

The identification of seral stages is a complex issue that often relies on stand attributes which are not easily modelled (i.e. stand structure and complexity). Age is typically used to define seral stages since it can be classified in an inventory and is usually an indicator for the onset of late seral stage characteristics.[1]

2. What portions of the landbase should be included in the strategy, i.e. does it include both the operable and non-operable areas?

Operable and non-operable areas are defined as follows:

- Operable areas: All stands that were included in the Annual Allowable Cut calculation. This includes all stands in the net landbase as well as the productive conifer stands in the grazing leases. Table B-1 shows the breakdown of the operable landbase for the two FMAs.

TABLE B-1: OPERABLE LANDBASE SUMMARY

FORESTED LANDBASE CATEGORY	JOINT FMA		TOLKO FMA	
	AREA (HA)	PERCENT OF OPERABLE AREA	AREA (HA)	PERCENT OF OPERABLE AREA
NET PRODUCTIVE AREA	168,229	99.9	156,651	98.5
GRL CONIFER LANDBASE	168	0.1	2,450	1.5
TOTAL OPERABLE AREA (HA)	168,397	100.0	159,101	100.0

- Non-Operable areas: Stands that were not included in the Annual Allowable Cut calculation except for the productive deciduous stands in the grazing lease areas. The productive deciduous stands in the grazing lease areas are not included in this strategy because they are not sequenced for harvest in this plan, but they will be harvested under a separate management plan. Therefore, their seral stage status

[1] ***A process for identifying seral stages was carried out in the landscape assessment document for the two FMAs. This process was empirical in nature and used available growth and yield data as the basis for the seral stage definitions. These seral stage definitions were compared to the literature reviewed and were not deemed to be significantly different.***

through time is uncertain and cannot be assumed to be late seral stage in the future. Table B-2 provides a breakdown of the operable landbase for the two FMAs.

TABLE B-2: NON-OPERABLE LANDBASE SUMMARY

FORESTED LANDBASE CATEGORY	JOINT FMA		TOLKO FMA	
	AREA (HA)	PERCENT OF NON-OPERABLE AREA	AREA (HA)	PERCENT OF NON-OPERABLE AREA
LANDUSE DISPOSITIONS	74	0.1	1,466	2.2
RECREATIONAL LAKE BUFFERS (400M)	0	0.0	65	0.1
TRUMPETER SWAN LAKE BUFFERS (200M)	79	0.1	294	0.4
MEDIUM RECREATIONAL LAKE BUFFER (200M)	0	0.0	863	1.3
LAKE BUFFERS (100M)	990	1.8	3,178	4.8
LARGE PERMANENT BUFFERS (60M)	4,014	7.3	2,399	3.6
SMALL PERMANENT BUFFERS (30M)	3,504	6.3	2,988	4.5
NON-MERCHANTABLE	46,580	84.3	54,661	82.9
POTENTIALLY PRODUCTIVE	40	0.1	33	0.1
TOTAL NON-OPERABLE FORESTED AREA (HA)	55,282	100.0	65,948	100.0

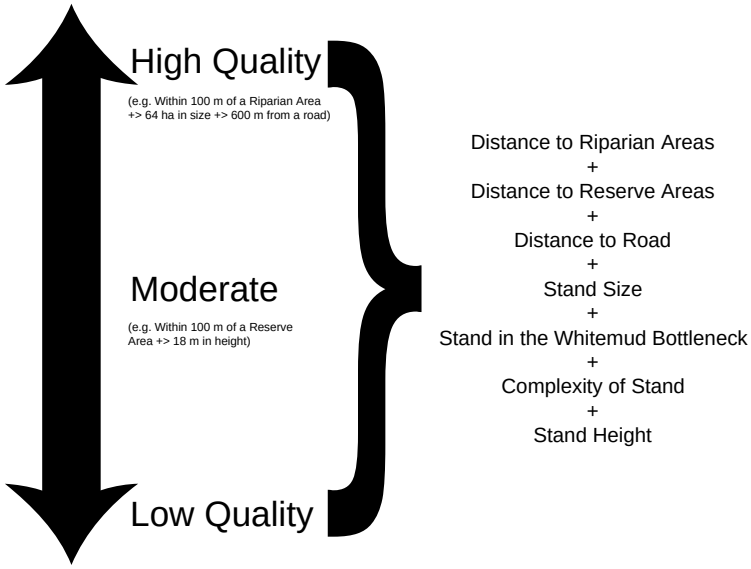
The literature review emphasized that seral stage maintenance is a landscape issue and that all portions of the forested landbase should contribute to late seral stage retention. To determine whether stands on the non-operable landbase are representative of the entire landbase, a comparison was done[2].

3. How can high quality late seral stage be defined and how much high quality late seral stage currently exists on the landscape?

A process for identifying high quality late seral stage was required in order to compare the amount of "high quality" late seral stage that currently exists to what will be retained in the future. Quality indicators identified in the literature and through the DFMP planning process were used to define "high quality" late seral stage. Each of the quality indicators were assigned "quality points" and these points were summed up in order to determine the amount of "high quality" late seral stage for each cover group/operating area strata identified. Figure B-1 illustrates the process used.

[2] *The data used in this analysis was sourced from the April 30, 2003 Net Landbase Determination*

FIGURE B-1: QUALITY POINT EXAMPLE



The identification of these high quality stands was then used for both the definition of targets and the implementation of the strategy.

4. What is the amount of late seral stage that should be maintained?

Within the two FMA areas there are six operating areas that are geographically separated. Using the April 30, 2003 net landbase, the current amount of late seral stage for each cover group/operating area strata was calculated. The variable amounts of late seral stage in each of the six operating areas provided a way to determine an approximation of the natural range of variability for the amount of late seral stage present over time in any given area within the FMA.

Within each operating area stands representing each cover group exist in the non-operable landbase. These non-operable stands will become late seral stage in the future since they are unavailable for harvest[3]. A comparison between the approximate natural range of variability of late seral stage for each cover group and the area that will be retained in the non-operable landbase will help determine if the total non-operable landbase late seral stage is within the approximate natural range of variability.

Late seral stage maintenance is an issue of quality as well as quantity. Since non-operable areas are primarily riparian buffers (i.e. high quality late seral stage stands), a comparison was made to analyze the difference between the current amount of the gross forested landbase in high quality late seral stage and the amount of non-operable area that will be late seral stage. The difference between the two values identified the amount of high quality late seral stage required on the operable landbase in order to retain the current amount of high quality late seral stage existing on the FMAs.

B.5 RESULTS

1. What are the defining features of a late seral stage stand?

The seral stage definitions determined in the landscape assessment are summarized in Table B-3. The overmature seral stage is equivalent to late seral stage.

[3] *This analysis does not incorporate random disturbance events (fire, insects and disease, etc)*

TABLE B-3: DEFINITION OF SERAL STAGES

SERAL STAGE	COVER GROUP				
	PURE CONIFER WHITE SPRUCE LEADING	PURE CONIFER PINE LEADING	PURE CONIFER BLACK SPRUCE LEADING	MIXEDWOOD	PURE DECIDUOUS
	AGE RANGE (YEARS)	AGE RANGE (YEARS)	AGE RANGE (YEARS)	AGE RANGE (YEARS)	AGE RANGE (YEARS)
ESTABLISHMENT	0 – 15	0 – 15	0 – 15	0 – 15	0 – 10
JUVENILE	16 – 39	16 – 54	16 – 94	16 – 54	11 – 39
IMMATURE	40 – 74	55 – 89	95 – 129	55 – 79	40 – 64
MATURE	75 – 149	90 – 124	130 – 174	80 – 119	65 – 94
OVERMATURE	150 +	125 +	175 +	120 +	95 +

2. What portions of the landbase should be included in the strategy?

Figure B-2 presents the timber productivity rating (TPR) of the non-operable landbase stands by cover group and Figure B-3 presents the TPR of the operable stands by cover group. This analysis shows that for all cover groups, with the exception of Black Spruce leading conifer[4], the non-operable stands are representative of the operable landbase.

FIGURE B-2: TIMBER PRODUCTIVITY RATING OF THE NON-OPERABLE LANDBASE

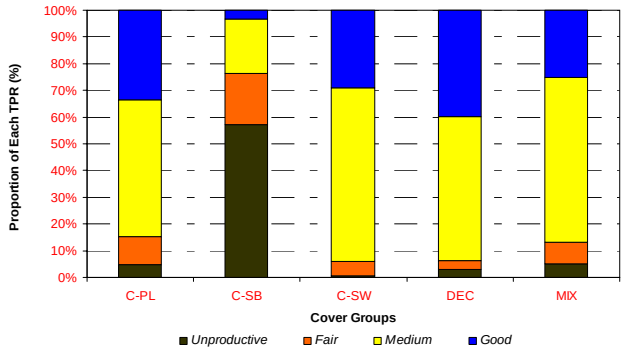
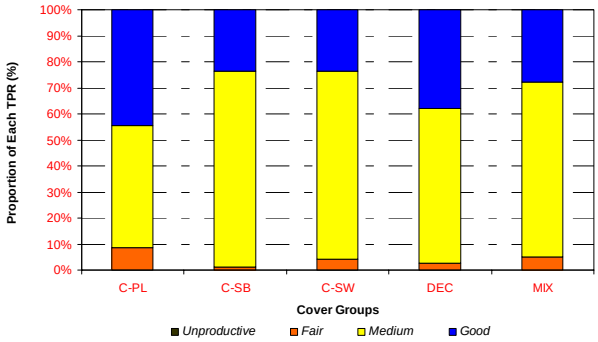


FIGURE B-3: TIMBER PRODUCTIVITY RATING OF THE OPERABLE LANDBASE



3. How can quality late seral stage be defined and how much high quality late seral stage currently exists on the landscape?

Stands were assigned a quality rating in order to identify high quality seral stage areas. The current amount of high quality late seral stage across both FMAs is provided in Table B-4.

[4] *The Black Spruce leading Conifer has ~90% of the area removed from the net landbase for each of the six operating areas, resulting in proportionally very little area in the operable landbase. The amount of the Black Spruce cover group that will be retained in late seral stage as a result of the non-operable area far exceeds the proxy natural range and therefore no strategy is warranted for the operable landbase.*

TABLE B-4: CURRENT AMOUNT OF HIGH QUALITY LATE SERAL STAGE

	COVER GROUP				
	DEC	C-PL	C-SB	C-SW	MIX
CURRENT AVERAGE AMOUNT OF HIGH QUALITY LATE SERAL STAGE (%)	3%	2%	0%	1%	8%
CURRENT TOTAL AMOUNT OF HIGH QUALITY LATE SERAL STAGE (%)	3%	5%	0%	1%	8%

4. What is the amount of late seral stage that should be maintained?

The area of late seral stage existing in each of the six operating areas is provided in Figure B-4. The area that will be retained in late seral stage in the non-operable landbase is provided in Figure B-5. By comparing the approximate natural range of variability of late seral stage for each cover group to the area that will be retained in the non-operable landbase, it appears that the late seral stage areas that will be contributed by the non-operable landbase are well within or above the natural range of variability. This analysis is seen in Figure B-6.

FIGURE B-4: CURRENT AMOUNT OF LATE SERAL STAGE PRESENT IN THE SIX OPERATING AREAS

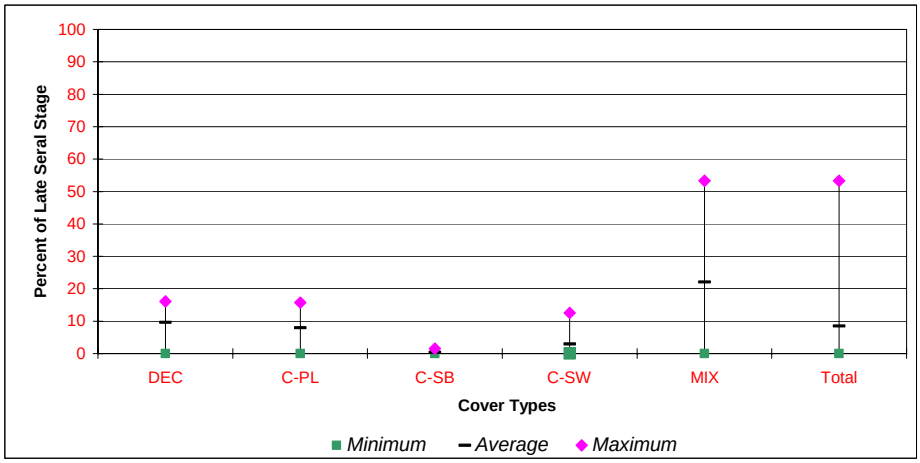


FIGURE B-5: AMOUNT OF AREA IN THE NON-OPERABLE LANDBASE IN THE SIX OPERATING AREAS[5]

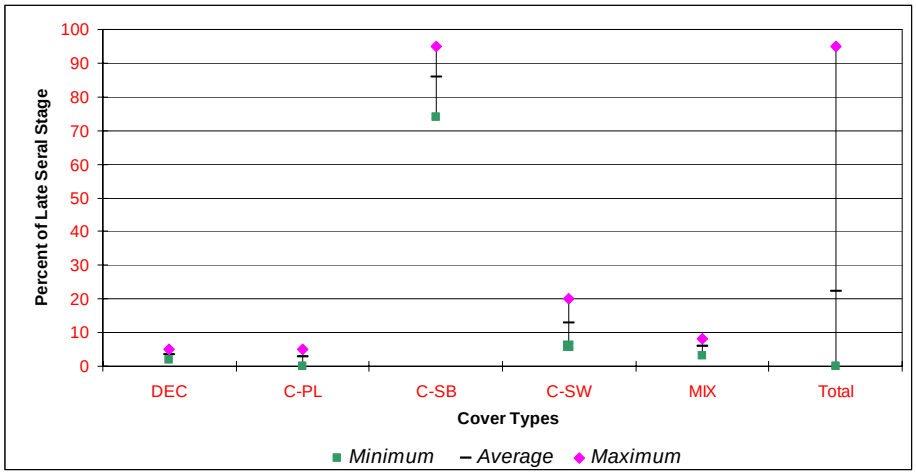
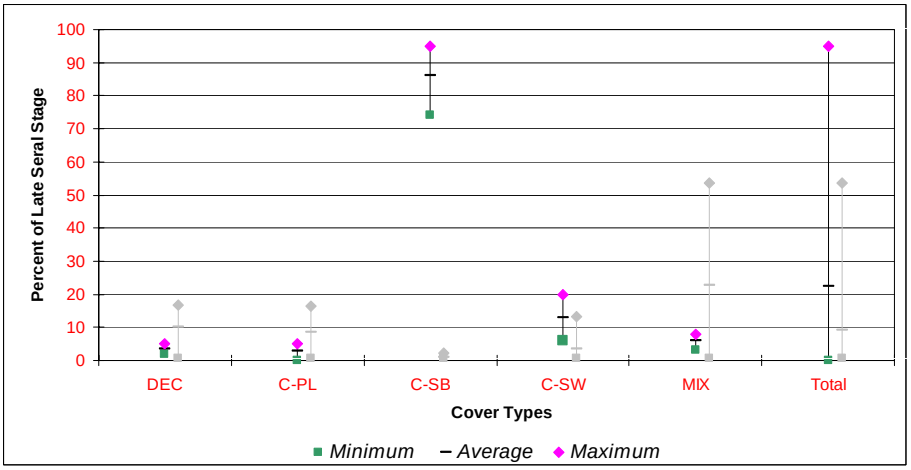


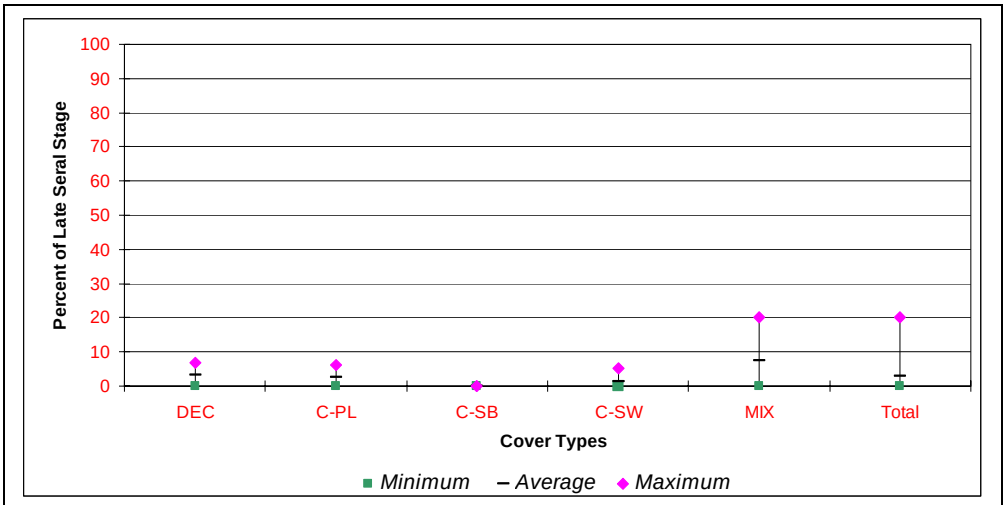
FIGURE B-6: AMOUNT OF AREA IN THE NON-OPERABLE LANDBASE COMPARED TO THE APPROXIMATE NATURAL RANGE OF VARIABILITY (APPROXIMATE NRV IS IN GREY)



Next, a comparison between the amount of high quality late seral stage that currently exists and what will be present in the non-operable landbase was required. The current amount of high quality is seen in Figure B-7.

[5] *Due to the overall size of the Birch operating area and its proximity to the Whitemud operating area, the two operating areas will be combined.*

FIGURE B-7: CURRENT AMOUNT OF HIGH QUALITY LATE SERAL STAGE PRESENT IN THE SIX OPERATING AREAS



	DEC	C-PL	C-SB	C-SW	MIX
CURRENT AVERAGE AMOUNT OF HIGH QUALITY LATE SERAL STAGE (%)	3%	2%	0%	1%	8%
CURRENT TOTAL AMOUNT OF HIGH QUALITY LATE SERAL STAGE (%)	3%	5%	0%	1%	8%

TABLE B-5: CURRENT AMOUNT OF AREA IN HIGH QUALITY LATE SERAL STAGE COMPARED TO THE AVERAGE AMOUNT OF AREA IN THE NON-OPERABLE LANDBASE IN THE SIX OPERATING AREAS

COVER GROUP	CURRENT TOTAL AMOUNT OF HIGH QUALITY LATE SERAL STAGE (%)	AVERAGE FUTURE AMOUNT OF LATE SERAL STAGE IN NON-OPERABLE LANDBASE(%)	DIFFERENCE (%)
MIX	8%	6%	2%
C-PL	5%	3%	2%
DEC	3%	4%	-1%
C-SW	1%	13%	-12%
C-SB	0%	86%	-86%

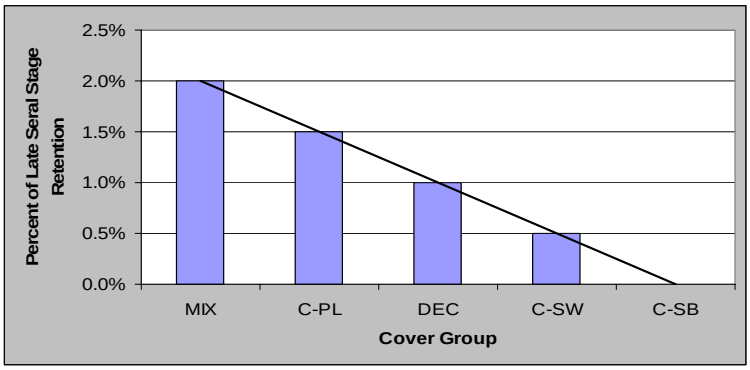
As seen in Table B-5 the Mixedwood cover group has an average of 6% of non-operable area. Other than the Black Spruce leading conifer cover group, the non-operable areas are primarily riparian buffers, which are high quality late seral stage stands. There is currently 8% of the gross forested landbase in the Mixedwood cover type in high quality late seral stage. In order to retain a similar amount of high quality late seral stage, an additional 2% of the gross forested landbase area will be required on the operable landbase for the Mixedwood cover group.

When comparing the difference between the average future amount of late seral stage in non-operable landbase and the current amount of high quality late seral stage for the Deciduous and White Spruce leading conifer cover groups, it appears that no further retention on the operable landbase is required. But as a result of the majority of the non-operable area being comprised of riparian buffers, the stand shape of the retention

areas may not produce enough interior forest as riparian areas are typically narrow, so it was determined that area should be retained on the operable landbase in these cover groups as well. The Pine Leading Conifer and Mixedwood both have a 2% difference, but when comparing the average of non-operable area to the current total amount of late seral stage, there is a greater difference in the Mixedwood cover group. Therefore the higher percentage will be maintained for Mixedwood. The cover types will be assigned target retention percents linearly between the Mixedwood minimum target of 2% and the Black Spruce leading Conifer minimum of 0%, based on their ranking identified by the % difference.

Figure B-8 graphically represents the minimum retention targets for the five various cover groups.

FIGURE B-8: MINIMUM PERCENT RETENTION ON THE OPERABLE LANDBASE



B.6 CONCLUSION

Tolko Industries Ltd. and Buchanan Lumber will initially address the maintenance of wildlife habitat and biodiversity within their forest management area by managing late seral stage as follows:

1) using the overmature definition as identified in the Landscape Assessment;
2) considering both the operable and non-operable landbase in the strategy;
3) focusing on the retention of high quality, effective late seral stage by using the identified quality indicators and;
4) retaining the non-operable landbase area, plus an additional 2% minimum of the gross forested landbase area on the operable landbase for the Mixedwood cover group, 1.5% for the Pine Leading Conifer cover group, 1.0% Deciduous cover group, and 0.5% White Spruce Leading Conifer cover group, for each operating area cover group strata.[6]

Implementation of this strategy will be spatially explicit for the full 160 year planning horizon with each high quality stand identified and managed operationally. Details regarding the implementation are discussed in Section 6.2.

[6] *Due to the overall size of the Birch operating area and its proximity to the Whitemud operating area, the two operating areas have been combined. Some of the other cover group/operating area strata do not have enough area to require an individual targeted strategy and are combined with other similar strata.*