Chapter 6: Forest Management Plan Implementation

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6. FOREST MANAGEMENT PLAN IMPLEMENTATION

This chapter of the 20-Year Forest Management Plan describes how the long-term strategic objectives will be implemented operationally at the ground-level. Operating Plans (OP's)will be developed and implemented, based on the Strategic Harvest Schedule of the Preferred Management Scenario.

A strategic plan was developed to help achieve long-term goals. Ideally, the strategic plan comes first, followed by a robust and measurable Operating Plan. Operating Plans support the strategic planning efforts and directions. The strategic plan needs to be linked to future Operating Plans. Both the strategic and operational plans are utilized simultaneously, there is no choosing one plan over the other.

What is Strategic Planning?

A strategic plan outlines high-level goals for the next 20 years across the entire landscape. It also estimates how well these goals are achieved in the future. Strategic plans are successful due in large part to focused effort. It's nearly impossible to focus on hundreds of strategic items.

Strategic plans help identify ways to achieve planned goals (*e.g.* balance cover types). They also can create new capabilities (*i.e.* moose habitat modeling, new road construction reductions) to help achieve future opportunities.

What is Operational Planning?

Operational plans are detailed short-term plans made under the umbrella of strategic planning. An Operating Plan (OP) has block-level details for a very small portion (0.5 to 0.7% annually) of the landbase. OPs currently detail activities planned over a two-year period, with three years of planned projection areas.

Operational planning is done to support strategic planning efforts. Operating Plans focus on proposed roads, crossings, and cut blocks at the operational or ground level. Completing the Operation Plan activities assists in achieving the strategic goals.

Linkages between strategic and operational plans

Strategic plans have a goal to maintain biodiversity at a landscape level. Strategic plans provide the framework which is used to develop operational plans. The operational plan refines strategic data to maintain and/or enhance biodiversity at the ground level. Operational plans do this using techniques such as variable block sizes, buffers, leave areas within blocks, wildlife debris piles, water crossing prescriptions and access management.

Strategic Planning vs. Operational Planning

A strategic plan enables the creation of an operational plan. An operational plan should not be formulated without guidance from a strategic plan (Table 6.1). Strategic planning has a wide influence on the forest management activities, but operation planning has a narrow influence on forest management activities. Strategic planning remains constant over time. Operational planning is an action plan that can be changed to suit site-specific or weather conditions. Operating plans help run the month-to-month forest management activities.

Table 6.1 Comparison of Strategic and Operational Plans.

Category	Strategic Planning	Operational Planning
Overview	Strategy and general guide for forest management (*e.g.* balance cover types) Strategic plan does not stipulate annual tasks and activities Set direction for the forest, devised goals, objectives, and identified strategies to pursue	Specific plan for forest management activities (*e.g.* roads, crossings, cut blocks) Operational Plan does present highly detailed information about annual tasks and activities.
Focus	Strategy and guidance to achieve goals - vision, mission and objectives. Patches (aggregates of blocks)	Planning routine activities; Action (details activities); Blocks
Time	Long-term; 20 years – Strategic Harvest Schedule; 200-year sustainability analysis	Short-term; What to do in the short term to achieve strategic goals; Two years – block-level detail Three years – projection with little detail
Area	Entire landbase (approximately 2.5 million ha)	Two years of potential harvest for Quota Holders and LP (approximately 6,000 ha over two years)
General	May be a one-time goal (e.g. balance cover types)	Reoccurring items (e.g. proposed harvest blocks)
Plan Duration	Once created, the strategic plan does not change significantly from year to year	Operational plan details may differ significantly from year to year, but remain linked to the strategic plan

6.1. Overview to Implementing the FMP

An overview of the steps to implementing the 20-Year Forest Management Plan at the operational level is described in the steps below:

1. The Spatial Harvest Schedule from the Preferred Management scenario is operationalized by the LP planner.
2. The Spatial Harvest Schedule is used as a strategic guide to layout proposed harvest blocks and associated roads and water crossings.
3. Proposed harvest blocks, roads and crossings are designed. Proposed blocks are Preharvest surveyed. Most roads and crossings are field checked for inclusion in the operating plan.
4. The proposed harvest blocks and associated roads and water crossings are mitigated between the Province of Manitoba's Western Region IRMT (Integrated Resource Management Team), Quota Holders, and LP staff.
5. Input on proposed forest management activities is received from stakeholder involvement, including Stakeholder Advisory Committee meetings, public engagement meetings hosted by LP, and engagement with Indigenous communities. Input is documented and considered in the development of operational plans. This input may change proposed harvest blocks and associated roads and water crossings or modify related forest management activities.
6. Mitigated proposed harvest blocks, roads, and water crossings are documented in the Operating Plan, then submitted to the Province of Manitoba. The submission date for the Operating Plan is the end of February.
7. Crown consultation is done by the Province of Manitoba with Indigenous communities n on the Operating Plans for FML # 3. Additional changes to the operating plans may be made at this stage.
8. The Province of Manitoba reviews the Operating Plans from March 1st, to May 31st.
9. The Province of Manitoba approves the Operating Plan on June 1st.
10. Work Permits are issued at the Regional level authorizing harvest of blocks, building of roads and installation of water crossings.
11. The Quota Holders and LP implement the Operating Plan on the ground, subject to both internal and provincial field supervision.

6.2. Strategic Linkages to the Operating Plan

There are linkages between the strategic 20-year Forest Management Plan (FMP) and the Operating Plans (Table 6.2). Linking the strategic direction of the FMP to the operational implementation of the Operating Plans, ensures that the expected benefits from the strategic objectives will be realized in FML # 3.

Table 6.2 Strategic linkages to Operating Plans and Forest Reports.

FMP Year (post FMP approval)	Planning	2 yr Reports	5 yr Forest Reports
	submission of FMP **Terms of Reference** (signed: July 29th, 2019)		
	Submission of **new FMP** (Dec. 31st, 2019)		
	FMP approval by provincial government – *expected Dec. 2021*	2-year reports due	Five-year reports due 5 years after the FMP is approved
1	**1st year of approved FMP**		
2	Two-Year Operating Plan	2-year Report	
3			
4	Two-Year Operating Plan	2-year Report	
5			
6	Two-Year Operating Plan	2-year Report	5-yr Report (FMP Years 1- 5)
7			
8	Two-Year Operating Plan	2-year Report	
9			
10	Two-Year Operating Plan	2-year Report	5-yr Report (FMP Years 6 - 10)
11			
12	Two-Year Operating Plan	2-year Report	
13			
14	Two-Year Operating Plan	2-year Report	
15			
16	Two-Year Operating Plan	2-year Report	5-yr Report (FMP Years 11 - 16)
17			
18	Two-Year Operating Plan	2-year Report	
19			
20	Two-Year Operating Plan	2-year Report	5-yr Report (FMP Years 16 - 20)

Multiple timeframes are interlinked to translate a 20-year strategic plan into operating plans. Modeling the future forest condition of ecosystems and sustainability is evaluated over 200-year modeling run, while the FMP is a 20-year plan. The Province of Manitoba also requires a 5-year report, entitled the 'Forest Report' which compares 20-year FMP planned operations to actual operations. This comparison of planned to actual helps evaluate the short-term Operating Plan's progress in achieving the values and objectives of the long-term strategic Forest Management Plan.

How do we maintain linkages between these different plans with different timeframes? Two methods have been utilized to link these different timeframes: bottom-up linkages and top-down linkages.

6.2.1. Bottom-Up Linkages

Before modeling started, the desire was to link operational realities to the FMP by the following method. Typically, this method is referred to as a 'bottom up' linkage.

Operational -> Tactical -> Strategic

To accomplish this the model included all real-world constraints, existing cutover boundaries, exclusions, buffers and other net-down areas in the land base data set. An example of bottom-up linkage is how mineral licks are considered. Mineral licks receive any where from a 50 to 200 m buffer, as per provincial terrestrial buffer guidelines. All mineral licks were buffered by 200 m in the modeling land base, to avoid erroneously scheduling harvest on or near a mineral lick. This buffer, now incorporated into the scenario model, affects the way all other harvest block, roads, and buffers are planned. Mineral lick buffers are then mitigated with the IRMT and determined at an operational level.

Additional real-world constraints at the tactical level were addressed as Patchworks (computer modelling) scenario characteristics. One constraint incorporated was the provincial Annual Allowable Cut limits for both hardwood and softwood. Limits were also placed on the amount of road that can be built.

6.2.2. Top-Down Linkages

Operational implementation of the objectives is accomplished following a top-down approach.

Strategic -> Tactical -> Operational

For example, strategic retention of some old forest in the Duck Mountains at all times (0 to 200 years) was desired to benefit biodiversity and wildlife species that utilize the habitat provided by old forest.

6.2.3. Utilizing the Strategic Harvest Schedule

The Strategic Harvest Schedule (Figure 6.1) acts to guide future operations but is not a precise blue print. Operationalization of the Strategic Harvest Schedule is still required by planners.

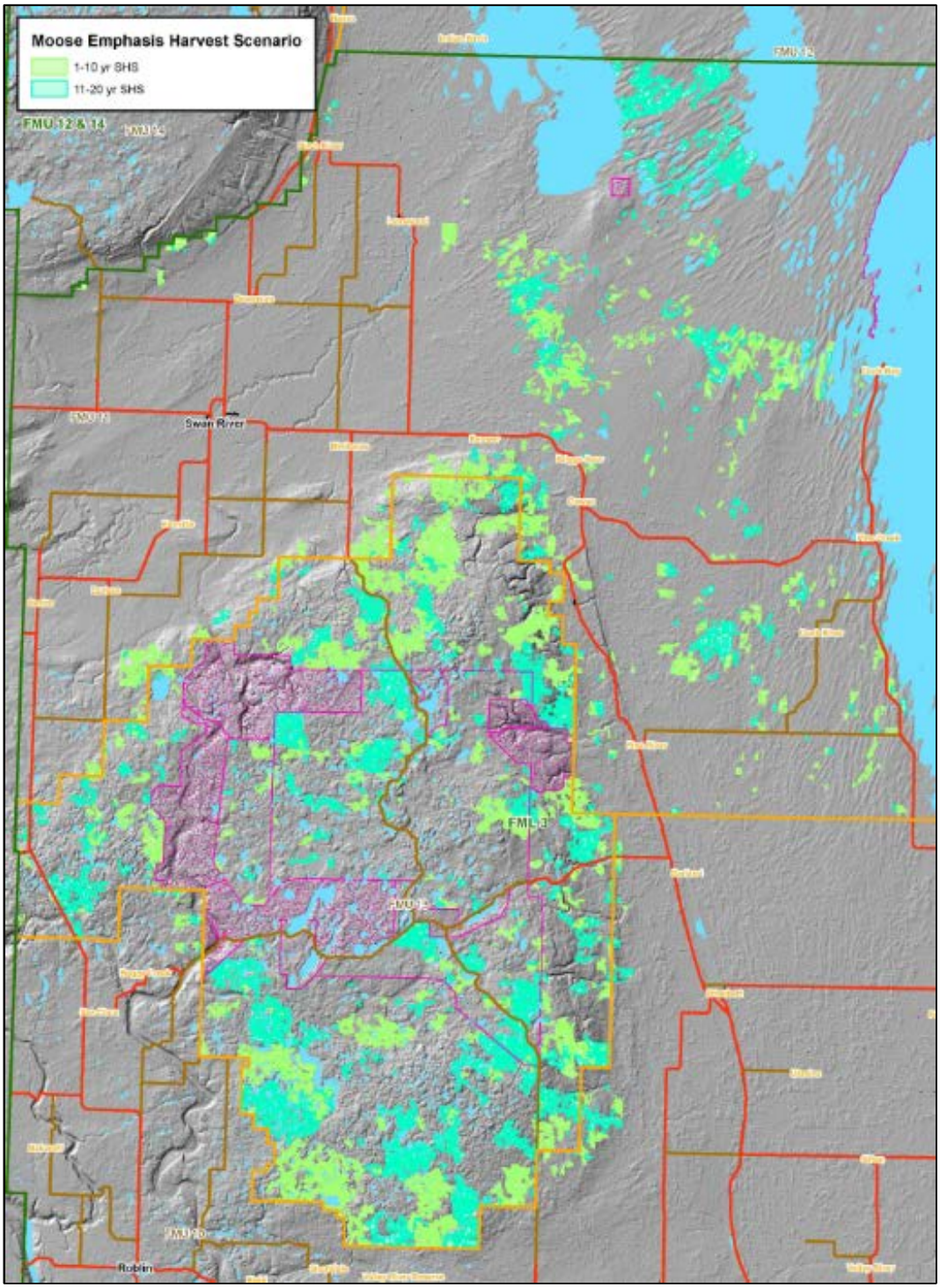

Figure 6.1 Overview of the Spatial Harvest Schedule for the next 20 years.

Operationally, the Moose Emphasis scenario provides a Strategic Harvest Schedule (*i.e.* proposed harvest blocks based on scenario objectives and targets) in two 10-year periods. The LP planner for FML 3will take the Strategic Harvest Schedule and operationalize these proposed patches into Operating Plans.

Proposed harvest blocks need a Pre-Harvest Survey (PHS) prior to mitigation and harvest. Potential changes to the blocks could be made based on the results of the PHS field findings. Mitigation of each proposed harvest block occurs with Provincial staff, Quota Holders, and LP staff. Mitigated blocks are incorporated into the Operating Plan.

Mitigation often brings up other issues such as elk management in some area. If blocks are considered important habitat for elk LP will implement reduced line of sight requirements. Some blocks have also been temporarily deferred.

The submitted Operating Plan's proposed harvest blocks may be similar to the original Strategic Harvest Schedule's patches. The Strategic Harvest Schedule patches are a tool for decision making and should not be viewed as an exact operational blueprint. Instead, the computer model provides a virtual strategic outlook. Ultimately, real-world change and consequent adjustments are typically made to meet operational requirements.

Provincial forest practice guidelines, both present and future versions, may also necessitate changes to forest management activities, such as how blocks are harvested. These guidelines could include access management or wildlife guidelines which give new guidance and require changes be made to the operational plans. Further changes to proposed blocks can be made by the Integrated Resource Management Team (IRMT), stakeholders, and the public.

6.2.3.1 Operational Planning Concepts

Operational planning often changes the strategic harvest boundaries due to consideration of the following

- changing a block boundary to follow natural boundaries
- variable-width buffers instead of strategic buffers
- Excluding non-operable areas such as wetlands
- Excluding non-merchantable areas such as undersized timber or blowdown areas
- not harvesting small isolated blocks
- leaving more wildlife tree clumps through variable retention harvest within a proposed cut block

- aggregating small adjacent blocks into a bigger block (that would otherwise trap wood as inaccessible)
- adding small areas within the larger proposed cut block boundary
- actual harvested area is typically less area than the planned area (typically 70 -85% of planned area, as per FML # 3 Annual Reports), due to wildlife tree clumps and variable retention harvest

6.2.3.2 Large Patches

First and second-pass harvest blocks combine to form harvest patches. A range of patch sizes are proposed in the Moose Emphasis scenario by these size categories:

- 5 - 50 ha
- 50 – 250 ha
- 250 - 500 ha
- 500 - 1,000 ha
- 1,000 ha plus

The larger patch locations proposed in the Moose Emphasis scenario are shown in Figure 6.2.

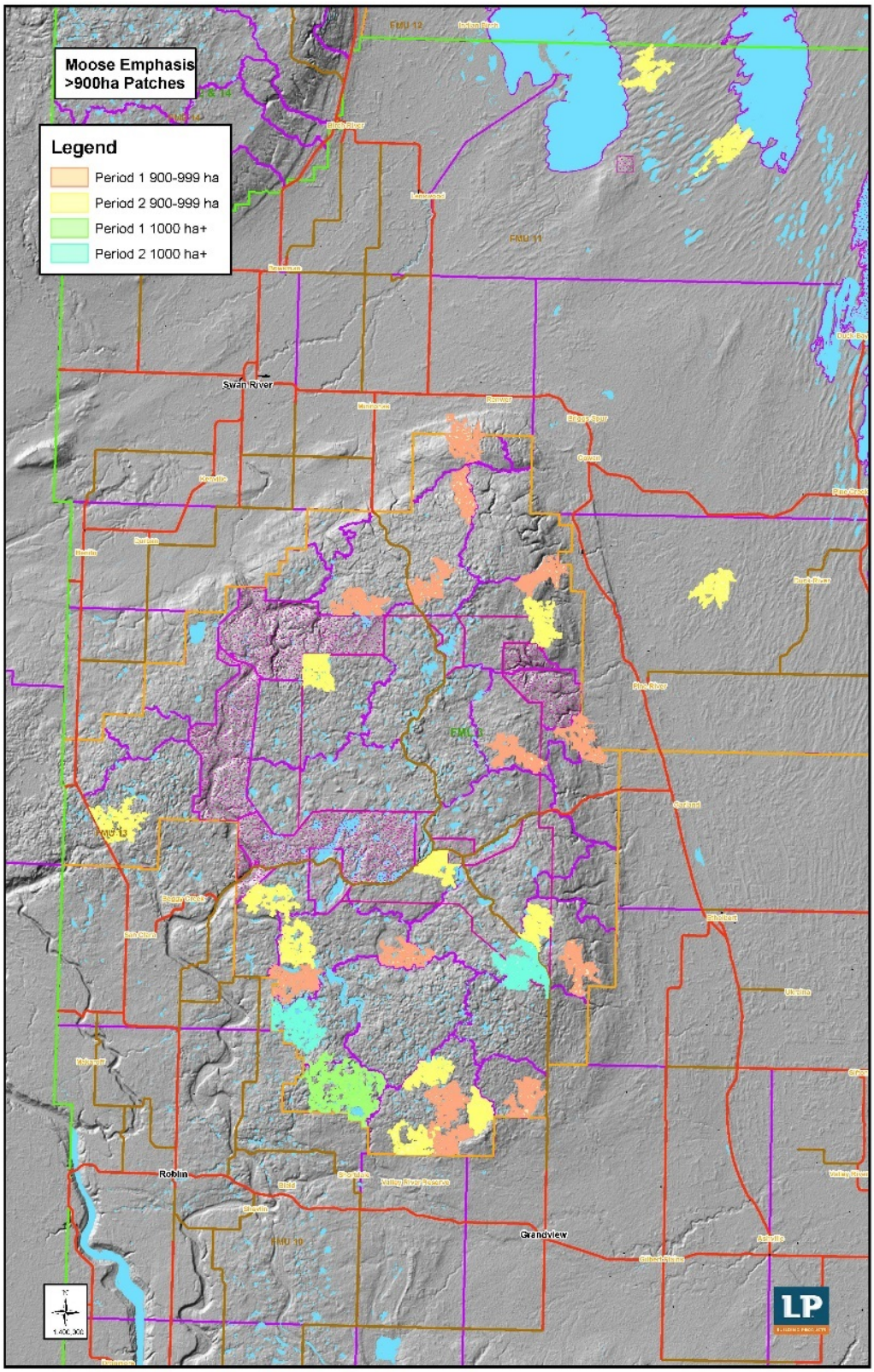

Figure 6.2 Proposed large patches in planning periods 1 and 2 (1-10 years and 11-20 years).

6.2.4. Planning Example

An example of operationalizing one proposed harvest block at an operational scale helps show the previously-mentioned operational planning concepts. Silver Creek (SLC) operating area was selected as an example (Figure 6.3).

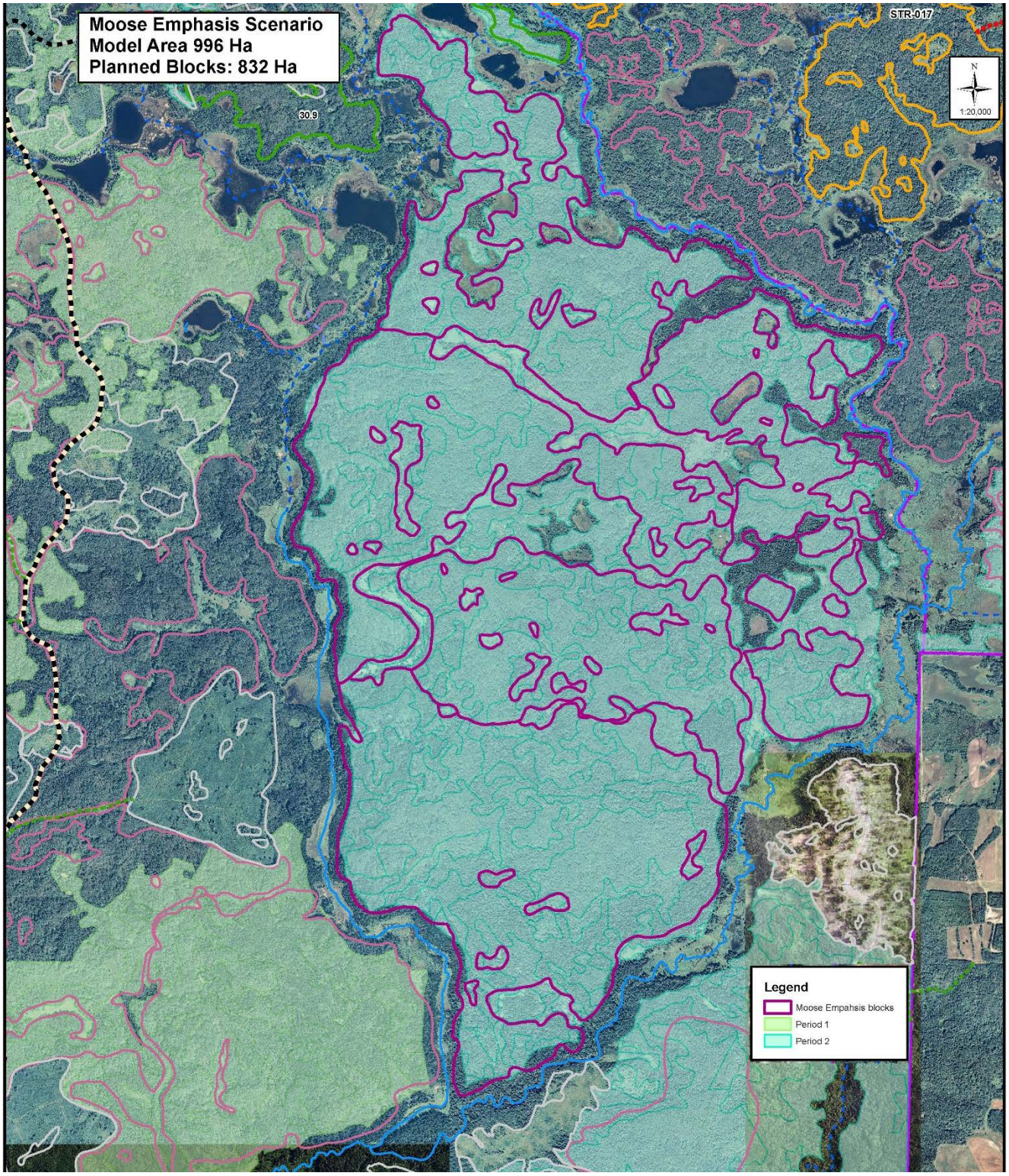

Figure 6.3 Strategic to operational planning example.

The blue-green large polygon in Figure 6.4 is a large (996 ha) computer-generated proposed harvest block from the Strategic Harvest Schedule. The proposed harvest block is bounded by creeks and water features on all sides.

Figure 6.4 Overview of one proposed harvest block in Silver Creek operating area.

6.2.4.1 *Not harvesting small isolated blocks*

On the north tip of the large block, the computer has chosen to include a long, narrow peninsula (Figure 6.5 - circled in red on the left). The planner has decided to separate this 10 ha (1%) area from the original block and exclude it. The benefits of this decision include:

- avoids crossing the wetland
- avoids building a lot of extra in-block road for a small amount of wood
- still being able to harvest the isolated 10 ha by merging it with a block (green boundary) north of the small waterbodies (Figure 6.5 - right) making it no longer isolated

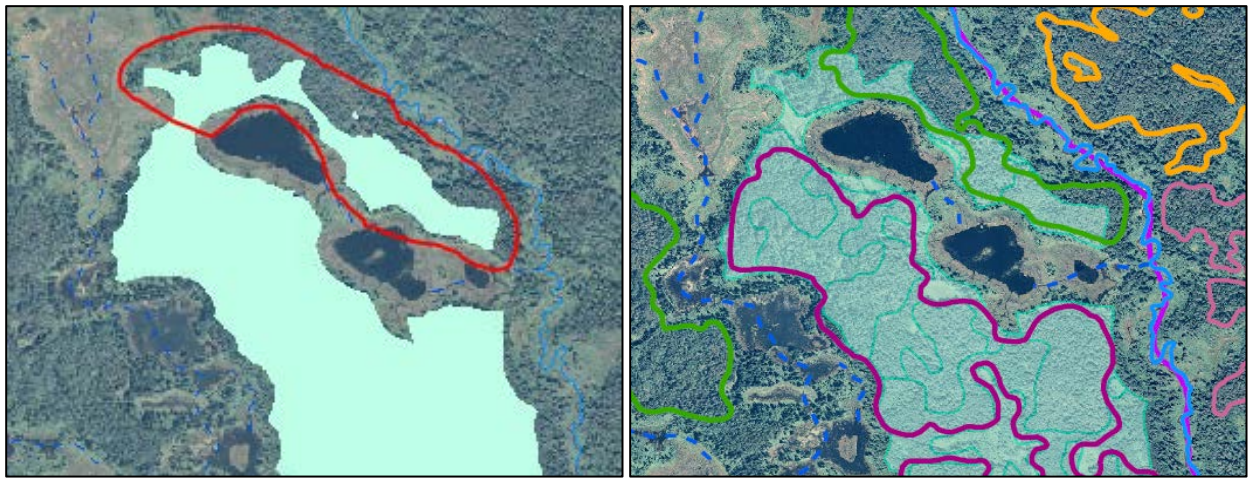

Figure 6.5 Small isolated blocks (left) are manually separated (right).

6.2.4.2 *Excluding non-merchantable areas*

The computer-generated large block for Silver Creek also contains some areas that were merchantable, but due to the forest changing are now non-merchantable. A significant example of this concept is the wind-damaged tornado area (Figure 6.6) above the centre of the block.

Figure 6.6 Wind-damaged tornado area within the Silver creek block (1:2,000 scale).

Therefore, the planner manually delineated the tornado area of approximately 20 ha (2% area) and excluded it from the operationalized block (Figure 6.7).

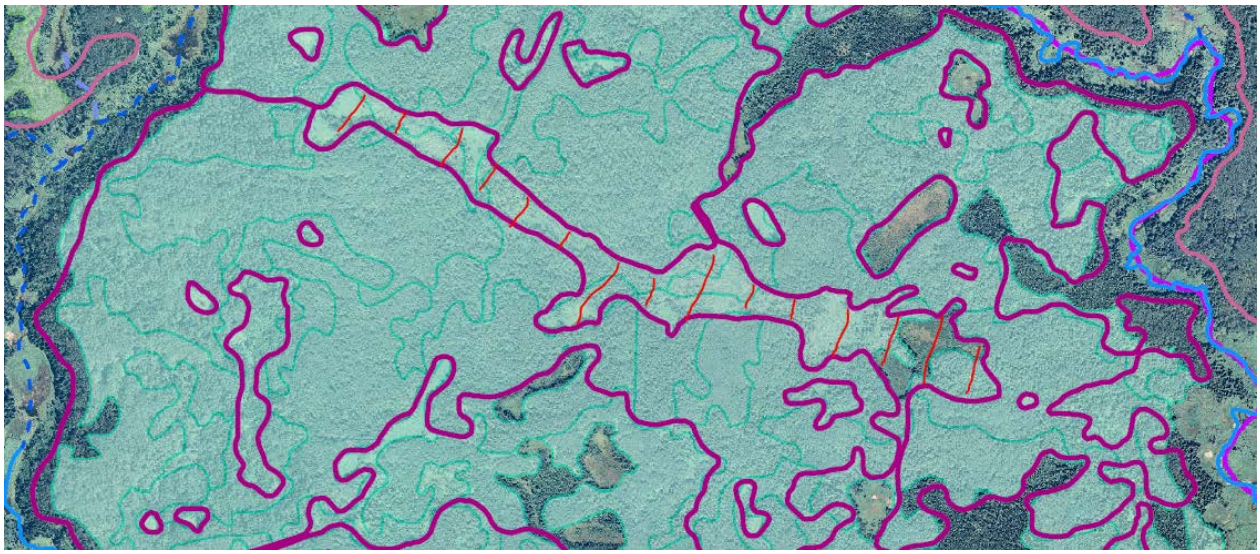

Figure 6.7 Tornado area delineated (red cross-hatch) and manually excluded from the Silver Creek block.

6.2.4.3 *Excluding non-operable areas*

There are fine-scale, non-operable areas that the computer doesn't know about (Figure 6.8 - left). Often these areas are due to changes in the forest such as stand decline from old age, beaver flooding, and other agents of change. Furthermore, the forest ecological inventory can only separate non-operable areas that are approximately two ha or greater in area. Smaller non-operable areas are simply a natural part of larger forested stands.

Figure 6.8 Southern tip of the Silver creek block appears all operable (left) but has non-operable areas that are manually removed (red polygons on right).

Therefore, the planner utilizes the newest imagery available and excludes non-operable areas. Some of these non-operable areas are treed, such as undersized black spruce on wet organic soil, and therefore excluded as red polygons within the block (Figure 6.8 - right). The largest non-operable exclusion is 8.0 ha in size. The two smaller exclusions are 1.2 and 0.5 ha in area.

6.2.4.4 *Leaving more wildlife tree clumps*

In the entire Silver Creek block, there are approximately 10 larger wildlife tree clumps strategically planned (Figure 6.9 - left). Of course, more wildlife trees clumps would be left during harvest operations, but operator-chosen wildlife tree clumps at the ground level and can't be mapped yet. After the planner has operationalized the block, there are approximately 40 wildlife tree clumps planned (Figure 6.9 - right), in addition to the operator-chosen 8-12 wildlife trees per hectare that will be left during harvest operations.

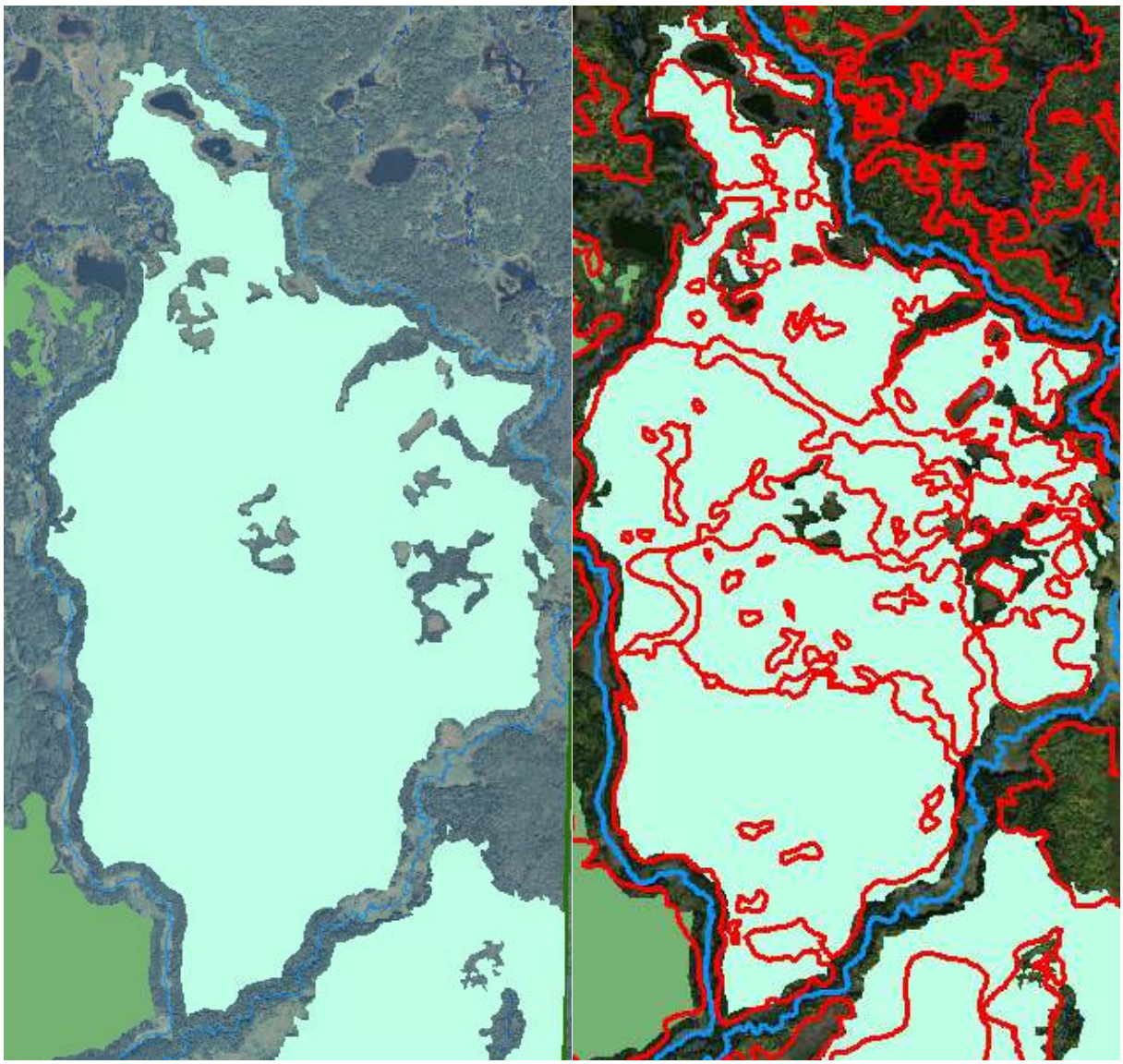

Figure 6.9 Planned wildlife tree clumps (strategic-left, and operational-right).

6.2.4.5 Aggregating Non-Operable Areas

In the centre of the Silver creek block, the computer leaves non-merchantable forest wetlands (Figure 6.10 - left) out of the scheduled harvest. These three wetlands are sized 1.5, 1.8, and 4.3 ha in area. However, the computer wants to harvest the wood in between these wetlands.

Therefore, the planner will often aggregate these non-operable areas into a single larger leave area (Figure 6.10 – right). Note that additional area has been aggregated to the west and to the east of the wetlands.

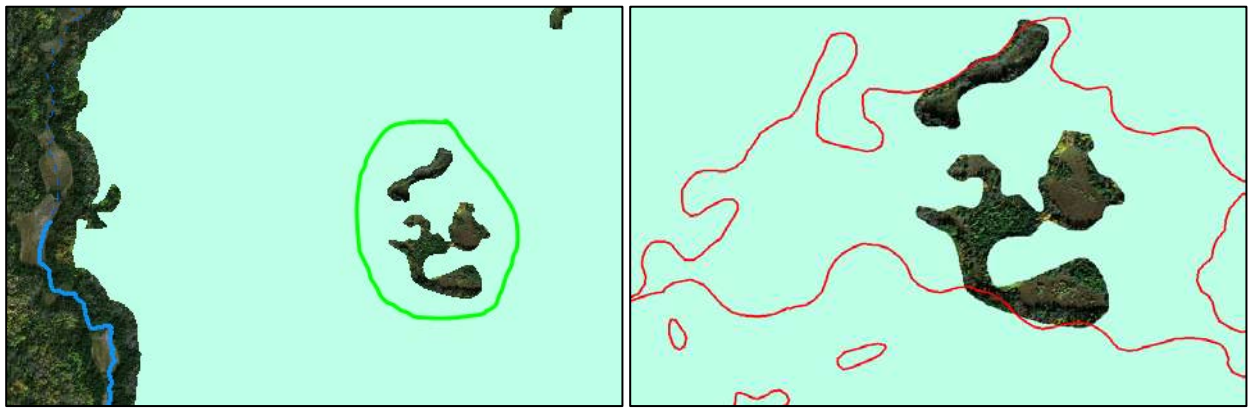

Figure 6.10 Non-operable areas (left) are aggregated by the planner (right).

6.2.4.6 Water Buffers

Strategically, water buffers are pre-determined in the land base file with a constant buffer width (100 m) on larger water features such as perennial creeks. Operationally, buffers can be variable-widths to match the terrain and trees and shrubs that protect the waterway. Also, intermittent creeks that do not appear on the inventory can be field identified on the ground and buffered.

On the south-east side of the Silver Creek block, strategic and operational buffers are compared. The strategic buffer is exactly 100 m all the time along the perennial creek and is shown as green-coloured imagery in Figure 6.11 – left. A variable-width operational buffer (70 m to 210 m wide) is detailed in Figure 6.11 (right) as follows:

a. Operational buffer width is 70 m. A smaller buffer is possible due to the terrain, and still provides significant protection to the creek.

b. Operational buffer width is 210 m. The larger buffer was chosen to ensure significant protection to the creek by trees, and not just shrubs.

c. Operational and strategic buffers are both 100 m.

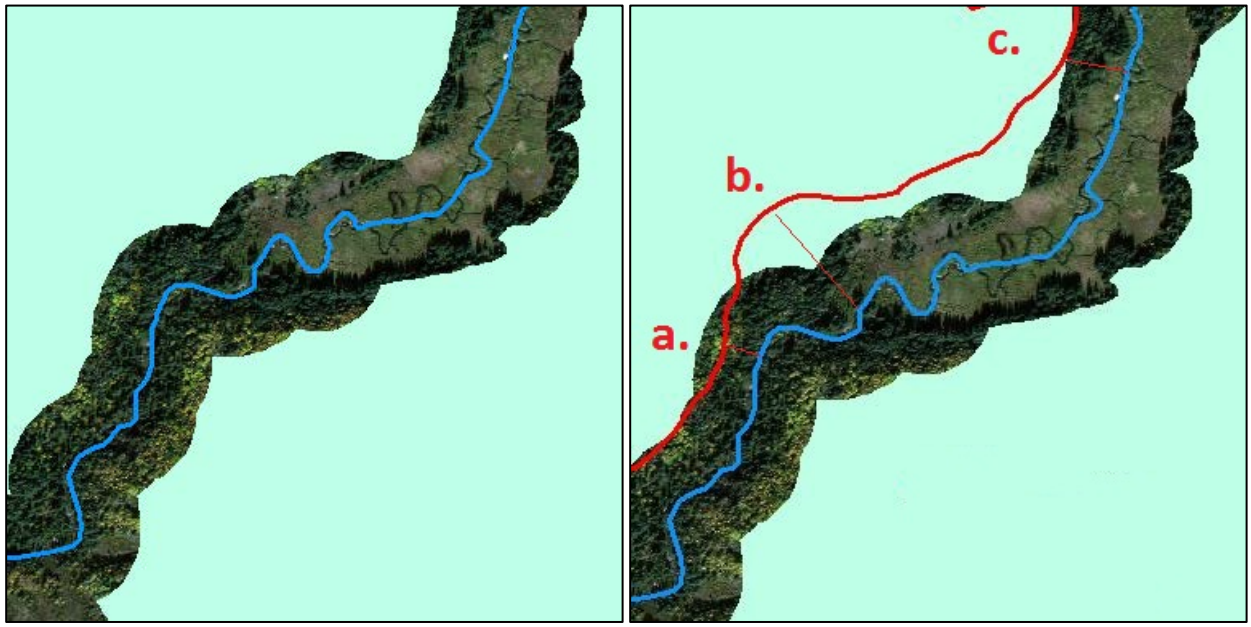

Figure 6.11 Water buffer example on Silver Creek block.

6.2.4.7 Adding small areas

Small areas outside the strategic harvest area sometimes make sense to add to the main block, if harvesting will 'trap' the small area. On the east side of the Silver Creek block, a 2.6 ha addition was operationally added to the block. If not harvested, this small area would be trapped between a perennial creek and regenerating cutover. To harvest this small area in the future, either the creek would have to be crossed or a new road made through regenerating forest.

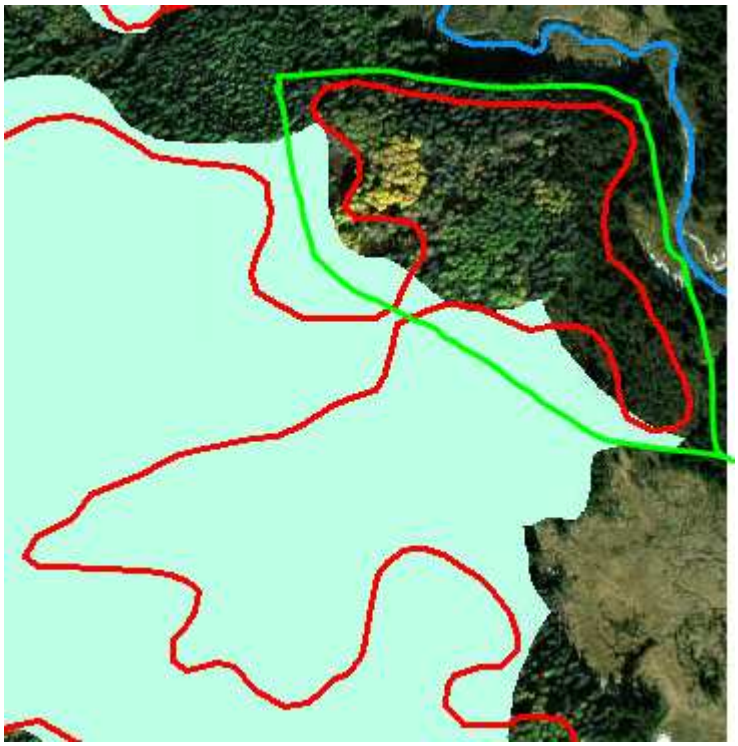

Figure 6.12 Small area added to the strategic harvest block.

6.2.4.8 Planning Example Summary

The Strategic Harvest Schedule is valuable at the landscape-level and provides many benefits. However, the many details of operational planning and making site-specific decisions based on a changing forest is far beyond what any computer can do. Therefore, an operational planner needs to use the Strategic Harvest Schedule as a guideline and template but then refine and improve the planning based on site-specific knowledge and experience (Appendix 2).

The actual harvested area of a cut block is typically less than the original planned area. Proposed block boundaries can decrease or increase in area, depending on PreHarvest Survey information, such as the presence of exceptional features. Most of the planning concepts detailed above (e.g. wildlife tree clumps, excluding non-merchantable areas) contribute to the actual area being smaller than the planned area. Good planning is more about the structure, arrangement, and connectivity of what areas you leave behind than it is about what gets harvested.

6.3. FMP Implementation Strategy

As described in Chapter 5, the Moose Emphasis scenario was chosen as the Preferred Management Strategy. Therefore, the Moose Emphasis scenario will be implemented as the template for sustainable forest management in Forest management Licence # 3 for Quota Holders and LP operations for the next 20 years.

By implementing the Moose Emphasis scenario, the mutually agreed upon forest management objectives (fully described in Chapter 5) can be managed sustainably:

- Moose habitat
- Roads
- Natural Range of Variation (seral stages by cover group)
- Watershed Limits
- Patch Size Distribution
- Cover Group
- Species-At-Risk (one bird species – Canada Warbler)
- Indicator Bird Species
- Marten Winter Cover

How the strategic Moose Emphasis scenario will be carried out as Operating Plans include:

- harvest operations;
- road development and access management;
- forest renewal; and
- forest health.

6.3.1. Harvest Operations

Harvest operations are an important part of implementing the Forest Management Plan. Specific guidelines for FML # 3 harvest operations are described in the Forest Operations - Standard Operating Guidelines (Appendix 1).

6.3.1.1 Criteria used in identifying and selecting areas for harvest

The Moose Emphasis Scenario that will be implemented builds upon the approved Baseline Management Scenario. The Baseline Scenario harvest pattern was modified to benefit moose habitat, while still meeting ecological and economic sustainability objectives. Moose forage (aspen and aspen-mixedwood 0 to 20 years old) will be intermixed with thermal cover, which is generally mature or old seral stage forest, to improve moose habitat.

6.3.1.2 *Overview of Annual Wood Requirements*

An overview of annual wood requirements in FML # 3 is shown in Table 6.3. This table is for the FML # 3 geographic area only (*i.e.* Forest Management Units 10, 11, and 13). Wood harvested outside FML # 3 (e.g. FMUs 12, 14, and private wood) is not included.

Table 6.3 Overview of annual wood requirements.

Licencee or Quota Holder	Product	* FMU	Softwood (m3)	Hardwood (m3)	Total Annual Volume (m3)	Comments
Spruce Products Ltd.	Sawlogs and chipperwood	13	165,430	12,743	178,173	Includes 10,000 m^3 special allocation hardwood
LP Building Solutions	Siding (OSB)	13	0	255,626	255,626	Hwd AAC**
All other Quota Holders	various	13	11,507	43,565	55,072	Includes 5000 special allocation hardwood
		Sub-totals	**176,937**	**311,934**	**488,871**	
Spruce Products Ltd.	Sawlogs and chipperwood	11	5,122	78	5,200	
LP Building Solutions	Siding (OSB)	11	0	89,909	89,909	Hwd AAC**
All other Quota Holders	various	11	527	2,017	2,544	
		Sub-totals	**5,649**	**92,004**	**97,653**	
LP Building Solutions	Siding (OSB)	10	0	7,850	7,850	Open crown land only/not including lease land AAC**
		Sub-totals	**0**	**7,850**	**7,850**	Hwd AAC**
		GRAND TOTALS	**182,586**	**411,788**	**595,374**	

* FMU - Forest Management Unit; ** ACC – Annual Allowable Cut

6.3.1.3 *Projected Harvest Area*

Harvest area by ecological strata (i.e. Habitat Element Curve strata) and age class for planning period one (1 - 10 years) is shown in Table 6.4 and Figure 6.13. The age classes are generally 20-year age classes, with a few exceptions. The first age class (0 to 50 years) is all the unmerchantable wood that is too young to harvest. The second age class (50 to 60 years) only has a 10-year range, due to the 50-year old harvest minimum age.

Table 6.4 Annual forecast of sequencing for the first 10-year planning period.

		Age Class (years)										
strata		0 50	50 60	60 80	80 100	100 120	120 140	140 160	160 180	180 200	200 +	*Strata Total Area (ha)*
S	SWD1	0	0	0	11	25	11	13	0	0	0	**60**
	SWD2	0	0	1	24	70	71	15	5	0	0	**185**
	SWD3	0	0	5	77	161	165	52	12	0	0	**474**
	SWD4	0	0	0	6	60	84	9	3	0	0	**163**
M	MWD1_M	0	0	0	0	0	0	0	0	0	0	**0**
	MWD2_M	0	0	3	42	127	62	8	0	0	0	**242**
	MWD3_M	0	0	0	1	3	2	0	0	0	0	**6**
N	MWD1_N	0	0	6	18	52	11	8	0	0	0	**95**
	MWD2_N	0	0	5	88	365	211	19	2	1	0	**691**
	MWD3_N	0	0	2	16	39	19	3	0	0	0	**78**
H	HWD1	0	4	68	34	137	0	0	0	0	0	**244**
	HWD2	0	19	375	347	897	46	0	0	0	0	**1,685**
	HWD3	0	17	272	34	44	1	0	0	0	0	**368**
	Age Class Total Area (ha)	**0**	**40**	**737**	**698**	**1,979**	**683**	**128**	**23**	**1**	**0**	**4,290**

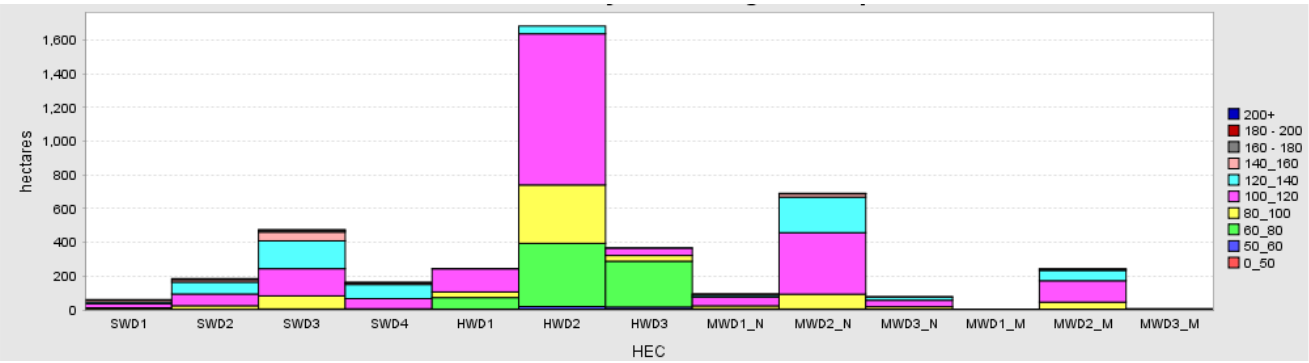

Figure 6.13 Annual harvest area by strata and age class for planning period 1 (1 to 10 years).

Note that the strata proposed to be harvested are in proportion to the strata on the landbase. HWD2 (aspen-hazel on mesic clay), MWD2_N, and SWD3 are the most common strata on the landbase and would be harvested in proportion to the landbase.
Harvest area by strata and age class for the second planning period (11 - 20 years) is shown in Table 6.5 and Figure 6.14.

Table 6.5 Annual forecast of sequencing for the second 10-year planning period.

		Age Class (years)										
strata		0 50	50 60	60 80	80 100	100 120	120 140	140 160	160 180	180 200	200 +	*Strata Total Area (ha)*
S	**SWD1**	0	0	11	1	22	5	0	1	0	0	**40**
	SWD2	0	0	38	13	60	96	36	9	0	0	**252**
	SWD3	0	0	94	29	75	95	65	22	4	0	**385**
	SWD4	0	0	0	9	29	78	28	1	1	2	**147**
M	**MWD1_M**	0	0	0	0	0	0	0	0	0	0	**0**
	MWD2_M	0	0	38	19	75	95	24	6	0	0	**256**
	MWD3_M	0	0	1	0	1	3	1	0	0	0	**6**
N	**MWD1_N**	0	0	8	10	28	27	7	0	0	0	**79**
	MWD2_N	0	0	27	57	340	420	56	6	0	0	**905**
	MWD3_N	0	0	4	10	33	31	5	0	0	0	**82**
H	**HWD1**	0	0	20	36	50	44	2	0	0	0	**153**
	HWD2	0	15	324	352	666	459	53	0	0	0	**1,870**
	HWD3	0	12	196	84	20	12	1	0	0	0	**324**
	Age Class Total Area (ha)	**0**	**27**	**761**	**620**	**1,400**	**1,366**	**277**	**44**	**5**	**2**	**4,501**

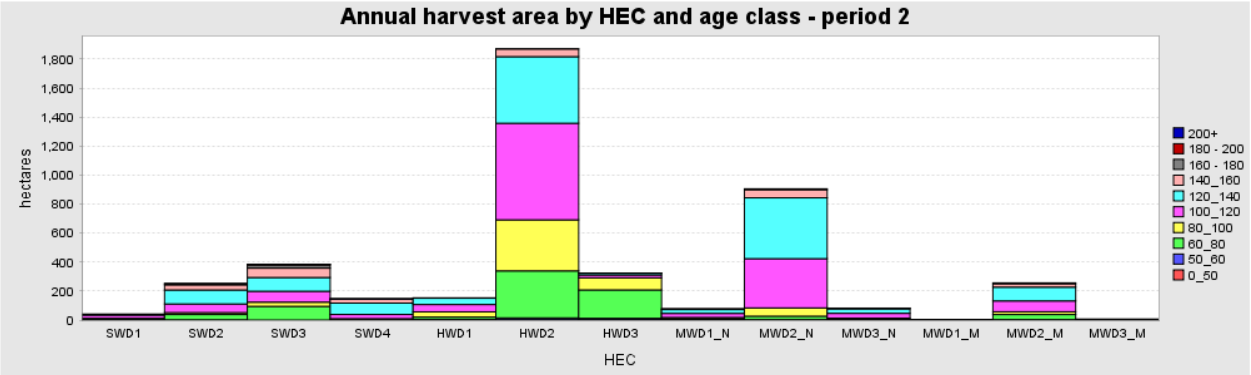

Figure 6.14 Annual harvest area by strata and age class for planning period 2 (11 to 20 years).

6.3.1.4 Harvesting Methods

The primary harvest method is Variable Retention harvesting. Variable retention harvesting provides a variety of wildlife habitats and helps conserve biodiversity at the stand level. The practice of variable retention harvesting retains both live and dead standing wildlife trees, protects understorey vegetation, and leaves coarse woody material behind after harvest. The characteristics of variable retention harvesting varies depending on the nature of the harvest area.

All harvest operations consist of mechanical logging operations. The harvest equipment used varies slightly, but typically consists of the following equipment by harvesting stage.

Felling – Feller bunchers are used to cut standing trees. A saw cuts each tree, while the accumulator arms allow for several trees to held and form a 'bunch'. The 'bunch' of trees is then laid on the forest floor (Figure 6.15).

Figure 6.15 Feller-buncher machine (left) and bunches of tree length ready for skidding.

Topping and limbing – Power saws or stroke delimbers are used to delimb the branches off the stems, and to cut off the tree's top. Power saws are more commonly used for topping and limbing hardwood, while softwoods are often stroke delimbed with a machine (Figure 6.16).

Figure 6.16 Topping and limbing with power saws (left) and a stroke delimber (right).

Skidding – A grapple skidder (Figure 6.17) is used to move bunched tree stems to roadside for processing and hauling.

Figure 6.17 Grapple skidder skidding softwood (left) and hardwood (right).

Slashing – Either a slasher or a processor head on an excavator processes tree-length stems (Figure 6.18). Hardwood tree-lengths are processed into 2.54 m (8 foot) lengths. Softwood tree-lengths that are sawlogs are processed into 5.1 m (16 foot), 3.8 m (12 foot), or 3.2 m (10 foot) lengths. Softwood chipperwood has variable lengths.

Figure 6.18 Slasher (left) slashes tree-length logs into 2.5 m bolts, a processor head on an excavator (right) performs the same task.

Loading- A swing loader on a tracked excavator is used to load processed logs onto a haul truck (Figure 6.19).

Figure 6.19 Swing loaders in action.

Hauling – Processed wood is then hauled to a mill. Trailer configurations include Super B (8 axle) (Figure 6.20), B-train (7 axle), or Tridem (6 axle).

Figure 6.20 Super B haul trailer with a load of 2.5 m aspen bolts.

6.3.1.5 Understory Protection Approaches

Understory protection of softwood strategies are dependent upon the density of softwood understory, as well as the softwood species. The methods used to protect softwood understory include (Province of Manitoba 2017):

- avoidance
- patch retention
- designated skid trails

Immature white spruce occupying the understory of the hardwood ecosystems is protected, when the density of white spruce was high enough to warrant understory protection (Appendix 3). Logging contractors are encouraged to leave softwood understory trees within variable retention clumps, wherever possible. Softwood understory protection is common in small localized areas, even within pure hardwood areas with only a few mature softwood trees.

6.3.2. Road Development and Access Management

6.3.2.1 Road Operating Practices

Road construction standards are outline in the Forest Roads and Crossings Standard Operating Guidelines (Appendix 4). Road types are defined by season of road use.

All-Season roads are designed for all-season use and include ditching and graveling the road surface. Existing provincial gravel highways and Rural Municipality grid roads are generally considered all-season.

Dry/Frozen roads typically have clay base. Sections of dry/frozen roads may need ditching and graveling. Traffic ceases on these roads after a significant rainfall and must wait for the road to dry out. Dry-frozen roads are the most common type of forestry road.

Frozen roads are winter-only roads that cross wet areas. Only when road is frozen can these wet areas be crossed in a portion of the winter season.

6.3.2.2 Future Roads

Under the Moose Emphasis scenario, it was modeled that 25% less new roads could be built to access the same volume of wood (*i.e.* the full allowable cut of softwood and hardwood). The estimated amount of new (candidate future) roads is summarized in Table 6.6.

Table 6.6 Length of roads by type and planning period in FML # 3.

Road Type	Road Length (km) Period 1 (1 10 yrs)	Road Length (km) Period 2 (11 20 yrs)
Candidate Future Roads	288.4	322.8
Existing All-Season	45.2	50.2
Existing Dry-Frozen	285.3	256.6
Totals	**618.8**	**629.6**

An overview map of the candidate futures roads for planning periods one and two (1-10 years and 11-20 years) combined is displayed in Figure 6.15.

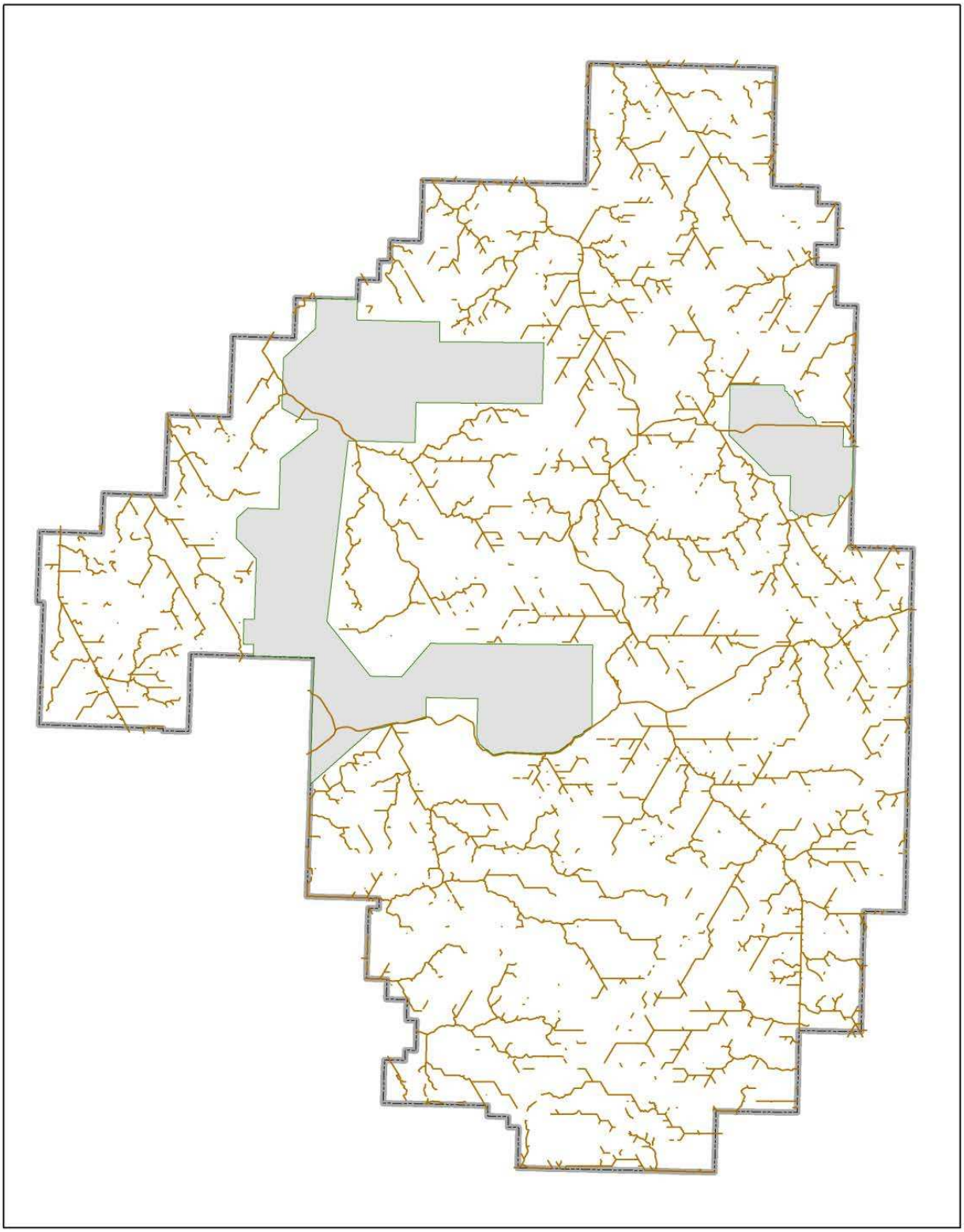

Figure 6.21 Existing and candidate future roads for planning periods one and two (20 years total).

6.3.2.3 *Road Related Activities*

Broad management strategies for road use are in the Forest Roads and Crossings SOG (Appendix 4), and the provincial forestry road management guideline (Manitoba Conservation and Water Stewardship 2012). Specifics on roads and access management are contained within individual Forest Road Development Plans (FRDP's) and the access management portion of the Operating Plan.

Water crossings are identified and prescribed at an operational level in the Operating Plans. The crossing prescriptions include detailed crossing descriptions, proposed crossing structures and photographs of the water course. Water crossings are not practical at the strategic level. Procedures for crossings are contained in the Forest Roads and Crossings Standard Operating Guidelines (Appendix 4). Forest road wetland crossings have an operational guide (Ducks Unlimited Canada 2014) to assist with maintaining the natural hydrologic flow of wetlands.

Wood stockpile and processing sites are handled at an operational level. These sites can change depending on mill requirements, suitability of potential sites, and weather. Stockpile sites are usually on private land, active harvest blocks, or gravel pit areas. These locations change depending on where harvest is occurring, season of harvest, and the need to stockpile. These ground-level details are handled operationally at the Work Permit or General Permit level (Appendix 5).

6.3.2.4 *Access Management*

Access management and its' relationship to wildlife is consistently the most significant concern. Therefore, a significant emphasis is placed on access. The Moose Conservation Closure (Regulation 122/2011) is yet another reason to closely manage access.

Access is managed cooperatively with the provincial Integrated Resource Management Team (IRMT) and the public. Existing or traditional access remains open, while all candidate future roads will be closed with berms, crossing removal, slash roll-back, and/or gates. Once harvesting and renewal activities are complete in an area, new forest access roads are closed or decommissioned.

6.3.3. Forest Renewal

An important part of forest sustainability is the forest renewal of all harvested areas. Strategically, the balance of aspen, mixedwoods, and softwood cover types across the landscape is also important to avoid large-scale conversion of the forest over time.

6.3.3.1 Forest Renewal Operating Practices

An overview of forest renewal operating practices is described in both the FML # 3 Hardwood Silviculture Standard Operating Guidelines (Appendix 5) and the Softwood Silviculture Standard Operating Guidelines (Appendix 6).

Some renewal practices are rarely used and are therefore not discussed further. These practices include tending and tree improvement. It is possible that these practices would be re-initiated in the future. The Manitoba Government is working to reinvigorate the tree improvement program due to the dwindling seed supply.

Mechanical site preparation methods are used on a site-specific basis to encourage natural or assisted regeneration of harvested areas. Pre-harvest survey and post-harvest field assessments are used to assist with making this decision. Typically, scarification using barrels and chains is used on jack pine and black spruce mixed conifer sites to prepare suitable planting microsites.

Planting softwood seedlings is done annually in FML # 3 by the Mountain Forest Softwood Renewal Company (MFSRC). Planting is usually done in May and June. Area planting without any site preparation is the most common method. Larger container stock is preferred, which helps the seedling outgrow the competing shrubs, herbs, and forbs.

Forest Renewal Assessments (softwood and hardwood) are done on 10-year old softwood sites, and three to five-year old hardwood sites. The survey system chosen by the province of Manitoba (Manitoba Sustainable Development 2019) is a systematic grid survey with a random start. 10 m^2 survey plots are laid out on a grid system, and then surveyed.

The criteria used in identifying and selecting areas for renewal and tending operations follows the guidance that 100% of all sites harvested will be renewed through either natural regeneration or by planting softwood seedlings. The criteria used in general is softwood sites are renewed to softwood, mixedwood sites get renewed to mixedwood, and hardwood sites are renewed to hardwood. This is the strategic strategy to balance cover types. Operational (ground-level) renewal is subject to site-specific criteria, as well as the influence of Province of Manitoba block-specific mitigation.

6.3.3.2 Forest Renewal Treatments

Renewal activities are linked to the overall management objective of balancing and maintaining cover types at the landscape-level. The implementation strategy relates to forest renewal treatments by strata. Forest renewal treatments by strata (*i.e.* H, N, M, S) vary by strata:

H -Hardwood - natural regeneration (LFN)

N – hardwood-mixedwood - natural regeneration (LFN) and or/planting softwood seedlings

M – softwood-mixedwood - planting softwood seedlings

S – softwood - planting softwood seedlings

Expected responses of forest renewal treatment by strata (*i.e.* S, M, N, and H) are shown in Table 6.7 for plantations. For example, if a **M** – softwood-mixedwood stand will be harvested then planted, it is expected to return to an **M** – softwood-mixedwood stand, 44% of the time. Other renewal possibilities for the **M** – softwood-mixedwood stand include becoming an S-softwood (31%), N hardwood-mixedwood (21%), or H - hardwood (4%). These percentages by post-harvest cover groups, are based on previous plantation success at the time of the survey

Areas planted to softwood seedlings are expected to maintain the softwood component of the pre-harvest strata across the landscape.

Table 6.7 Expected responses to plantation silviculture by cover group.

	Post Harvest Cover Group			
Pre Harvest Cover Group	**post-S**	**post-M**	**post-N**	**post-H**
pre-S	**62%**	29%	8%	1%
pre-M	31%	**44%**	21%	4%
pre-N	24%	48%	**23%**	5%
pre-H	8%	40%	33%	**19%**

Expected responses forest renewal treatment by cover group (*i.e.* S, M, N, and H) are shown in Table 6.8 for natural regeneration or Leave-For-Natural silviculture. For example, if an H - hardwood stand is to be harvested, there is a 91% chance it will regenerate to the same cover group H-hardwood. There is a small chance that the same H – hardwood stand could have enough softwood regeneration (without planting) that 6%, 2%, or 1% of the cut blocks would be N, M, or S, respectively.

Hardwood sites mostly regenerate to hardwood. Softwood sites under natural regeneration typically have less softwood success than planted softwood. The softwood cover group includes all softwoods, such as lowland black spruce and upland jack pine.

Table 6.8 Expected responses to Leave-For-Natural silviculture.

	Post Harvest Strata			
Pre Harvest Strata	**post-S**	**post-M**	**post-N**	**post-H**
pre-S	**51%**	34%	10%	5%
pre-M	28%	**56%**	8%	8%
pre-N	1%	6%	**19%**	74%
pre-H	1%	2%	6%	**91%**

A forecast of the treatment types and levels of activity for forest renewal planned for the FMP period of 20 years is shown in Table 6.9.

Table 6.9 Area of planned forest renewal treatments by planning period.

Planning Period	Leave-For-Natural (ha)	Plant Softwood Seedlings (ha)	Total Area (ha)
Period 1 (1-10 yrs)	2,887	1,403	**4,290**
Period 2 (11-20 yrs)	3,083	1,418	**4,501**

6.3.4. Forest Health

Insects and diseases are a natural part of forest ecosystems. Insects especially contribute to the food chain and are eaten by birds, bats *etc*. Insects also pollinate many flowering plants. However, it is important to know when population levels change from normal or endemic levels to localized extremes, or epidemic levels.

Harvest and renewal planning must be aware of the presence and severity of insects and disease to properly manage the forest and ensure adequate regeneration. Failure to account for insects and disease may have serious impacts on the future forest.

The best opportunity to identify any localized forest health problems is during operational field work, such as a Pre-Harvest Surveys and Forest Renewal Assessments. The Province of Manitoba's forest health requirements are followed by:

- training field staff to identify significant insects and diseases with help from Forest Health and Ecology section;
- tallying trees with health problems at each plot;
- rating each pest by tree species and severity level when traveling between plots; and
- sending forest health data to Urban Forestry, Forest Health and Field Services section for a 'coarse filter' screening.

Previous field work has found severe infestations of *Armillaria* root rot, western gall rust, forest tent caterpillar, hypoxylon canker, and poplar borer. Recently, an outbreak of spruce budworm has occurred in the south-west corner of the Duck Mountains.

6.4. CONCLUSIONS

The 20-year Forest Management Plan (FMP) provides strategic direction, including a strategic harvest layout for the Moose Emphasis Scenario for 20 years. The FMP will still be subject to the existing Province of Manitoba approvals and permits processes. This includes Pre-Harvest Survey, mitigation, an Operating Plan and written approval, followed by Work Permits. In addition, there is also Indigenous community, stakeholder, and public input.

The strategic harvest schedule is valuable at the landscape-level and provides many benefits. However, the many details of operational planning and making site-specific decisions based on a changing forest is far beyond what any computer can do. Therefore, an operational planner needs to use the Strategic Harvest Schedule as a guideline or template but refine and improve the planning based on site-specific knowledge and experience.

Strategically, the Moose Emphasis scenario can harvest the full Annual Allowable Cut, but with 25% less new roads. Operationally, the harvest schedule subsequent roads need to follow the strategic guidance of the Forest Management Plan. If we depart significantly from the strategic guidance, the 25% road reduction may not be achieved.

6.5. LITERATURE CITED

Ducks Unlimited Canada. 2014. Operational Guide – Forest Road Wetland Crossings. v 1.0. Edmonton, AB. 43 pp.

Manitoba Conservation. 2007. Manitoba's Submission Guidelines for Twenty Year Forest Management Plans. Manitoba Conservation. Edited by Forestry Branch. 200 Saulteaux Crescent, Winnipeg, MB. 24 pp.

Manitoba Conservation and Water Stewardship. 2012. Forestry Road Management. Forest Practices Guidebook. 200 Saulteaux Crescent, Winnipeg, MB. 29 pp.

Manitoba Sustainable Development. 2017. Protection of Softwood Understorey. Forest Practices Guidebook. 200 Saulteaux Crescent, Winnipeg, MB. 19 pp.

Manitoba Sustainable Development. 2019. Manitoba Forest Renewal Assessment Ground Methodology Supplementary Manual. 200 Saulteaux Crescent, Winnipeg, MB. 24 pp.

6.6. APPENDICES

APPENDIX 1. Harvest operating areas map – Spatial Harvest Schedule - Moose Emphasis Scenario

APPENDIX 2. Planning Standard Operating Guidelines

APPENDIX 3. Biodiversity Standard Operating Guidelines

APPENDIX 4. Forest Roads and Crossings Standard Operating Guidelines

APPENDIX 5. Forest Operations Standard Operating Guidelines

APPENDIX 6. Hardwood Silviculture Standard Operating Guidelines

APPENDIX 7. Softwood Silviculture Standard Operating Procedures

Moose Emphasis Harvest Scenario

- 1-10 yr SHS
- 11-20 yr SHS

FMU 12 & 14

FMU 14

FMU 12

FMU 45

FMU 43

FMU 11

FMU 13

FML 3

FMU 10

FMU 15

Novra

Indian Birch

Birch River

Lenswood

Bowsman

Swan River

Minitonas

Renwer

Briggs Spur

Cowan

Duck Bay

Pine Creek

Duck River

Pine River

Kenville

Durban

Benito

Garland

Winnipegosis

Ethelbert

Fork River

Ukraina

Sifton

Valley River

Boggy Creek

San Clara

Makaroff

Roblin

Bield

Shortdale

Valley River Reserve

Shevlin

Grandview

Ashville

Gilbert Plains

Dauphin

Eclipse

Dropmore

Inglis

Shellmouth

Cracknell

1:450,000

LP BUILDING PRODUCTS

LP Canada Ltd.

Swan Valley Forest Resources Division

STANDARD OPERATING GUIDELINE

PLANNING

Revised: June 22nd, 2016

Contents

STANDARD OPERATING GUIDELINES (SOG's)

1.0 General Overview

LP Canada Ltd. (LPC) is committed to working with surrounding communities that may be affected by forest management operations and to ensuring orderly development of the forest resource to accommodate forest values.

Originally LPC included a group of Standard Operating Procedures (SOP's) in Section 9 of the 10 Year Forest Management Plan (FMP). With the subsequent development of an Environmental Management System (EMS) for the Swan Valley Operations, it is appropriate to adapt the original SOP's into a complimentary set of Standard Operating Guidelines (SOG's) within the EMS.

LP Canada Ltd. is committed to the implementation of ecosystem based management within FML #3 and is presently developing the required infrastructure. This includes the development of an ecosystem based resource inventory, adjustments to planning and operational practices and the research necessary to achieve a better understanding of the ecosystems present and the processes occurring within them.

1.1 Sustainable Forest Management (SFM)

The Canadian Council of Forest Ministers (CCFM) began a process in 1993 to define, measure and report on the forest values Canadians want to sustain and enhance. The CCFM, along with technical and scientific advisors to lend support, consulted with officials and scientists of federal, provincial and territorial governments, experts from industry, the academic community, non-governmental organizations, the Aboriginal community and various other interest groups. The results of these consultations were documented in *Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators* (1995). The development of these criteria and indicators (C & I) was an important step in meeting Canada's domestic commitments on sustainable forest management.

The purpose of the Criteria and Indicators are to provide a common understanding and scientific definition of sustainable forest management in Canada. Together they form a framework for describing and measuring the state of our forests, forest management practices, values and progress towards sustainability. This information is then used to develop forest management policy and to determine areas where research is required to fill information gaps and develop new technologies. The C & I approach not only recognizes that forests are ecosystems but also realizes forests provide a wide range of social, economic and environmental benefits to Canadians and realizes the necessity of public education and participation in the process of sustainable forest management.

There are six criteria relating to sustainable forest management. Each criterion has been broken down into 27 elements to yield 83 indicators to help track progress in achieving sustainable development and social, economic and environmental objectives. The six criterion of SFM are:

- Conservation of biological diversity.
- Maintenance and enhancement of forest ecosystem condition and productivity.
- Conservation of soil and water resources.
- Forest ecosystem contributions to global ecological cycles.
- Multiple benefits of forests to society.
- Accepting society's responsibility for sustainable development.

LPC is striving towards sustainable forest management, as defined by the above criterion, in its forest management practices. These SOG's are a partial fulfillment of SFM. The Stakeholders Advisory Committee plays an integral role in the public participation, contribution of societal values and knowledge dissemination component of SFM. Pre-harvest surveys, permanent sample plots, ecological monitoring and research programs contribute to SFM by providing baseline data, site specific ecological information and enable LPC to identify areas where more information is required.

1.2 Stakeholders Advisory Committee

LPC established a Stakeholders Advisory Committee (SAC) at the beginning of the Ten-Year FMP process (1994) to ensure related concerns were discussed and addressed as early as possible. This ongoing committee includes representatives of provincial government departments, independent loggers, Timber Quota Holders, Duck Mountain Trappers Association, Metis organizations, Parkland Trails Snowmobile Association, environmental groups, First Nations, conservation groups, anglers, outfitters, cottage owners, and other representatives from various communities and organizations. The SAC has been important in helping define and develop the SOGs to be used throughout the planning and implementation of forest management operations within Forest Management License (FML) #3. The SAC has been instrumental in providing information during the preparation of detailed annual operating plans.

The SOGs are unique to FML #3. They have been developed with specific reference and compliance to Federal and Provincial legislation, regulations and guidelines, and the requirements and conditions of the FML #3 agreement signed in September 1994, with the Province of Manitoba. They are also consistent with the requirements as set out in Environment Act License 2191E issued to LPC in 1996.

Many of the provisions, options and approaches in these SOGs may be considered for other jurisdictions, but they cannot be considered as a precedent for those jurisdictions. These provisions are based on concerns and conditions specifically related to operations within FML #3. They take into account

potential future uses. They are an interrelated set of provisions, and not stand-alone solutions.

The Environmental Management System and SOGs ensure LPC meets or exceeds government regulations. They cannot, however, be considered a final position. Rather, they are part of a dynamic plan that will adapt or adjust as determined by legislation or societal attitudes, interests and concerns. As the SAC will assist LPC throughout the years in operational planning, ongoing review of the EMS and SOGs will be part of LPC's adaptive management planning.

1.3 Objectives of the SOG's

The EMS and SOGs provide a framework for the company to achieve and maintain a particular standard, as set out in these documents as well as the approved 10 Year FMP, Environment License 2191E and the FML #3 Agreement.

- The government's objectives will be met by the forest management planning process described in the EMS and the SOGs.
- Provide direction to LPC for planning, implementing and monitoring timber harvest operations on the forest management area.
- Outline the planning and operating standards of Ecosystem Based Management for timber harvest, road development, reclamation and integration of timber harvesting with other forest uses.
- Describe the planning and submission requirements for timber harvest operations.
- The EMS and SOGs are dynamic enough to provide sufficient flexibility to accommodate most site conditions. The principles in the EMS and SOGs are considered to be the normal expectations for harvest operations.
- The EMS and the SOGs are expected to be applied using sound judgment based on practical experience and technical competence.
- The EMS and SOGs provide documentation, structure and accountability associated with a particular activity.

Ecosystem based management refers to the development of management systems that attempt to simulate ecological processes with the goal of maintaining a satisfactory level of diversity in natural landscapes and their pattern of distribution in order to ensure the sustainability of forest ecosystems and forest ecosystem processes (Canadian Council of Forest Ministers, 1997).

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2.0 Planning Framework

2.1 Forest Management Planning

Numerous forest resource values are considered by LPC in the design of harvest blocks at the stand and landscape levels. These include watersheds, exceptional features, protected areas, silviculture, aesthetics, wildlife, fisheries, harvesting economics, site features, stand type and the needs of other users.

Harvest block boundaries are located along natural boundaries and usually follow natural terrain and/or stand boundaries to minimize the effect on the aquatic and terrestrial ecosystems, aesthetics, the potential for blowdown.

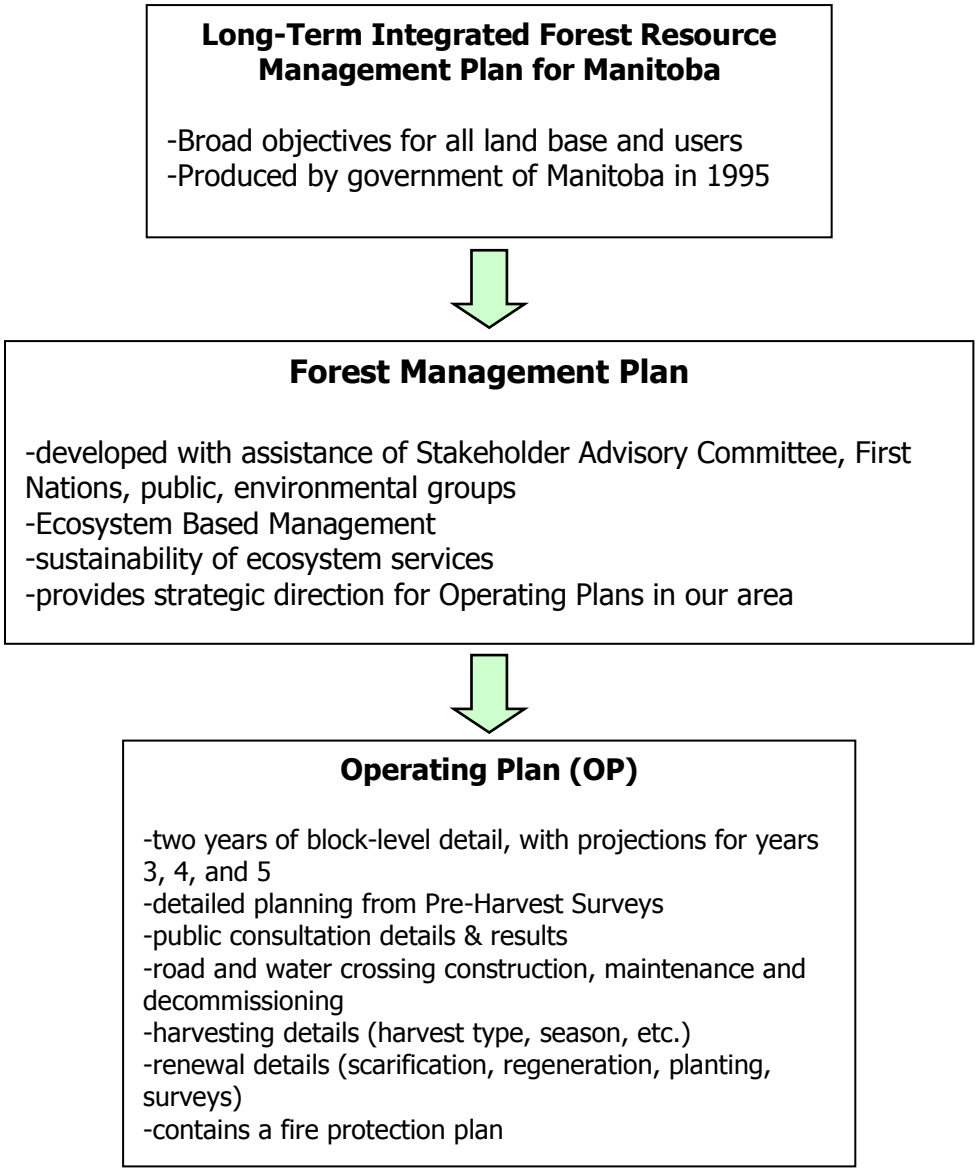

Figure 1. Forest Management Planning Process

2.2 Long Term Forest Management Plans

Long-term Forest Management Plans (FMPs) are developed with assistance from the Stakeholder Advisory Committee (SAC) and must meet or exceed applicable Federal and Provincial Acts and Regulations. The Long Term FMP objectives are:

- To sustain resources, enhance productivity and improve environmental quality and human health.
- To improve and diversify income and job opportunities through the management, protection and development of land and water resources.
- To manage resources and related activities to preserve development options for the future.

- To protect ecological systems, maintain the genetic diversity of species, and preserve the resilience and productivity of the natural environment.

A forest management plan is a document containing pertinent information and prescriptions by which forest policy and objectives are translated into a set of specific treatments on a forest landscape for a specified period of time.

- Describes objectives and strategies to manage the ecosystems within FML #3 over the long term, while recognizing and considering the needs of other resources and users of those resources
- Illustrates ecosystem-based management
- Demonstrates sustainability of ecosystem services
- Provisions to address aesthetic, ecological, historical or cultural considerations
- Forest renewal and stand management activities
- Monitoring plan

The forest management planning process includes a series of forest management plans covering various time periods. Typical planning time frames range from 1 – 20 years in length in order to allow for longer-term, intermediate-term and shorter-term perspectives on harvesting and reforestation activities. Short term plans (Operating Plans) typically provide details on two years' road building, harvest, and silvicultural operations along with a projection for future years. Long term plans (10 – 20 years) typically provide more information on landscape issues and solutions, and models sustainability of timber and non-timber resources several rotations into the future.

2.3 Operating Plans

Operating plans are prepared within the controlling framework of the Long Term FMP, and the Standard Operating Guidelines (SOGs). These are developed in accordance with various Federal and Provincial policies and guidelines.

Planners design proposed harvest blocks by taking many factors into consideration, such as stand type, terrain, water and exceptional features. These blocks receive a Pre-Harvest Survey to collect a wide variety of site-specific ecosystem data. Harvest survey data is reviewed and proposed harvest blocks may be edited (*e.g.* boundary and/or prescription change) if warranted.

The layout of harvest areas, construction and tenure of access roads, harvest scheduling, renewal, and road construction operations will be conducted in an environmentally sensitive manner. Considerations for structure retention, understory protection, mitigating impacts on fish and wildlife species and minimizing impacts of insects and diseases on regenerating forests are incorporated into planning.

Harvest blocks receive a unique number. A Pre Harvest Cutblock Prescription is generated for each proposed harvest block. Maps and volume information are generated for harvest blocks by operating area.

3.0 Block-Level Planning

Forest planners consider many factors when developing potential harvest blocks. Detailed harvest information is provided for all harvest blocks. For those blocks falling within areas identified as having a severe erosion risk, or found to be such during the pre-harvest surveys, further information will be prepared on managing these areas. This information is provided as mutually agreed upon between LPC and the Province of Manitoba during the review of the OP. The detailed harvest information provided will include necessary information to address the specific resource considerations for the harvest block.

3.1 Season of Harvest

Forest planners consider and assign a season of harvest (i.e. winter, dry/frozen, or all-season) to each cutblock. Permanent moisture conditions (i.e. Soil Moisture Regime and drainage class) of both the proposed cutblock and proposed access are considered.

3.2 Operability

Specific operating conditions and the type of harvest equipment to be used is based on the nature of the soils and soil moisture conditions, slope, timber volumes, stand structure, contractor availability, season, potential for erosion and safety considerations.

3.3 Water Features

Water features (*e.g.* wetlands, lakes, streams, etc.) will be considered and managed appropriately during the planning phase. Forest along water features may be managed or buffered, depending upon site-specific characteristics and the social values of the water feature.

3.4 Cover Type

Deciduous and coniferous cutblocks are planned according to provincial guidelines and the silvics of the tree species.

Mixedwood cutblocks are harvested with the following in mind:

- Where there is merchantable hardwood in a conifer stand, the hardwood is harvested in conjunction with the conifers.
- Where there are conifers in a hardwood stand, the conifers may be left as single trees or clumps for wildlife purposes, or they may be harvested simultaneously.
- Where an isolated bluff of conifers is present in a large contiguous hardwood block, it may be harvested or left for seed trees.

3.5 Integrated Harvesting Practices

As detailed in the FML agreement, harvesting operations are integrated as much as possible to accommodate softwood and hardwood harvest. Volumes harvested by quota holders and licencees, are coordinated to provide full use of the timber resource, as well as to minimize duplication of effort.

3.6 Contingency Planning

Contingency blocks are supplemental areas identified for potential harvest if there are unforeseen shortfalls of wood that may be caused by early breakup, late freeze-up or wet summer soil conditions. Contingency blocks are specified in the OP in the same detail required for harvest blocks.

3.7 Second-Pass Cutblocks

Second and third pass removals are allowed only when the adjacent previously harvested cutblocks have reached as defined in the province of Manitoba's guidelines. The timing of harvest can be shortened or lengthened for specific sites if there are wildlife habitat concerns, watershed protection, timber loss from disease or blowdown, with the Province of Manitoba's consent.

4.0 Forest Protection

Fires, insects, and diseases are natural disturbances that affect the forest. LPC attempts to minimize the negative effects of these natural disturbances by implementing cooperative and pro-active approaches to planning.

4.1 Fire Protection Plan

Under Paragraph 23 of LPC's Forest Management License Agreement (1994), the Province of Manitoba is responsible for all forest protection services including protection from fire, insect and disease within FML # 3. The Mountain Forest Section has many values to a variety of stakeholders, and therefore must be protected against wildfires. LPC cooperates fully with the Province of Manitoba in the prevention, detection, and suppression of forest fires within the Mountain

Forest Section. The Fire Protection/Suppression Plan, as part of the Annual Operating Plan includes detail regarding equipment, manpower and transportation facilities available for the prevention, detection and suppression of forest fires in FML # 3, as well as Forest Management Units 12 and 14.

4.2 Insects and Disease

Insects and diseases are part of forest ecosystems. Insects are a very important part of the food chain and are eaten by birds, bats and other forest dependent species. Insects also pollinate many flowering plants. It is important to know, however, when insect population levels change from normal (or endemic) levels to localized extreme (or epidemic) levels. Harvest and renewal planning must be aware of the presence and severity of insect and disease infestations to properly manage the forest and ensure adequate regeneration. Failure to account for insects and disease may have serious impacts on the future forest. The best opportunity to identify any localized forest health problems is during field work, such as during a Pre-Harvest Survey, plantation assessment, regeneration survey, or free-to-grow survey. LPC follows the Province of Manitoba Forest's Health and Ecology requirements by:

a) training field staff to identify significant insects and diseases with help from the Province of Manitoba;

b) tallying trees with health problems at each plot;

c) rating each pest by tree species and severity level when traveling between plots;

d) sending forest health data to the Province of Manitoba Forest Health for a 'coarse filter' screening.

LPC field surveys have, in previous years, found severe infestations of *Armillaria* root rot (*Armillaria mellea*), Western gall rust (*Endocronartium harknessii*), forest tent caterpillar (*Malacosoma disstria*), *Hypoxylon* canker (*Hypoxylon mammatum*) and poplar borer (*Saperda calcarata*).

In cooperation with the province of Manitoba, LPC has adjusted its Operating Plan to accommodate for several outbreaks of pest infestations over the past several years. LPC will continue to work cooperatively with the Province of Manitoba Forest Health and Ecology in this regard.

The Forest Management License (FML) Agreement between the Province of Manitoba and LP Canada Ltd. (LPC) states that: *23 B ii) Similarly, an annual [insect and disease] plan shall also be submitted on Feb. 1st each year*. This annual insect and disease plan outlines any activities the Company proposes for the protection and/or management of any known insect or disease problem on FML 3. Instead of submitting an independent insect and disease plan on Feb. 1st of each year, insect and disease site-specific strategies are integrated into the Annual Operating Plan, which is submitted on Feb. 28th of each year.

4.3 Forest Protection Planning Requirements

Issues relating to forest protection are included in the OP where a concern may exist. Concerns that may be addressed include:

- Sensitive sites or critical habitats or sites vulnerable to insect and disease damage in future years of the harvest projection.
- Management prescriptions for harvest and renewal strategies as related to forest protection.
- Planning rationale in support of forest renewal objectives especially as they apply to insect and disease protection measures.
- Minimizing impacts of insects and disease on regenerating forests.

5.0 Design Considerations for Wildlife Management

5.1 Wildlife Habitat Planning

Wildlife habitat is strongly considered while planning cut and leave areas. LPC can influence habitat, but LPC does not manage wildlife populations. The province of Manitoba is responsible for wildlife management.

5.2 Wildlife Guidelines

Commitments to meeting the wildlife objectives will be shared by LPC, the province of Manitoba and the SAC. Each group will strive to ensure that the intents and objectives pertaining to flora, fauna, ecosystem management and conservation within FML #3 are met. To assist in meeting the objectives, all participants should be aware of relevant guidelines. Guidelines which are used in wildlife planning are The Forest Management Guidelines for Riparian Management Areas, Terrestrial Buffer Guidelines, The Forest Management Guidelines for Wildlife in Manitoba, Roads Management, and The Recommended Fish Protection Procedures for Stream Crossings in Manitoba.

LPC's biologist, provincial biologists, and the SAC will make recommendations on detailed aspects of wildlife planning and management during the preparation and review of OPs. The above guidelines are a minimum requirement. Where possible, operations and methods will be adapted to better manage habitat planning.

6.0 Recreational and Cultural Planning

6.1 Planning Considerations

To ensure that other ecosystem services continue within the FML area, the following are considered in the planning process:

- access
- alternate uses
- stakeholder considerations
- parks/closed areas
- exceptional features
- buffers (aesthetic, riparian, research etc.)
- adjacency
- heritage sites
- natural boundaries
- topographic considerations
- insects & disease
- block size

6.2 Recreational Considerations

FML #3 provides a wide range of benefits to local communities and Manitobans, independent of forestry. The Duck and Porcupine Mountains are renowned as superb hunting, fishing, and camping areas. The area has supported a strong trapping tradition and is an attractive destination for wilderness and cultural enthusiasts. Recognition of other resource values in FML #3 will be documented and integrated into various Forest Management Plans. Recreational, commercial, and cultural planning requirements will be addressed early in the process.

Outfitters operate in the licence area. Bear bait sites and other outfitting infrastructure such as access trails will be managed or mitigated with individual outfitters. Deer outfitters will likewise be incorporated into the planning process or mitigated, as appropriate.

Snowmobiling and ATV use have become popular activities in the FML #3 area. Many of the trails used are old logging roads that may occasionally be utilized for logging purposes. When and if this occurs, the various clubs will be contacted in advance and arrangements made to minimize disruptions.

Proposed harvest blocks adjacent to traditional trails may incorporate buffers along the trail, to ensure the aesthetics are maintained.

6.3 Heritage Resource Considerations

Heritage resources are works of nature or human activity having prehistoric, historic, cultural, natural, scientific, or aesthetic value. The potential impacts to heritage resources from forestry operations focus upon the disturbance of sites and their contents. Roads have a greater potential impact to heritage resources than harvest blocks.

Pre-Harvest Surveys may identify potential heritage resources sites. The required mitigation measures for significant sites are determined by the Historic Resources Branch in consultation with LPC.

LP Canada Ltd.

Swan Valley Forest Resources Division

STANDARD OPERATING GUIDELINE

BIODIVERSITY

Revised: June 20th, 2016

Contents

STANDARD OPERATING GUIDELINES (SOG's)

1.0 General Overview

LP Canada Ltd. (LPC) is committed to working closely with surrounding communities that may be affected by forest management operations and to ensuring orderly development of the forest resource to accommodate all forest values.

Originally LPC included a group of Standard Operating Procedures (SOP's) in Section 9 of the 10 Year Forest Management Plan (FMP). With the subsequent development of an Environmental Management System (EMS) for the Swan Valley Operations, it is appropriate to adapt the original SOP's into a complimentary set of Standard Operating Guidelines (SOG's) within the EMS.

LP Canada Ltd. is committed to the implementation of ecosystem based management within FML #3 and is presently developing the required infrastructure. This includes the development of an ecosystem based resource inventory, adjustments to planning and operational practices and the research necessary to achieve a better understanding of the ecosystems present and the processes occurring within them.

1.1 Sustainable Forest Management (SFM)

The Canadian Council of Forest Ministers (CCFM) began a process in 1993 to define measure and report on the forest values Canadians want to sustain and enhance. The CCFM, along with technical and scientific advisors to lend support, consulted with officials and scientists of federal, provincial and territorial governments, experts from industry, the academic community, non-governmental organizations, the Aboriginal community and various other interest groups. The results of these consultations were documented in *Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators* (1995). The development of these criteria and indicators (C & I) was an important step in meeting Canada's domestic commitments on sustainable forest management.

The purpose of the Criteria and Indicators are to provide a common understanding and scientific definition of sustainable forest management in Canada. Together they form a framework for describing and measuring the state of our forests, forest management practices, values and progress towards sustainability. This information is then used to develop forest management policy and to determine areas where research is required to fill information gaps and develop new technologies. The C & I approach not only recognizes that forests are ecosystems but also realizes forests provide a wide range of social, economic and environmental benefits to Canadians and realizes the necessity of public education and participation in the process of sustainable forest management.

There are six criteria relating to sustainable forest management. Each criterion has been broken down into 27 elements to yield 83 indicators to help track progress in

achieving sustainable development and social, economic and environmental objectives. The six criterion of SFM are:

- Conservation of biological diversity.
- Maintenance and enhancement of forest ecosystem condition and productivity.
- Conservation of soil and water resources.
- Forest ecosystem contributions to global ecological cycles.
- Multiple benefits of forests to society.
- Accepting society's responsibility for sustainable development.

LPC is striving towards sustainable forest management, as defined by the above criterion, in its forest management practices. These SOG's are a partial fulfillment of SFM. The Stakeholders Advisory Committee plays an integral role in the public participation, contribution of societal values and knowledge dissemination component of SFM. Pre-harvest surveys, permanent sample plots, ecological monitoring and research programs contribute to SFM by providing baseline data, site specific ecological information and enable LPC to identify areas where more information is required.

1.2 Objectives of the SOG's

The EMS and SOGs provide a framework for the company to achieve and maintain a particular standard, as set out in these documents, as well as in the approved 10 Year FMP, Environment License 2191E and the FML #3 Agreement.

- The government's objectives will be met by the forest management planning process described in the EMS and the SOGs.
- Provide direction to LPC for planning, implementing and monitoring timber harvest operations on the forest management area.
- Outline the planning and operating standards of Ecosystem Based Management for timber harvest, road development, reclamation and integration of timber harvesting with other forest uses.
- Describe the planning and submission requirements for timber harvest operations.
- The EMS and SOGs are dynamic enough to provide sufficient flexibility to accommodate most site conditions. The principles in the EMS and SOGs are considered to be the normal expectations for harvest operations.
- The EMS and the SOGs are expected to be applied using sound judgment based on practical experience and technical competence.
- The EMS and SOGs provide documentation, structure and accountability associated with a particular activity.

Ecosystem based management refers to the development of management systems that attempt to simulate ecological processes with the goal of maintaining a satisfactory level of diversity in natural landscapes and their pattern of distribution in order to ensure the sustainability of forest ecosystems and forest ecosystem processes (Canadian Council of Forest Ministers, 1997).

The SOGs are unique to FML #3. They have been developed with specific reference and compliance to Federal and Provincial legislation, regulations and guidelines, and the requirements and conditions of the FML #3 agreement signed in September 1994, with the Province of Manitoba. They are also consistent with the requirements as set out in Environment Act License 2191E issued to LPC in 1996.
Many of the provisions, options and approaches in these SOGs may be considered for other jurisdictions, but they cannot be considered as a precedent for those jurisdictions. These provisions are based on concerns and conditions specifically related to operations within FML #3. They take into account potential future uses. They are an interrelated set of provisions, and not stand-alone solutions.

The EMS and SOGs ensure LPC meets or exceeds government regulations. They cannot, however, be considered a final position. Rather, they are part of a dynamic plan that will adapt or adjust as determined by legislation or societal attitudes, interests and concerns. As the SAC will assist LPC throughout the years in operational planning, ongoing review of the EMS and SOGs will be part of LPC's adaptive management planning.

2.0 General Habitat Management Objectives and Guidelines

Sound wildlife habitat management attempts to maintain viable habitat for wildlife species throughout a designated area. All areas within FML#3 are subject to the following management objectives and guidelines.

2.1 Biodiversity Objectives

Biodiversity objectives to be met are:

- To manage wildlife habitat biodiversity at a coarse-filter or landscape-level;
- To maintain, or enhance, the biodiversity of terrestrial and aquatic communities and associated ecological processes;
- To maintain or enhance the integrity and diversity of riparian habitats and/or established aquatic buffer zones;
- To manage forest management activities in order to minimize disturbance on wildlife habitat;
- To report and protect critical habitat for plant and animal species considered at risk, threatened, or endangered in each area.

With the support of current research, LPC has established a set of standard operating guidelines for biodiversity that will be used throughout FML 3 during forest management activities. As new information and research becomes available, LPC will adapt guidelines and specifications to ensure biodiversity objectives are continually met.

2.2 Variable Retention

Variable retention is the maintenance of structural elements of the original forest in order to facilitate the conservation of both vegetation and animal biodiversity. Various structural elements of the forest include large live or dying trees, standing dead trees or snags, woody debris, understory vegetation, such as shrubs, herbs and mosses. Depending on forest management objectives for each cutblock, some of these structural elements can be maintained individually or as combined elements in forest patches or clumps.

2.2.1 Live Trees

Large diameter live and dying trees provide habitat for a number of animal species. The retention of large diameter trees in cutblocks provides short-term habitat requirements for canopy-loving species and long-term habitat requirements for primary and secondary cavity dependant species. Through time as the regenerating forest grows, live trees retained from the original harvest become future sources of snag and coarse woody debris habitat. Many species of birds, insects, amphibians, reptiles, small mammals and some fur-bearing species depend on snag habitat for all or part of their daily life requirements. Therefore, the planning and implementation of live trees is essential for the conservation of biodiversity in harvested areas over time.

2.2.2 Dying or Standing Dead Trees (Snags)

Standing dead trees in various stages of decay provide habitat for a variety of animal species. Specifically, there are differences in trees used for nesting and trees used for feeding. Primary cavity nesters, which excavate a new cavity each year, usually select living or partially dead hardwoods for nesting purposes. Most feeding by these birds occurs on partially dead or fully dead hardwood and softwood trees. Bole diameter and tree height are important characteristics of cavity tree selection and appear to vary with each species of bird. Most cavity dependent mammals are secondary cavity users (i.e. they use existing tree cavities). Snags also contribute to woody-debris recruitment which provides habitat for animal species living above and below the forest floor. The maintenance of snag structure in harvested areas is critical when managing for biodiversity due to the assortment of habitats snags can provide through time.

2.2.3 Coarse Woody Material

Coarse woody material also provides habitat to a myriad of forest animal species. Coarse woody material is used as cover habitat, feeding habitat, nesting and breeding habitat and also provides for suitable microclimates. In aquatic habitats, woody material is a source of nutrient inputs over time, and is also used as cover and nesting habitat for a variety of fish species. Through the maintenance of snag structure and methods used to log and delimb trees, an adequate source of coarse woody debris can be left in harvested areas.

2.2.4 Understory Vegetation

The maintenance of understory vegetation such as immature softwood, shrubs, herbs and mosses is also critical in achieving biodiversity objectives within a harvested area. Understory vegetation provides for structural variability offering a multitude of habitats, as well as providing for more microclimatic conditions both in terrestrial and aquatic environments.

2.3 Distribution of Variable Retention within Cutblocks

Implementing in-block retention strategies can be achieved by simply adjusting the density and spacing of the structural elements of the forest that need to be retained (Sougavinski and Doyon 2002). Two methods for accomplishing this are:

1. Dispersed Retention (Single Tree) – which refers to a uniform distribution of retained structural elements across a harvest block, and

2. Aggregate Retention (Wildlife Tree Patch) – which refers to the distribution of patches containing a combination of retained structural elements within the harvest block.

The two methods described can be used alone or can be combined in order to maintain landscape connectivity once the stand is harvested. Aggregate or patch retention provides for structurally diverse islands with a climatologically moderated habitat. Dispersed or single tree retention can provide stepping stones between these islands.

LPC is currently conducting forest operations in order to maximize landscape connectivity by combining the dispersed and patch retention strategies. The following guidelines provide a planning and operational framework in order to achieve wildlife habitat diversity within harvested areas of FML 3.

2.4 Operating Guidelines for Wildlife Habitat Biodiversity

- In cutblocks larger than 10 ha, 8-12 trees/ha on average per block, will be retained as wildlife trees, as a minimum requirement. Wildlife trees are live or dying trees that should be a minimum of 25 cm diameter at breast height (dbh). Smaller trees can be left when no larger diameter trees are present within the stand. Retention of large trees, over 45 cm dbh, is encouraged in order to provide the most suitable trees for a variety of cavity-dependent birds and mammals.

- Trembling aspen and balsam poplar are the preferred tree species for cavity nesters. However, white birch and various conifer species should be retained to provide feeding cavities, escape cover, and contribute to biodiversity within the block. Conifer cavity trees not only provide thermal and security cover but also contribute to long-term snag structure as the regenerating forest stand reaches maturity. Non-merchantable trees (trees with a high degree of stem rot, trees that would be difficult to process due to growth form, etc.) should be retained for wildlife trees where possible. Retention of only white birch trees is not adequate for wildlife tree habitat provision due to the possible die-back of birch following harvest. They are also not a preferred species for cavity nesting. Wildlife trees are retained within a cutblock not only to provide habitat for the present, but more importantly to provide snags over the next 30-40 years as the stand regenerates.

- An aggregation of wildlife trees, dying and/or standing dead trees (snags), and understory vegetation must be retained in patches of varying sizes across the cutblock (Table 1). Patches can be retained around low lying wet areas, softwood understory, along inoperable slopes, and along in-block streams and swales. In block situations where these attributes are not present, LPC may designate patch location on the ground prior to harvest. Patches must be left undisturbed by logging equipment unless otherwise directed by LPC and the Province of Manitoba.

Table 1. Patch Size Classes (adapted from Sougavinski and Doyon 2002).

Patch Class	***Patch Size (ha)***	***Approximate Number of Trees***
Small Patches	.01 to.14	5 – 70
Medium Patches	.141 to .26	71 – 125
Large Patches	>.26	>125

- Wildlife trees should be distributed throughout the block, both as single trees and in clumps (clumps are also defined as wildlife tree patches, see Table 1). Since most cavity users are territorial, it is important to retain a relatively uniform distribution of cavity trees throughout each block. On larger cutblocks (defined as cutblocks larger than 10 Ha), where present, clumps of mature mixed deciduous and conifer species should be retained. Trees that are retained to provide support for softwood

understory protection, biodiversity, stream buffers, line of sight buffers, buffers around nests, mineral licks or other significant features will be considered to contribute to the provision of wildlife trees and in-block structure.

- Wildlife tree patches in larger blocks will be retained to provide habitat diversity. To maximize the effectiveness of these leave areas, activities associated with logging operations will be kept to a minimum where possible. Leave areas should be located within 400 m of contiguous forest to encourage utilization. For instance, pine marten have been found to avoid large areas of open habitat and rarely venture more than 500-1000 m from uncut forest areas.

- LPC recognizes that many wildlife species depend heavily on snags and downed woody debris. LPC will strive to maintain snags for foraging habitat and wildlife trees to provide nesting opportunities in its operations, recognizing that it must first consider the safety of its contractors and conform to Manitoba Workplace Safety and Health regulations. LPC staff will promote the maintenance of snags and wildlife trees with the public, its contractors and Manitoba Workplace Safety and Health. In situations where the retention of snags could be dangerous for other forest workers, snags can be topped at approximately 2.0-2.5 m in height.

- Leave patches, in addition to other forest structure retained, should be no more than 400 m apart to provide cover for wildlife, unless hunting concerns can be mitigated using alternative methods, such as slash dispersal on roads, berms, gates, and/or legislated road closures.

- To encourage the use of cutovers by wildlife and to mitigate hunting pressures, cutblocks should be designed to reduce long, unobstructed lines of sight. Retention of structure by single stems and patches of trees (wildlife tree patches) or topographic features such as small hills can be left to facilitate this.

- Snags and coarse woody debris provide habitat for many species and are necessary to sustain elements of biological diversity. Silvicultural practices that maintain abundant coarse woody debris are encouraged. In order to provide large pieces of decaying wood within cutblocks, trees are topped and limbed at the tree stump. In areas where slash loading is a concern, the provision for coarse woody debris may be waived.

- In designated harvest blocks small piles of tops and limbs and slash debris will be retained within block boundaries between 50 m and 100 m from dense softwood stands to provide habitat for small mammal species. This provision is established to help maintain known pine marten populations, as well as to contribute to the maintenance of stand wildlife biodiversity.

- Small merchantable stands surrounded on at least three sides by meadow, shrub lands, or streams and lakes may be excluded from logging operations and left as cover or mature forest cover.

- During planning, block design will ensure forested corridors are retained for wildlife movement between various seasonally used habitats.

- All post-harvest activities will be consistent with habitat and wildlife management, objectives, and guidelines.

3.0 Forestland Raptors and Herons

Where raptor or heron nests are located and confirmed, the following guidelines will apply. Raptors use habitats ranging from bottomland to upland sites and from mature stands to recent clearcuts. In this respect, forest management and raptor habitat management are not in conflict. The key to maintaining a diversity of forestland raptors is to maintain a mixture of forest types at a large enough scale in various successional stages. Great blue herons also deserve special management considerations because they are colonial nesters that rely on large, mature forest stands close to the aquatic habitat where they feed. Great blue herons prefer stands of tall trees for nesting. A colony site will be reused and should continue to support herons as long as the site and birds remain undisturbed, and adjacent wetlands remain productive.

3.1 Eagles

When a tree with a large raptor nest is identified during a Pre-Harvest Survey, an uncut buffer of 20 m should surround it.

Nest management for bald eagles and golden eagles involves concentric buffer zones centered on the nest site (Figure1), each with forest management activities that become less restrictive at greater distances from the nest. Buffer zones encompass a radius of 400 m around an eagle nest. An inner zone with a radius of 100 m is maintained as a sanctuary where only those actions essential to protect the site are permitted, and must be conducted during the non-nesting period (early September to late January). Single-tree selection or small patch cutting is permitted in the second zone of 100-200 m from the nest if conducted during the non-critical period when the birds are in residence. Care should be taken to maintain all potential nest and perch trees within this zone. In the outer zone, 200-400 m from the nest centre, all activities are again curtailed during the nesting period (April to August), but there are no timber-harvesting restrictions other than preserving roost trees or potential nest trees.

3.2 Herons

Management of great blue heron colonies involves buffer zones similar to those recommended for eagles (Figure 1). The inner zone should extend 100 m from the edge of the colony. Within this zone, and within the colony itself, there should be no tree harvesting or disturbance except that essential to maintaining the colony and the site. Any such activities must be conducted during the non-nesting period from early September to late January. Recreational activities of all forms are prohibited during the nesting period, from early April to late August, within the colony and inner zone.

In the second zone of 100-200 m from the edge of the colony, limited selection or patch cutting can occur during the non-nesting period. Care must be taken to protect all potential nest trees and ensure their wind firmness. Within the outer zone of 200-400 m from the edge of the colony, high disturbance activities such as road construction, harvesting, and site preparation, are prohibited during the nesting period.

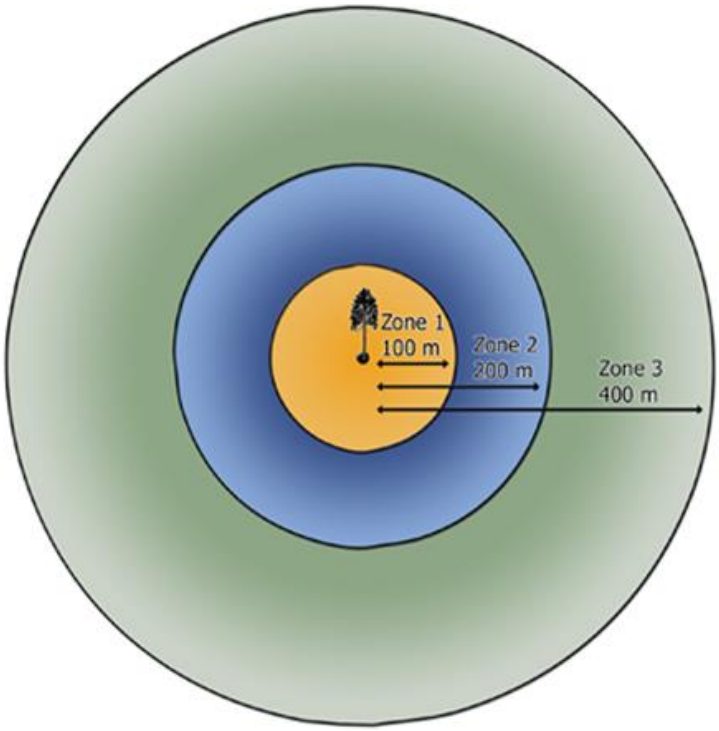

Figure 1. Nest management zones for bald eagles and great blue herons.

4.0 Aquatic and Riparian Habitats

There are several types of aquatic and riparian habitats in FML#3, all of which require certain levels of protection. Riparian habitat may have to be managed differently for each site. Before the AOP review, all riparian habitats in the vicinity of harvest blocks will be identified and specific management options set for each. Riparian habitats are important for a variety of species such as furbearers, small mammals, birds and large game.

The objectives specific for aquatic and riparian habitat protection are:

- To allow free and unobstructed fish passage through stream crossings so that fish may migrate to spawning, rearing, feeding, over wintering, or other critical areas without harmful delay.
- To protect stream bottom and banks from accelerated erosion processes to minimize disturbance to fish and fish habitat.
- To avoid impairment to the physical condition of fish and their habitats which may result from the introduction of hazardous construction materials or any deleterious substance into the stream community.
- To protect habitat diversity and any unique and seasonally critical habitat commonly associated with riparian and aquatic areas.
- To prevent the harmful alteration, disruption or destruction (HADD) of aquatic habitat
- To maintain navigability as necessary

Guidelines specific to construction of stream crossings are presented in the Roads and Major Structures SOG. However, all the applicable objectives in this section are in addition to those specified in that SOG. The following guidelines apply primarily to logging operations near all aquatic habitats in FML#3:

- Buffers will be retained along rivers, creeks, lakes, critical wildlife habitat (nests, mineral licks) and along specific roads. However, these may be managed (selectively harvested, tended and reforested) where the condition of timber warrants and where approval is granted. When buffers are designed, consideration will be given to the intended function of the buffer over the long-term. Buffers deteriorate as trees age and decay (breakup), and therefore become susceptible to insect infestations or fire. Fire or insect infestations may spread into an adjacent regenerated area causing further disturbance. Depending on its purpose, the size or width of a buffer may vary. Buffers may be widened from those specified in the guidelines to account for steep slopes, soil types and vegetative cover.

- Standard buffer widths that do not protect enough critical riparian habitat will be widened as required for each site.

- Aquatic habitat includes the area up to the normal high-water mark.

5.0 Specialized and Unique Habitat

Special habitat identified before or during harvest will be maintained and protected to meet wildlife objectives. Plans will be developed which help address management needs for a particular site. Habitats given this special designation may include, but are not limited to, calving sites, mineral licks, caves, colonial-nesting sites, remnant prairies, and meadows. Block boundaries will be moved to exclude these areas from the harvest block, or reserves will be left around these areas in accordance with the *Forest Management Guidelines for Wildlife in Manitoba.* Excluded areas will receive special attention if they provide species with seasonal habitat for the purposes of calving, denning, and winter feeding. Where logging operations are conducted near sensitive areas, attempts will be made to harvest at times that do not coincide with seasonal activities.

6.0 Endangered Plant and Animal Species and Plant Communities

Where a plant or animal species, or plant community in any category under *the Endangered Species Act,* or COSEWIC is identified in FML#3, either before or during harvest, exclusion zones to protect the particular resource will be required. Any species, plant community, or unique feature present in FML#3 that is classified as endangered, threatened, or at risk will be reported and protected.

7.0 Literature Cited

Sougavinski S, Doyon F. 2002. Variable retention: Research findings, trial implementation and operational issues: final version Synthesis Report. Sustainable Forest Management Network, Edmonton, AB. 51 pp.

LP Canada Ltd.

Swan Valley Forest Resources Division

STANDARD OPERATING GUIDELINE

FOREST ROADS AND MAJOR STRUCTURES

Revised: August 30th, 2018

Contents

STANDARD OPERATING GUIDELINES (SOG's)

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1.1 Sustainable Forest Management (SFM)

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1.2 Objectives of the Specifications & SOG's

The EMS and SOGs provide a framework for the company to achieve and maintain a particular standard, as set out in these documents as well as the approved 10 Year FMP, Environment Licence 2191E and the FML #3 Agreement.

- The government's objectives will be met by the forest management planning process described in the EMS and the SOGs.
- Provide direction to LPC for planning, implementing and monitoring timber harvest operations on the forest management area.
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The EMS and SOGs ensure LPC meets or exceeds government regulations. They cannot, however, be considered a final position. Rather, they are part of a dynamic plan that will adapt or adjust as determined by legislation or societal attitudes, interests and concerns. As the SAC will assist LPC throughout the years in operational planning, ongoing review of the EMS and SOGs will be part of LPC's adaptive management planning.

2.0 Background and Objectives

This document includes information pertaining to general operating guidelines used in the development, maintenance and decommissioning phases of forest access roads in Forest Management License Area #3 (FML 3). Detailed forest road development plans are presented in Annual Operating Plans (AOP) which are submitted to both Federal and Provincial Government Agencies for review, mitigation and subsequent approval. These plans include information on road classes, right-of-way (ROW) widths, road lifespan, access control (if any), road closure/ retirement plans and all watercourse descriptions and proposed crossing types to be used along the access route. All forest access road and water crossing information included within the AOP is stored in a geographical information system (GIS) database known as Woodlands the System.

LPC has recognized the potential effects on terrestrial and aquatic environments associated with forest road development and water crossings and is committed to implementing best management practices and ensuring compliance with Federal and Provincial laws, regulations and guidelines to avoid or minimize environmental effects from forest road development. Therefore, the guidelines presented within this document will develop a framework that will assist LPC in implementing sustainable forest management practices by ensuring the following key objectives are achieved in the planning, operation and decommissioning phases of forest road development activities in FML 3. These key objectives are:

- Maintain water quality and prevent deposition of slash, debris and sediment into aquatic environments;
- Maintain biodiversity in both terrestrial and aquatic environments;
- Minimize disturbance to fish-bearing or potentially fish-bearing habitats;
- Maintain natural surface run-off and stream flow patterns;
- Maintain fish migration and water flow within active water crossings;
- Protect and maintain known unique and critical habitats;
- Minimize loss of productive forest lands;
- Protect traditional and cultural resources identified.

3.0 Forest Road Planning Process

Several criteria are taken into consideration when forest roads are initially designed on digital aerial photos during the planning phase of road development. These are:

- topography
- location and types of watercourses and wetlands,
- proximity to lakes and unique features,
- critical wildlife habitat locations,
- location of existing roads and trails
- cultural features or other protected areas
- number of cutblocks to be accessed
- season of use
- other users

Once a road system is designed, LPC staff ground truth the designed road system to ensure that the proposed road location will not conflict with any of the aforementioned criteria. The road will then be given a classification based on the level of access required within the operating area and season of harvest.

Table 3.1 Forest Access Road Classification

Road Type	Road Class	Description
All Weather Roads	I and II	Class I and II roads are all-weather roads. Class I roads are graveled for 20 years or more. Class II roads are graveled for up to 20 years. Roads in this group require precut rights-of-way of 45m and 30m respectively before roads are constructed.
Dry Weather Roads	Classes III and IV	Class III and IV roads are operable under dry weather. Class III roads provide access to harvest areas for two to seven years. They are low grade roads with some grade work and ditching where necessary, and may include gravel. Class IV roads provide access to harvest areas for one to five years.
Seasonal Roads	Classes V and VI	Class V roads are trails with little to no development and are typically winter roads.

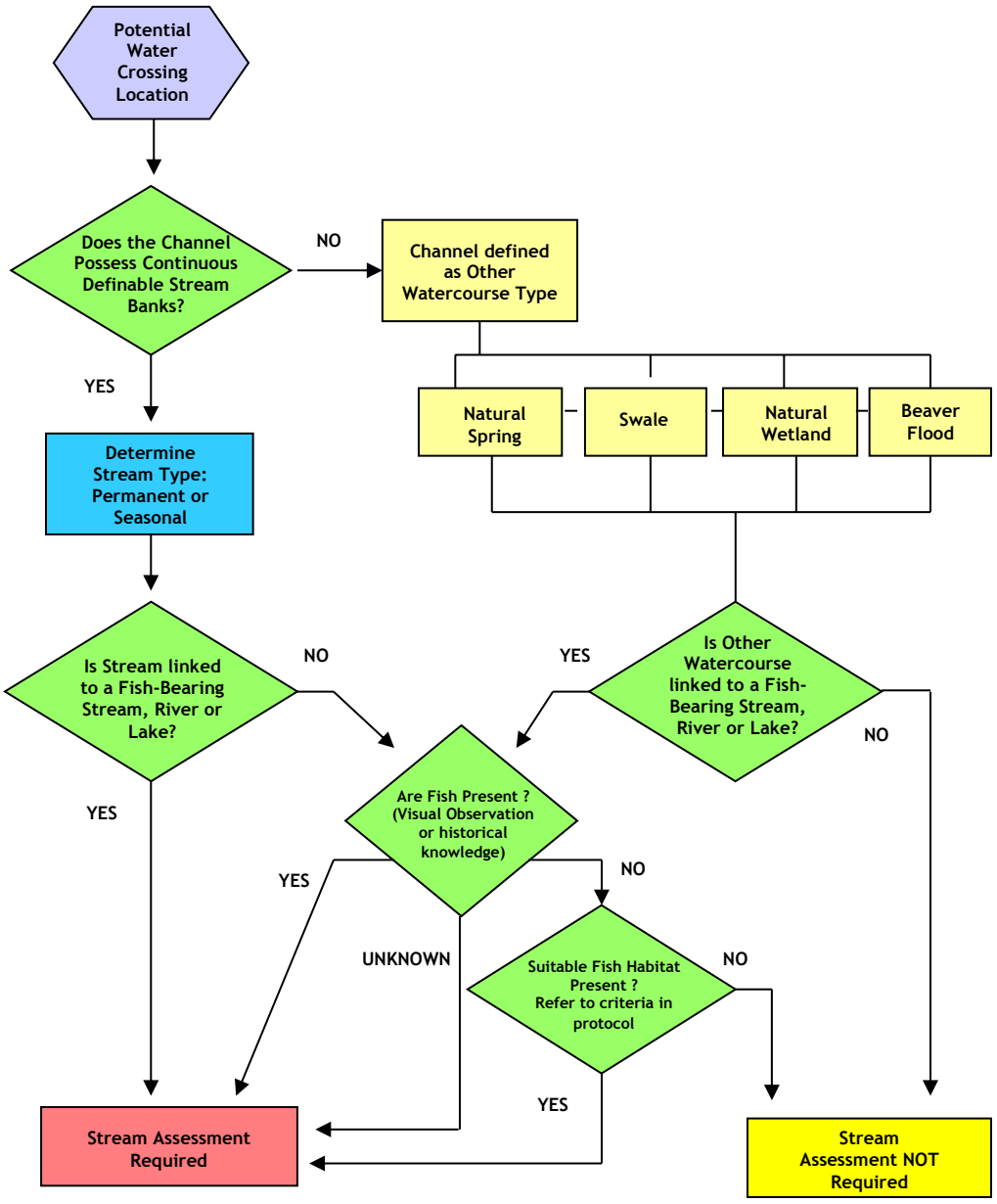
During the field inspection, LPC staff will document characteristics of all water crossings that exist along the proposed road location and digitally photograph the proposed point

of crossing, upstream and downstream portions of the watercourse. Decisions are later made by the Area Planner whether or not the proposed water crossing locations require a more comprehensive assessment that would examine both the physical and biological characteristics of the watercourse.

Several criteria are used to make that decision which are based on both physical and biological components present within the watercourse and direct or indirect linkages to known fish bearing streams, rivers or lakes (see Figure 1). If a comprehensive assessment is required, it will be completed a year prior to proposed road construction to ensure all the information collected is used to make informed decisions regarding the proposed location of crossing, the water crossing type and erosion control measures to be used, start –up date for construction, length of time the crossing will be in place, and rehabilitation measures that will be required to restore the site back to a near natural state.

All this information is then synthesized into an access management prescription for the operating area, pre-mitigated by LPC, Department of Fisheries and Oceans, Manitoba Conservation and the SAC. The AOP is then submitted to both the Federal and Provincial Governments for final review.

Figure 3.1 Fish-Stream Identification Process



4.0 Forest Road

4.1 General Road Construction Guidelines

- Forest access roads will be constructed on stable soil types and located away from major waterbodies and/or watercourses, where possible, to minimize potential effects on aquatic habitats. Forest areas known to support unique or critical habitats and/ or sensitive cultural heritage sites will be avoided entirely.
- To reduce the number of cut and fill operations, forest roads will be constructed on natural benches, moderate slopes and ridges in order to minimize forest disturbance, where possible.
- When constructed, forest road ditches will be directed into adjacent forest vegetation, in order to minimize the potential for sediment to be transported directly into the watercourse. The forest vegetation will help filter any sediment carried by surface runoff before the water enters the stream channel. Exposed soil material in road ditches must be stabilized using surface roughening techniques and/or seeding. These methods will prevent the potential for erosion to occur through time.
- All debris accumulated through road clearing and construction operations is to be stored away from any watercourse or waterbody to prevent the material from potentially entering these areas.

4.2 Forest Road Construction Standards

Table 1 shows minimum construction standards for all classes of roads. Attributes that vary between classes, but are applicable to all include safe design speed, width of right-of-way, ditches, culverts, bridges, road use, and term of life. The table also shows road construction planning and practices, retirement proposals, and access control and closures. If existing roads are upgraded or abandoned roads are reused, the road must be meet the appropriate standards for the class of road it is to be upgraded to.

4.3 Forest Road Development Operations

Guidelines for clearing, construction and re-vegetation are presented in Table 1 - Road Construction Guidelines.

4.3.1 Clearing

The width of road right-of-ways (ROW) will be determined by LPC's road construction and maintenance needs and by site specific environmental considerations consistent with Table 1. The following factors will influence ROW clearing widths:

- Visual screening for wildlife and aesthetics.
- Need for road grade drying.
- Unstable and difficult terrain for construction.

- Safety concerns.

The organic horizon and herbaceous vegetation will be maintained on the approaches adjacent to the watercourse crossings, where possible. Top soil will be piled apart from logging debris and used for road and bared landing reclamation, where feasible.

Road and trail construction within 100m of the high-water mark of any permanent stream, and 30m of an intermittent stream or natural spring will be avoided. In situations where construction can not be avoided, careful planning is required in order to minimize the potential for erosion and sedimentation from occurring.

Associated road construction activities such as borrow pits, landings, camp and storage sites in buffer zones will be avoided.

4.3.2 Road Construction

Road backslopes will have a regular profile from the top of the cut to the bottom of the ditch with no hanging banks or sharp cut ditches. Ditches will be constructed to the same grade as the road and be sufficiently deep to drain the subgrade unless limited by topography.

LPC will keep the number of borrow pits and gravel pits developed for road construction and maintenance to a minimum. The use of existing pits will be a priority. All gravel pits will require the appropriate permits from the Province of Manitoba, as well as Manitoba Energy and Mines (MEM). Consideration will be given to maximizing habitat potential of borrow pits during rehabilitation. Gravel pits will not be located near groundwater source areas, care will be taken to avoid contaminant spills in gravel pits.

Run-off ditches and other erosion control devices will be installed during road construction and maintained to:

- Minimize water movement and erosion along ditches, on the road surface and on cut-and-fill slopes.
- Direct water from the RoW into the surrounding vegetation in as short a distance as possible.
- Provide drainage as required, for water from springs or other seepage areas.
- Avoid direct ditch drainage into watercourses.

Final erosion control measures will take place after road construction. This may include re-vegetation, seeding, establishment of silt fence, and removal of unstable fill material.

Site disturbance will be minimized during road construction to reduce the extent of reclamation required during road abandonment.

4.3.3 Road Maintenance

Class I-IV roads will be maintained in order to facilitate the safe transport of raw wood products to existing road systems (municipal and provincial roads). These environmental and operational considerations will be followed:

- All season roads to have a crowned surface to provide adequate drainage and to prevent road erosion
- Runoff ditches to be kept open at all times
- Ensure road material does not enter any watercourse while grading; minimize the removal of gravel from road surface.
- Careful practices will be applied when grading on or near water crossing structures.

During active logging operations, monitoring of road conditions and water crossings occurs on a continual basis.

4.3.4 Road Abandonment

The regulation of the use of existing access is a significant concern in natural resource management, particularly for the protection of wildlife and wildlife habitat. Wildlife can be affected from access development through increased hunting pressure, and decreased habitat use on or adjacent to access corridors due to increased vulnerability to predation and vehicular collisions. For some species, major transportation corridors or wide rights-of-way (RoW) can also act as deterrents or barriers to movements.

As the relative significance of such effects depends on the behavior of an individual species, access closures are often focused on key species. Some species may be regionally significant and sensitive to disturbance or may exhibit highly localized habitat use both temporally and spatially. Therefore, physical means to close or minimize access to protect wildlife and wildlife habitat can vary in nature and timing of use.

Access controls may also be implemented where resource road deterioration such as rutting results from uncontrolled public use, particularly during wet conditions or spring breakup. They have also been used as a means of controlling chronic erosion and run-off problems on RoWs, where surface disturbance from off-road traffic prevents a stabilizing mat of vegetation from developing on steeper slopes. Such measures are of particular importance in the vicinity of water crossings, where sediment laden run-off can be introduced from RoWs into watercourses to the detriment of aquatic habitats.

4.3.4.1 Permanent Road Abandonment

Upon permanent abandonment or closure of roads, areas that may have been affected by road construction will be returned as close to their original state as possible. Abandonment may include:

- Removal of watercourse and drainage structures;

- Re-contouring to an acceptable land form;
- Cross-ditching to disperse runoff and suspended sediments into vegetated areas;
- Rollback of retained clearing debris and stripped topsoil;
- Re-vegetation or reforestation or both;
- Following winter operations, windrowed grader banks of snow may be pushed back at identified locations to prevent spring runoff from forming channels/gullies in roadbed.

Consideration will be given to the following when deciding whether all-terrain vehicle (ATV) access into an area should remain:

- Silviculture treatments that may be required.
- Any further requirements for research, development or monitoring.
- Wildlife concerns.
- Recreation opportunities.
- Fire control and management.
- Erosion control.
- Trapline access and other public or commercial uses.

4.3.4.2 Temporary Road Abandonment

Temporarily abandoning roads required for access to subsequent-pass harvest blocks will restrict four-wheel-drive access. This may include, but is not restricted to:

- Barricade placement and impediments with appropriate signage for the access restriction;
- Removal of watercourse crossings and drainage structures and backsloping of approaches; and
- Stabilization of all un-vegetated slopes with rollback (pulling debris such as logs and stumps back onto road), seeding to approved reclamation species and cross-ditching to disperse runoff and suspended sediment into undisturbed areas.

5.0 Standard Operating Guidelines for Water Crossings

5.1 General Guidelines

The following specific guidelines are to be used in the construction of water crossings within FML 3 and outside LPC operations.

- The crossing location should be free of downed woody material and be positioned at the narrowest point along the straight segment of the reach.
- The crossing location must be positioned at right angles to the watercourse and where there is enough area to construct gentle, direct and stable road approaches.

- Water crossings must provide uninhibited access for fish migration to both upstream and downstream habitats year round.
- In areas known to support or potentially support fish, portable bridges, snow and ice crossings or open bottom culverts are preferred.
- The removal of riparian vegetation along proposed crossing locations must be kept to a minimum on newly constructed forest roads.

All watercourse crossings will be installed with the objective of maintaining water quality and the stream environment.

Where construction equipment must cross a watercourse before or during the installation of a crossing, they will do so at only one location to minimize the number of crossings needed, ensuring no impact on fish habitat. In most cases pipe bundles will be used for the passage of equipment over these areas.

Logging debris, soil or any other deleterious material will not be deposited into, or pushed through, any watercourse, or onto the ice of any watercourse.

Work associated with the installation of culverts and bridges will be timed to avoid fish migration, spawning and incubation periods.

All watercourse crossings will conform to the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, and Recommended Procedures for Protecting Fish Habitat in Lakes and Streams in Forest Cutting Areas.

5.2 Culvert Crossings

Culvert crossings are typically installed during dry conditions in the spring, summer and autumn months. In some cases, small PVC culverts may be used to assist continuous flow during winter months within a winter snow and ice crossing. The following are general procedures and considerations for culvert installations:

- Culvert crossings will be designed to support between a Q2 and a Q100 flood event based on the lifespan of the crossing.
- Culvert installations will be planned for periods of low flow; if watercourse is flowing, flow will be blocked temporarily to enable dry installation.
- Large boulders or rocks will be removed from streambed in order to prevent culvert damage.
- While maintaining the original slope of the watercourse, the culvert will be embedded approximately 10% of its diameter.
- Geotextile may be laid underneath culvert if suitable base material is not present.
- Suitable backfill material is then placed around culvert and compacted to ensure culvert stability.

- The inlets and outlets may be rip rapped or re-vegetated if conditions warrant (slope, flow, channel width etc.).

5.3 Bridge Crossings

Bridge crossings often prescribed are engineered portable structures that can be installed with relative ease. Typical construction considerations for forest road bridges are described as follows:

- Bridge footings will be constructed out of stabile material to prevent sedimentation. Logs, timbers and soil wrapped in geotextile are some examples of appropriate footings.
- Wing walls will be constructed on all bridge installations and will remain in place during unfrozen conditions (spring, summer, and fall).
- Disturbance to the existing streamside vegetation will be minimized during construction. This will ensure natural re-vegetation after decommissioning as well as stabilization while the structure is active.

5.4 Snow and Ice Crossings

Temporary snow and ice crossings are common structures constructed during winter operations. The following guidelines/considerations are implemented during the construction of snow and ice crossings:

- Construction of snow and ice crossings occurs during freezing temperatures for water.
- Snow that is being pushed into watercourse must be free from dirt and or logging debris.
- Clean snow may be hauled in from an outside location if not present on site.
- Water may be pumped onto snow to strengthen and stabilize crossing.
- During deactivation a trench is constructed in order to allow for unobstructed flow during the spring melt.

5.5 Water Crossing Deactivation

Once harvesting is complete and the forest road is to be deactivated, all water crossings along the road may be removed. The following deactivation activities vary by site and include one or more of the following procedures:

- The establishment of sediment control fences on land and instream where required;
- Removing the structure (culvert or bridge);
- Removal and sloping of fill used to construct crossing;
- Sloping the roadbed away from the watercourse;
- Track walking the slopes;
- Installation of cross ditches to divert runoff from roadbed into standing vegetation;

- Stabilization of the exposed soil by spreading grass seed and covering with either Rolled Erosion Control Products (RECP), straw mulch or slash debris from harvesting and road construction activities;
- Permanent (long term) decommissioning can also involve the planting of trees and shrubs, as well as other bioengineering techniques;
- Snow and Ice crossings are decommissioned by digging a shallow trench in the ice to prevent spring runoff from backing up and scouring the banks on flowing streams. On swales the snow and ice is allowed to melt;
- Once the work is completed, the site is then monitored on a semi-annual basis to ensure that the soil stabilization techniques applied are working effectively.

APPENDICES

Appendix 1.1 LP Canada Ltd. Road Construction Standards

Road Description		Environmental Protection Guidelines								
		Detailed Plan Preparation	Field Layout	Design and Construction Guidelines						
				Right-of-Way (max. distances- normal conditions)			Alignment			
Road Class	term of Life			Clearing Width	Road Surface	Drainage Ditch	Sight distance	Slope of road/ditch see note 2	Design Speed	Borrow Pits
I	Permanent Year-round access for 20+ years	Detailed design plan on AOP maps. . Types of structures for water crossings, erosion control measures, and rehabilitation plans required.	Centreline marked.	45m or less	8.5m As specified in AOP	Rounded or scraper	Less than 1km	2:1	90km per hr	Location identified before construction commences and site tested for materials and ground water levels before clearing of borrow area. Dog-legged access or access constructed at an angle with buffer to off right-of-way should be incorporated by variable width and recontouring. Use of small borrow pits incorporated into right-of-way where possible
II	Permanent year-round access for up to 20 years	See Class I	See Class I	30m	As specified in AOP	Rounded or scraper	Less than 1km	2:1	80km per hr	See Class I
III	Permanent dry or frozen periods for 2-20 years	See Class I	See Class I	20m	As specified in AOP	Rounded or scraper	Less than 1km	2:1	60km per hr	See Class IV permanent
IV	Permanent year-round or seasonal access for more than 5 years	See Class I	Centreline marked.	10-20m	As specified in AOP	Rounded	Less than 1km	2:1	40km perhr	Use of small borrow pits incorporated into right-of-way where possible.
IV	Temporary dry or frozen periods for up to 2 years	See Class I	See Class IV permanent	10-20m	As specified in AOP	Rounded	Less than 1km	2:1	40km per hr	See Class IV permanent
V & VI	Temporary frozen periods only up to 2 years	See Class I	See Class IV permanent	8-20m	As specified in AOP	Rounded, if any required	Less than 1km			See Class IV permanent

1. Minimum allowable following distances on all road classes is 200 m. Bypasses or turnouts on haul road classes III, IV, V, and VI every 5 kms to allow vehicles to pass safely, where road width is insufficient to allow safe passing.
2. On normal soils, back and fill slopes may vary from the standards specified for temporary class IV and V roads, within reasonable limits.

Appendix 1 cont.

Environmental Protection Guidelines							
Design and Construction Guidelines							
		Water crossings				Decommissioning	
Timber Salvage	Debris Disposal	Bridges	Culverts	Erosion control & Revegetation	Maintenance	Temporary	Permanent
Salvage will be done according to timber management regulations.	Total disposal except strippings and fine debris (10cm or less) to be retained for erosion control by spreading on cuts and fills and any other critical areas. Can be piled along right-of-ways but not into standing timber, unless road is longer term, at which time it is ramped into piles outside the ROW.	Bridges may be required where biological, hydraulic and/or terrain characteristics are significant. Should be designed to facilitate other resource users.	All culverts designed for Q100 flood event. Culverts placed in fish bearing streams must facilitate fish passage.	Progressive reclamation (recontouring cuts and fills and revegetation) concurrent with construction. Seed mixtures to be appliedwhere necessary. Cross drains and ditch blocks dictated by slopes and soil conditions. Drainage water to be diverted off the r-o-w in as short a distance as possible.	Annual maintenance required	Removal of all crossing structures, additional erosion measures implemented and active maintenance required.	Complete removal of all crossing structures and engineering aspects of the road. Recontouring of road to original state and seeding of right-of-way.
See Class I	See Class I	See Class I	See Class I	See Class I	See Class I	See Class I	See Class I
See Class I	See Class I	See Class I	See Class I	See Class I	See Class I	See Class I	See Class I
See Class I	Partial disposal. May be spread on road bed on closure.	Portable bridges are preferred. Properly constructed ice bridges on intermittent streams. Temporary crossings must be removed before spring breakup.	See Class I	seeding may be required	As required	See Class I	See Class I
See Class I	See Class IV permanent	See Class IV Permanent	See Class I	See Class IV permanent	As required	See Class I	See Class I
See Class I	See Class IV permanent	See Class IV permanent	See Class I	See Class IV permanent	As required	See Class I	See Class I

LP Canada Ltd.

Swan Valley Forest Resources Division

STANDARD OPERATING GUIDELINE

FOREST OPERATIONS

Revised: June 20th, 2016

Contents

STANDARD OPERATING GUIDELINES (SOG's)

1.0 General Overview

LP Canada Ltd. (LPC) is committed to working closely with surrounding communities that may be affected by forest management operations and to ensuring orderly development of the forest resource to accommodate all forest values.

Originally LPC included a group of Standard Operating Procedures (SOP's) in Section 9 of the 10 Year Forest Management Plan (FMP). With the subsequent development of an Environmental Management System (EMS) for the Swan Valley Operations, it is appropriate to adapt the original SOP's into a complimentary set of Standard Operating Guidelines (SOG's) within the EMS.

LP Canada Ltd. is committed to the implementation of ecosystem based management within FML #3 and is presently developing the required infrastructure. This includes the development of an ecosystem based resource inventory, adjustments to planning and operational practices and the research necessary to achieve a better understanding of the ecosystems present and the processes occurring within them.

1.1 Sustainable Forest Management (SFM)

The Canadian Council of Forest Ministers (CCFM) began a process in 1993 to define, measure and report on the forest values Canadians want to sustain and enhance. The CCFM, along with technical and scientific advisors to lend support, consulted with officials and scientists of federal, provincial and territorial governments, experts from industry, the academic community, non-governmental organizations, the Aboriginal community and various other interest groups. The results of these consultations were documented in *Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators* (1995). The development of these criteria and indicators (C & I) was an important step in meeting Canada's domestic commitments on sustainable forest management.

The purpose of the Criteria and Indicators are to provide a common understanding and scientific definition of sustainable forest management in Canada. Together they form a framework for describing and measuring the state of our forests, forest management practices, values and progress towards sustainability. This information is then used to develop forest management policy and to determine areas where research is required to fill information gaps and develop new technologies. The C & I approach not only recognizes that forests are ecosystems but also realizes forests provide a wide range of social, economic and environmental benefits to Canadians and realizes the necessity of public education and participation in the process of sustainable forest management.

There are six criteria relating to sustainable forest management. Each criterion has been broken down into 27 elements to yield 83 indicators to help track progress in achieving sustainable development and social, economic and environmental objectives. The six criterion of SFM are:

- Conservation of biological diversity.
- Maintenance and enhancement of forest ecosystem condition and productivity.
- Conservation of soil and water resources.
- Forest ecosystem contributions to global ecological cycles.
- Multiple benefits of forests to society.
- Accepting society's responsibility for sustainable development.

LPC is striving towards sustainable forest management, as defined by the above criterion, in its forest management practices. These SOG's are a partial fulfillment of SFM. The Stakeholders Advisory Committee plays an integral role in the public participation, contribution of societal values and knowledge dissemination component of SFM. Pre-harvest surveys, permanent sample plots, ecological monitoring and research programs contribute to SFM by providing baseline data, site specific ecological information and enable LPC to identify areas where more information is required.

1.2 Objectives of the Specifications & SOG's

The EMS and SOGs provide a framework for the company to achieve and maintain a particular standard, as set out in these documents as well as the approved 10 Year FMP, Environment License 2191E and the FML #3 Agreement.

- The government's objectives will be met by the forest management planning process described in the EMS and the SOGs.
- Provide direction to LPC for planning, implementing and monitoring timber harvest operations on the forest management area.
- Outline the planning and operating standards of Ecosystem Based Management for timber harvest, road development, reclamation and integration of timber harvesting with other forest uses.
- Describe the planning and submission requirements for timber harvest operations.
- The EMS and SOGs are dynamic enough to provide sufficient flexibility to accommodate most site conditions. The principles in the EMS and SOGs are considered to be the normal expectations for harvest operations.
- The EMS and the SOGs are expected to be applied using sound judgment based on practical experience and technical competence.
- The EMS and SOGs provide documentation, structure and accountability associated with a particular activity.

Ecosystem based management refers to the development of management systems that attempt to simulate ecological processes with the goal of maintaining a satisfactory level of diversity in natural landscapes and their pattern of distribution in order to ensure the sustainability of forest ecosystems and forest ecosystem processes (Canadian Council of Forest Ministers, 1997).

The SOGs are unique to FML #3. They have been developed with specific reference and compliance to Federal and Provincial legislation, regulations and guidelines, and the requirements and conditions of the FML #3 agreement signed in September 1994, with the Province of Manitoba. They are also consistent with the requirements as set out in Environment Act License 2191E issued to LPC in 1996.

Many of the provisions, options and approaches in these SOGs may be considered for other jurisdictions, but they cannot be considered as a precedent for those jurisdictions. These provisions are based on concerns and conditions specifically related to operations within FML #3. They take into account potential future uses. They are an interrelated set of provisions, and not stand-alone solutions.

The EMS and SOGs ensure LPC meets or exceeds government regulations. They cannot, however, be considered a final position. Rather, they are part of a dynamic plan that will adapt or adjust as determined by legislation or societal attitudes, interests and concerns. As the SAC will assist LPC throughout the years in operational planning, ongoing review of the EMS and SOGs will be part of LPC's adaptive management planning.

2.0 Operations

2.1 General

2.1.1 Pre-Work Meeting

Prior to beginning operations on any block, LPC Operations staff conduct a pre work meeting with the contractor to discuss all pertinent information relating to the approved prescription for that block. It is important the contractor clearly understand the Company's stand level management objectives. A Harvesting & Roads Pre-Work Form (Figure 1) will be used to include:

- Cutblock Prescription
- Road development information
- Road Deactivation information
- Crossing information
- Permit conditions

2.1.2 Operations Guidelines

The following guidelines have general applicability to all harvesting, road construction and clearing operations within FML #3:

- Minor harvest plan modifications within approved blocks will be permitted in the field when agreed on by both LPC supervisory staff and the supervising Natural Resource Officer.

- Alterations which have an impact on the approved block boundary, road, stream or wildlife buffers and reserved or visually sensitive areas will require review and approval by LPC planning/wildlife/silviculture staff where required, followed by written approval from the IRMT. These changes will be documented on the ***Block Amendment Form*** (Figure 2)

- In the event that an unknown or unmapped watercourse is found during forest management operations it will be identified on the block map and given appropriate protection measures.

- As per government regulations, all logging debris, including that from landing, road and skid trail development, will be contained within the cutblock boundaries, and not pushed into standing timber. Unless otherwise specified in the work permit, tops and limbs will be spread over the cutover.

- Operations will be conducted to minimize soil disturbance, erosion and sedimentation into watercourses. Bared surfaces and unstable fill material will be stabilized and re-vegetated concurrent with operations if they are directly associated with a stream, and within one year in other situations. Details and specifics can be reviewed in Table 1 below.

Swan Valley FRD

SV-SOP-Form-01
Rev. 01-June-04

Harvesting & Roads Prework Form

Section 1 – General Information

Date:	Activity:	Contractor Name:
Block:	Road#:	Contractor Supervisor Designate:
		LP Supervisor Designate:

Section 2 – Specific Information to be Reviewed

The following have been RECIEVED & DISCUSSED:	Yes	N/A
Annual Operating Plan Details		
Cut-block Prescription • Harvest / Silviculture system • Slash abatement • Buffer information • Line of site mitigation • Wildlife tree / structure retention • Harvest comments / issues • In-block roads information		
Road Development Information • ROW width • Road surface width • Additional road development comments		
Road Deactivation Information • Road closure responsibility • Type of road closure • Additional road closure comments		
Water Crossing Installation and Deactivation Info • Proposed crossing structure • Lifespan of crossing • Installation and deactivation comments		

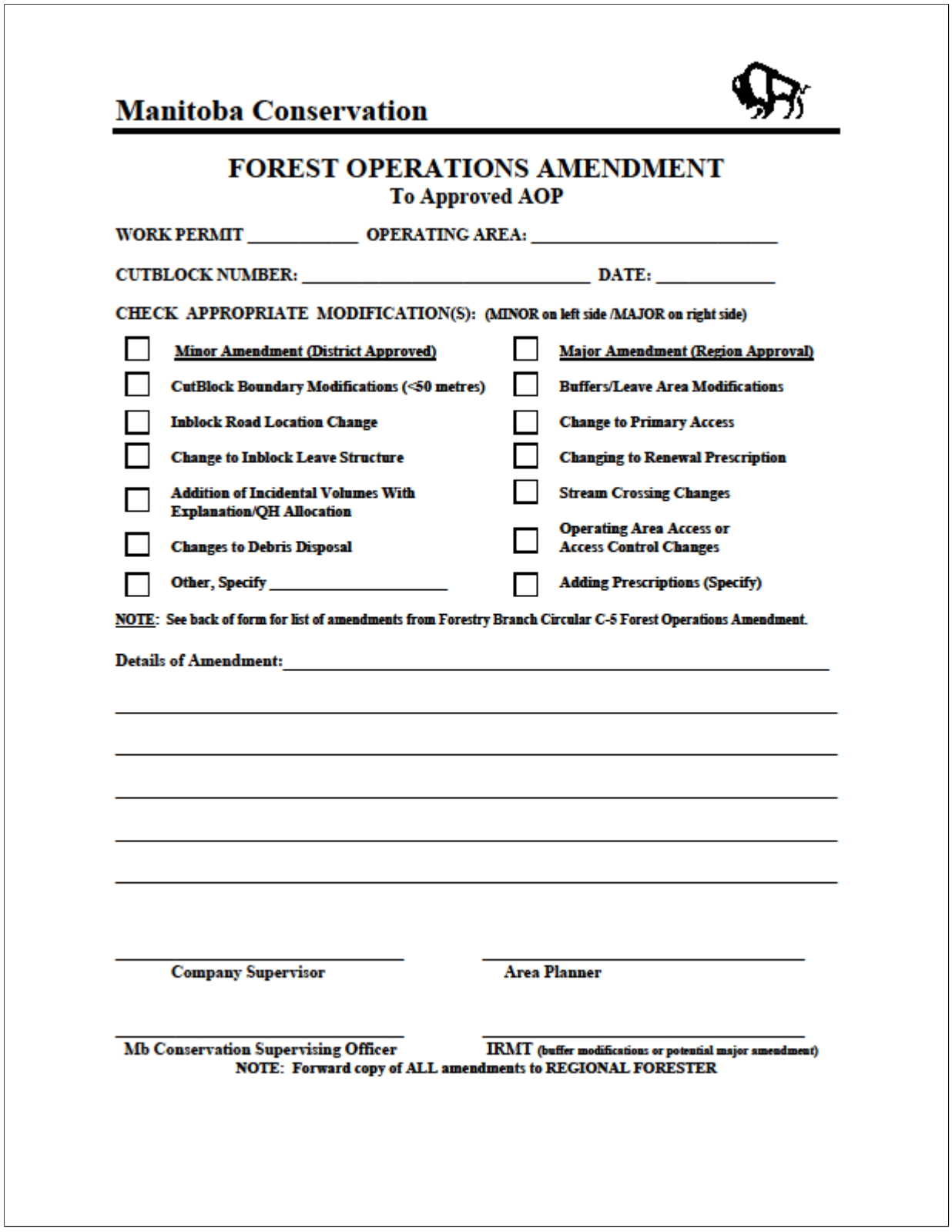
	Yes	AP#	N/A
General			
Block boundaries, stream crossing locations, and other resource features identified on maps			
Work Permit Effective Date: _____ Expiry Date:_____			
Layout complete			
Has contractor signed contract			
Contractor has discussed applicable WI with employees			
Applicable erosion control SOG's discussed			
Inspections - Interim & Final Inspections to be completed and additional inspections may be completed as required			
Work Permit Conditions			

Section 3 – Comments / Instructions

I acknowledge that I understand the plan or plans, including any special conditions conveyed to me in this prework.

Contractor Signature: _____ **LP Supervisor Signature:** _____

Figure 1. Harvesting and Roads Prework Form



Manitoba Conservation

FOREST OPERATIONS AMENDMENT
To Approved AOP

WORK PERMIT _____ **OPERATING AREA:** _____

CUTBLOCK NUMBER: _____ **DATE:** _____

CHECK APPROPRIATE MODIFICATION(S): **(MINOR on left side /MAJOR on right side)**

☐ **Minor Amendment (District Approved)**	☐ **Major Amendment (Region Approval)**
☐ **CutBlock Boundary Modifications (<50 metres)**	☐ **Buffers/Leave Area Modifications**
☐ **Inblock Road Location Change**	☐ **Change to Primary Access**
☐ **Change to Inblock Leave Structure**	☐ **Changing to Renewal Prescription**
☐ **Addition of Incidental Volumes With Explanation/QH Allocation**	☐ **Stream Crossing Changes**
☐ **Changes to Debris Disposal**	☐ **Operating Area Access or Access Control Changes**
☐ **Other, Specify** _____	☐ **Adding Prescriptions (Specify)**

NOTE: **See back of form for list of amendments from Forestry Branch Circular C-5 Forest Operations Amendment.**

Details of Amendment: _____

_____

_____

_____

_____

_____

_____ _____

Company Supervisor **Area Planner**

_____ _____

Mb Conservation Supervising Officer **IRMT** **(buffer modifications or potential major amendment)**

NOTE: Forward copy of ALL amendments to REGIONAL FORESTER

Figure 2. Block Amendment Form

Standards and guidelines for operating beside watercourses
LP Canada Ltd.

Table 1

Watercourse Classification	Watercourse Protective Buffers	Roads, Landings, Bared Areas	Tree Felling	Field Modification
Large Permanent	• no disturbance or removal of merchantable timber within 60m of the high-water mark except where specifically approved through the AOP approval procedures	• not permitted within 60m of the high-water mark • within 60 to 100m of the high-water mark may be permitted with written approval of a Natural Resources Officer (NRO) or the IRMT	• trees within these areas to be felled away from water • remove slash or debris as it accumulates	• where removal of timber within 60m is approved, no machinery normally operates within 20m of the high-water mark • timber within 20m to be removed by winching or other means so the machine remains outside a 20m strip. If possible, topographical breaks used as protective strip boundaries
Small Permanent	• no disturbance or removal of merchantable timber within 60m of the high-water mark except where specifically approved through the AOP approval procedures	• not permitted within 30m of the high-water • in the area 30-100m of the high-water mark may be permitted with written approval of an NRO or the IRMT	• trees within these areas to be felled away from water • remove slash or debris as it accumulates	• where removal of timber within 30m is approved, no machinery operates within 20m of the high-water mark • timber within 20m to be removed by winching or other means so the machine remains outside a 20m strip • if possible, topographical breaks should be used as protection strip boundaries
Intermittent/ Ephemeral	• buffer of brush and lesser vegetation to be undisturbed along the channel • width of buffer varies according to soils, topography, water source areas and fisheries values • treed buffer not required unless specifically requested for sensitive or complex sites	• not permitted within 30m of the high-water mark, unless approved by NRO or the IRMT	• trees within these areas to be felled away from water • remove slash or debris as it accumulates	• heavy equipment operates only within 20m during frozen or dry periods • no random skidding through channel - crossing must be planned with adequate structures • crossing removed on completion of operations • where fish and spawning movements have been identified, special crossings that will not obstruct fish passage or create stream silting should be required
Lakes, little or no recreation, waterfowl or sport fishing potential	• no disturbance or removal of merchantable timber within 60m of the high-water mark except where specifically approved through the AOP approval procedures	• not permitted within 100m of the high-water mark without written approval of an NRO or the IRMT	• trees within these areas to be felled away from water • remove slash or debris as it accumulates	• if timber removal is approved within the buffer, no machinery to operate within 20m of the high-water mark unless in winter conditions
Lakes, recreational waterfowl or sport fishing potential	• no disturbance or removal of merchantable timber within 60m of the high-water mark except where specifically approved through the AOP approval procedures	• not permitted within 100m of the high water mark without written approval of an NRO or the IRMT	• trees within these areas to be felled away from the water • remove slash or debris as it accumulates	• if timber removal approved within the buffer, no machine to operate within 20m of the high-water mark unless in winter conditions • aesthetics to be considered in planning and conducting harvesting adjacent to lakes with recreation potential • timber harvesting within reserve areas subject to specific operating conditions (i.e. selective cutting winter operations)
Water Source Areas/Springs	• no disturbance or removal of merchantable timber within 60m of the high-water mark except where specifically approved through the AOP approval procedures	• construction not permitted unless approved in the AOP • no log decks permitted	• heavy machinery not permitted in areas • timber may be harvested if minimal disturbance of organic soils and lesser vegetation • on unstable areas subject to blowdown, merchantable trees should be carefully harvested to minimize disturbance to roots and duff layers	• road construction, timber harvest, reforestation and reclamation done with equipment that minimizes disturbing organic soil layers • heavy equipment not permitted at all
Beaver Floods	• none unless specific wildlife habitat	• not permitted within 30m of water's edge unless approved by NRO or the IRMT	• trees to be felled away from water body • any slash or debris in water to be removed	• no machine to operate within 30m of the water's edge unless approved by NRO, IRMT or AOP

3.0 Harvesting Operations

3.1 Utilization Standards

LPC utilizes timber that meets the specifications identified in Timber Harvesting Practices for Forestry Operations in Manitoba developed by Manitoba Natural Resources, Forestry Branch, or that is identified in the LPC Independent Contractor Agreement and other logging contracts.

- All live, dead, downed or broken and defective trees whose merchantable content make up 50 percent or more of the tree and meet the utilization and wood quality standards of LPC will be utilized.

- LPC harvests and removes deciduous and incidental mature coniferous timber from its cutblocks during the same harvesting operations according to the requirements in the FML agreement, unless required for wildlife habitat or seed trees as prescribed in the AOP.

- In cooperation with coniferous operators, LPC utilizes merchantable deciduous timber harvested during coniferous operations in FML #3. Such utilization assists with reforestation commitments required of the coniferous operators, unless required for wildlife habitat as determined jointly by the Province of Manitoba and LPC.

3.1.1 Hardwood

Trembling Aspen/ Balsam Poplar

- The siding mill requires fresh cut roundwood logs for optimum performance. To ensure all roundwood delivered are fresh cut, LPC pays harvesting contractors for timber on delivery to the mill log yard. This encourages contractors to deliver the timber as soon as possible after harvest, virtually eliminating the need for log storage in the field.

- On occasion, interim roundwood storage areas may be required when wood has to be forwarded to high ground immediately prior to spring breakup. Such storage areas will be short-term as the timber will be moved as soon as access conditions improve and highway load limits are removed.

- If and when roundwood log storage sites are required on Crown land, LPC will notify the Province of Manitoba with site specific information.

3.1.2 Non-merchantable trees

- Residual non-merchantable trees, i.e. elm, maple, are left standing where possible. If felled in the course of logging operations, they are skidded to roadside. This is undertaken in pre-determined blocks where it is highly possible that it will be utilized by fuelwood users. Where it is not likely to be salvaged for fuelwood, the trees will

be left at the stump. This is better for the site ecologically and more aesthetically pleasing.

3.1.3 Softwood

- Softwood logs may be stored at various sites throughout FML #3.
- Incidental softwoods are harvested along with the hardwoods in LPC's operations. Softwood volumes harvested are purchased by a party as identified on the harvest permit such as Roblin Forest Products and Spruce Products Limited, or possibly one of the local softwood quota holders.
- Intermediate log storage sites may be required from time to time before delivery of softwood timber is finally made to the appropriate facilities. Use of these log storage and chipper processing sites is subject the Province of Manitoba approval following formal site specific application

3.1.4 Chipper Wood

- Chipper wood sites serve as holding areas for timber as well as processing sites for a portable softwood chipper.
- Chipper debris will be either piled and burned at roadside or spread on to the road network at a mean depth of 10 cm (4 inches)
- Spreading of debris onto specific roads may be denied for the following reasons:
  (i) access is required for forest renewal activities
  (ii) the road pre-existed harvesting activities
  (iii) the road may be required for future wood supply extraction from the area
- Use of these log storage and chipper processing sites is subject to the Province of Manitoba approval following formal site specific application

4.0 Final Clearance

LPC will complete slash abatement, cleanup and any other reclamation work required as a direct result of its operations before moving operations to another operating area. This ensures a progressive completion to harvesting operations. LPC will obtain a final harvest block inspection from the Province of Manitoba.

5.0 Fire Fighting Provisions

In compliance with the Forest Act, the Fire Prevention Act and Regulations and in accordance with all agreements, plans and operating and work permits pertaining to the

operation, firefighting equipment will be on site and in serviceable condition during active operating seasons, relative to the size and scope of the operation.

6.0 Debris Dispersal

Accumulated slash from harvesting operations will be minimized for the following reasons:

- Reduce fire hazard.
- Accommodate silviculture and wildlife objectives.
- Restore site productivity.
- Lessen any negative visual impact.

To minimize any effects related to debris accumulation, the following guidelines will be applied:

- Harvested areas subject to wind or water erosion will have slash evenly distributed to prevent soil erosion.
- Before construction, all landings are to be harvested to reduce debris accumulation.
- Slash and debris burning will not take place during the fire season (April 1 to November 15) unless approved on a work permit.
- Small debris piles may be left on cutblocks for rodent habitat.

7.0 Slash-Free Fire Break Zone

As per government guideline, and where possible, a slash-free firebreak zone will be maintained within five meters of uncut stands and all exclusion zones. A measure for determining acceptable levels of accumulated debris will be the levels on the adjacent undisturbed forest floor. All felled trees are to be removed from this zone and processed, thereby minimizing accumulation of litter.

LP Canada Ltd.

Swan Valley Forest Resources Division

STANDARD OPERATING GUIDELINE

HARDWOOD SILVICULTURE

Revised: June 20th, 2016

Contents

STANDARD OPERATING GUIDELINES (SOG's)

1.0 General Overview

LP Canada Ltd. (LP) is committed to working closely with surrounding communities that may be affected by forest management operations and to ensuring orderly development of the forest resource to accommodate all forest values.

Originally LP included a group of Standard Operating Procedures (SOP's) in Section 9 of the 10 Year Forest Management Plan (FMP). With the subsequent development of an Environmental Management System (EMS) for the Swan Valley Operations, it is appropriate to adapt the original SOP's into a complimentary set of Standard Operating Guidelines (SOG's) within the EMS.

LP Canada Ltd. is committed to the implementation of ecosystem based management within FML #3 and is presently developing the required infrastructure. This includes the development of an ecosystem based resource inventory, adjustments to planning and operational practices and the research necessary to achieve a better understanding of the ecosystems present and the processes occurring within them.

1.1 Sustainable Forest Management (SFM)

The Canadian Council of Forest Ministers (CCFM) began a process in 1993 to define measure and report on the forest values Canadians want to sustain and enhance. The CCFM, along with technical and scientific advisors to lend support, consulted with officials and scientists of federal, provincial and territorial governments, experts from industry, the academic community, non-governmental organizations, the Aboriginal community and various other interest groups. The results of these consultations were documented in *Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators* (1995). The development of these criteria and indicators (C & I) was an important step in meeting Canada's domestic commitments on sustainable forest management.

The purpose of the Criteria and Indicators are to provide a common understanding and scientific definition of sustainable forest management in Canada. Together they form a framework for describing and measuring the state of our forests, forest management practices, values and progress towards sustainability. This information is then used to develop forest management policy and to determine areas where research is required to fill information gaps and develop new technologies. The C & I approach not only recognizes that forests are ecosystems but also realizes forests provide a wide range of social, economic and environmental benefits to Canadians and realizes the necessity of public education and participation in the process of sustainable forest management.

There are six criteria relating to sustainable forest management. Each criterion has been broken down into 27 elements to yield 83 indicators to help track progress in

achieving sustainable development and social, economic and environmental objectives. The six criterion of SFM are:

- Conservation of biological diversity.
- Maintenance and enhancement of forest ecosystem condition and productivity.
- Conservation of soil and water resources.
- Forest ecosystem contributions to global ecological cycles.
- Multiple benefits of forests to society.
- Accepting society's responsibility for sustainable development.

LP is striving towards sustainable forest management, as defined by the above criterion, in its forest management practices. These SOG's are a partial fulfillment of SFM. The Stakeholders Advisory Committee plays an integral role in the public participation, contribution of societal values and knowledge dissemination component of SFM. Pre-harvest surveys, permanent sample plots, ecological monitoring and research programs contribute to SFM by providing baseline data, site specific ecological information and enable LP to identify areas where more information is required.

1.2 Objectives of the Standard Operating Guidelines

The EMS and SOGs provide a framework for the company to achieve and maintain a particular standard, as set out in these documents as well as the approved 10 Year FMP, Environment License 2191E and the FML #3 Agreement.

- The government's objectives will be met by the forest management planning process described in the EMS and the SOGs.
- Provide direction to LP for planning, implementing and monitoring timber harvest operations on the forest management area.
- Outline the planning and operating standards of Ecosystem Based Management for timber harvest, road development, reclamation and integration of timber harvesting with other forest uses.
- Describe the planning and submission requirements for timber harvest operations.
- The EMS and SOGs are dynamic enough to provide sufficient flexibility to accommodate most site conditions. The principles in the EMS and SOGs are considered to be the normal expectations for harvest operations.
- The EMS and the SOGs are expected to be applied using sound judgment based on practical experience and technical competence.
- The EMS and SOGs provide documentation, structure and accountability associated with a particular activity.

Ecosystem based management refers to the development of management systems that attempt to simulate ecological processes with the goal of maintaining a satisfactory level of diversity in natural landscapes and their pattern of distribution in order to ensure the sustainability of forest ecosystems and forest ecosystem processes (Canadian Council of Forest Ministers, 1997).

The SOGs are unique to FML #3. They have been developed with specific reference and compliance to Federal and Provincial legislation, regulations and guidelines, and the requirements and conditions of the FML #3 agreement signed in September 1994, with the Province of Manitoba. They are also consistent with the requirements as set out in Environment Act License 2191E issued to LP in 1996.

Many of the provisions, options and approaches in these SOGs may be considered for other jurisdictions, but they cannot be considered as a precedent for those jurisdictions. These provisions are based on concerns and conditions specifically related to operations within FML #3. They take into account potential future uses. They are an interrelated set of provisions, and not stand-alone solutions.

The EMS and SOGs ensure LP meets or exceeds government regulations. They cannot, however, be considered a final position. Rather, they are part of a dynamic plan that will adapt or adjust as determined by legislation or societal attitudes, interests and concerns. As the SAC will assist LP throughout the years in operational planning, ongoing review of the EMS and SOGs will be part of LP's adaptive management planning.

2.0 Hardwood Silviculture Practices

Louisiana-Pacific Canada Ltd. (LP) is committed to implementing forest renewal and stand management practices in all stands that were harvested subsequent to the date of the signing of the Forest Management License Agreement 3 (i.e. Sept. 21st, 1994). LP is responsible for all hardwood renewal in Forest Management Licence 3, both Quota Holder hardwood blocks and LP hardwood blocks. LP performs all hardwood reforestation activities, financed by a hardwood renewal account.

LP's forest renewal strategy is to reforest harvested ecosystems to their original tree species composition at the landscape level. Hardwood renewal is primarily accomplished through natural regeneration.

3.0 Hardwood Regeneration Strategies and Tactics

A significant portion of the licence area are pure hardwood or hardwood mixedwood stands. Typical harvest areas are predominantly aspen, but also contain some balsam poplar, white birch, and residual white spruce.

Modified clear cutting is the most appropriate silvicultural system utilized within the hardwood ecosystem. Aspen, poplar and birch are aggressive pioneer species that have the ability to regenerate vegetatively by 'suckering' from the roots or coppice growth from the root collar of the stump. Removal of the overstory tree canopy creates hormonal changes, stimulating suckering. Increased soil temperatures also trigger aggressive suckering, resulting in dense, vigorous natural regeneration. Hardwood

ecosystems regenerate quickly after logging, and establish a dense, vigorous hardwood stand.

There are many factors which influence the regeneration capacity of young hardwood stands. These factors include:

- machine traffic levels, especially skidding and avoidance of soil compaction;
- previous site disturbances ('high-grade' logging of conifer from mixedwood stands);
- competition from grasses and shrubs; and
- amount of residual overstory and leave tree structure density, health and vigour.

4.0 Hardwood Regeneration Surveys

All harvested hardwood areas are regeneration surveyed three to five years post-harvest to determine regeneration stocking. If a significant portion of a hardwood cutblock is inadequately regenerated, supplementary silvicultural treatments will be applied if at all possible.

All persons performing regeneration surveys for LP (staff or contractors) will be licenced regeneration surveyors through the province of Manitoba. Approved Manitoba provincial methods and procedures outlined within the current province of Manitoba hardwood regeneration survey manual will be followed.

MOUNTAIN FOREST SECTION RENEWAL COMPANY LTD

STANDARD OPERATING PROCEDURE

SILVICULTURE

2019

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STANDARD OPERATING PROCEDURES

1.0 General Overview

Mountain Forest Section Renewal Company (MFSRC) is committed to forest renewal and to ensuring logical development of the forest resource to accommodate all forest values.

The forest management responsibilities apply to areas harvested by Louisiana Pacific (LP) and all third party Quota Holders operating within the Mountain Forest Section (FMU 10, 11, 12, 13, 14) containing softwood volume of 25% or greater. This commitment will ensure the maintenance of forest ecosystems and a perpetual sustained timber supply/yield from the forest landbase.

1.1 Sustainable Forest Management (SFM)

In 1993, the Canadian Council of Forest Ministers (CCFM) began a process to define, measure and report on the forest values Canadians want to sustain and enhance. The CCFM, along with technical and scientific advisors to lend support, consulted a variety of interest groups which resulted in a document called *Defining Sustainable Forest Management: A Canadian Approach to Criteria and indicators* (1995). The development of the document was an important step in meeting Canada's domestic commitments on sustainable forest management.

The purpose of the criteria and indicators (C & I) are to provide a common understanding and scientific definition of sustainable forest management in Canada. Together they form a framework for describing and measuring the state of our forests, forest management practices, values and progress towards sustainability. This information will then be used to develop forest management policy and to determine areas where research is required to fill information gaps and develop new technologies. The C & I approach not only recognizes that forests are ecosystems but also realized forests provide the necessity of public education and participation in the process of sustainable forest management (SFM).

The six criteria relating to sustainable forest management are:

1. Conservation of biological diversity.
2. Maintenance and enhancement of forest ecosystem conditions and productivity.
3. Conservation of soil and water resources.
4. Forest ecosystem contributions to global ecological cycles.
5. Multiple benefits of forest to society.
6. Accepting society's responsibility for sustainable development.

MFSRC is striving toward SFM, as defined by the above criterion, in its forest management practices. These SOP's are a partial fulfillment of SFM. MFSRC works with Louisiana Pacific Ltd, Swan Valley Forest Resources Division (LP) and Mountain Quota Holders Association (MQHA) using the information from Pre-harvest surveys, permanent sample plots, ecological monitoring, research programs to provide data and site-specific ecological information to enable MFSRC to better plan renewal.

1.2 Objectives of the Specifications & SOP

Using LP and MQHA SOP's provides a framework for MFSRC to achieve and maintain a particular standard, as set out in this document as well in the LP and MQHA Plans.

- The government's objectives will be met by the forest management planning process described in the SOP's.
- Provide direction to MFSRC for planning, implementing and monitoring timber harvest operations on the Mountain Forest Section.
- The SOP applies sound judgment based on practical experience and technical competence.
- The SOP's provide documentation, structure and accountability associated with a particular activity.

2.0 Silviculture Practices

MFSRC is committed to implementing forest renewal and stand management practices in all stands harvested in the Mountain Forest Section subsequent to the date of the signing of the Memorandum of Agreement with LP and the Province of Manitoba.

All silviculture practices whether site preparation, tree planting, forest renewal, stand establishment, seed collection, monitoring, stand tending and forest protection will meet or exceed application industry and provincial guidelines. All forest renewal activities will be identified with the LP and MQHA Operating Plans (OP).

MFSRC has been assigned all obligations and responsibilities with respect to forest renewal of softwoods within the Mountain Forest Section. The reforestation activities are financed through the Forest Renewal Charge funded by all merchantable softwood harvested in the Mountain Forest Section.

MFSRC's forest renewal strategy is to reforest harvested ecosystems to their original tree species composition. This objective can be achieved at the landscape level, through silvicultural systems and treatments, which balance the ecology of the forest and the silvics of the tree species.

2.1 Regeneration Strategies and Tactics

All silvicultural management interpretations and prescriptions are based on the field data from the Pre-Harvest Survey, vegetation types (V-types) and soil types (S-types) identified within the Forest Ecosystem Classification for Manitoba Field Guide. All renewal management prescriptions are based on the assessment of the forest ecosystem. This management philosophy encompasses all prescriptions for each ecosystem classification type (treatment unit): the silviculture system, site limitations, harvesting constraints, regeneration method, regeneration species, and to the future monitoring of the treatments.

MFSRC's goal is to implement a variety of silvicultural systems, including natural, assisted, and advanced regeneration processes. To date, acceptable natural regeneration stocking within Jack Pine and Black Spruce ecosystems is being achieved with the clear-cut silvicultural system. In order to achieve natural regeneration within the Black Spruce and/or Jack Pine V-types it is crucial that cone bearing slash be maintained/left within the cutover, usually at the stump. Natural regeneration of the white spruce component of the mixedwood ecosystems will be accomplished by protection of white spruce conifer understorey and the retention of seed trees, which is commonly, incorporated within wildlife leave patches.

Generally, harvested areas will be regenerated natural, advanced, or assisted regeneration efforts, through a variety of silvicultural systems and treatments. For discussion purposes the forest ecosystems harvested within the Mountain Forest Section have been placed into one of the following v-type categories:

- Hardwood Dominant
- Jack Pine Dominant
- Mixedwood Dominant
- White Spruce Dominant
- Black Spruce Dominant

2.1.1 Hardwood Dominant V-Types

A significant portion of what LP harvests are pure hardwood or hardwood mixedwood stands. A 'typical' harvest area is predominantly Aspen, containing some Balsam Poplar, White Birch, and a few residual White Spruce. Occasionally, softwood is removed, MFSRC may plant concentrated softwood sections of these v-types.

Modified clear cutting is utilized within the hardwood v-type. Aspen, poplar and birch are aggressive pioneer species with the ability to regenerate by 'suckering' from the roots or coppice growth from the root collar. Removing the overstorey tree canopy creates hormonal changes and increases soil temperature that stimulates suckering. Hardwood will regenerate within the same year after logging, and establish a dense, vigorous hardwood stand. Only a few hardwood dominant v-types have a volume of softwood of 20% or more. Natural regeneration, suckering, of hardwood is expected in these v-types, so the softwood component is maintained on a small portion of the site. This will lessen the impact on the softwood, and less stand tending would be required.

The immature white spruce occupying the understorey of these hardwood v-types are protected, this also helps with the softwood renewal of the hardwood v-types that are planted. LP's Standard Operating Guidelines titled 'Protection and Preservation of Advanced White Spruce Regeneration' demonstrates how this works.

2.1.2 Jack Pine Dominant V-Types

Modified clear cutting is the silviculture system used for Jack Pine v-types. Jack Pine is an early successional, pioneer species, when exposed to direct sunlight will germinate and grow. After clear cutting, Jack Pine germination and establishment occurs from natural seeding. Opening the canopy will open the serotinous pine cones. When the cones open, seeds are deposited onto the mineral soil and germinate. Jack Pine trees are delimbed at the stump after felling; this leaves the branches, cones and seeds on the site. Delimbing at the stump ensures that adequate cones and seeds are available for natural regeneration. Sites harvested during the winter months will be scarified using shark-fin barrels and anchor chains to create mineral soil exposure that is crucial to the establishment of Jack Pine regeneration. Natural regeneration is easily attained within Jack Pine v-types when they are harvested correctly.

There are some Jack Pine cutovers that may not naturally regenerate to acceptable stocking levels and densities. These sites will be planted to ensure they reach an acceptable stocking standard.

2.1.3 Mixedwood Dominant V-Types

The mixedwood v-types are predominantly composed of aspen, poplar, birch, spruce and Balsam Fir. Mixedwood ecosystems are harvested by modified clear cutting with protection of White Spruce understorey. Excessive coniferous slash reduces the number of plantable microsites; therefore portions of mixedwoods cut blocks will be delimbed at roadside and the slash piles burnt.

Mixedwood v-types are challenging because you need to maintain the softwood component as well as the hardwood. Hardwood and conifers grow well together but too many hardwood stunt conifer and decrease the growth rate substantially. This balance of conifer and hardwood makes mixedwood sites the most complex and challenging.

Site preparation is not done in these sites, due to greatly increased competition from grass, weeds, and aspen. Disturbing the soil will promote excessive aspen suckering. Portions of mixedwood v-types are area planted to avoid excess aspen suckering, grass and weeds, yet still establishing a crop of spruce trees 1,400 – 1,800 stems per hectare immediately after harvest. Suckering of the hardwood is expected and encouraged on mixedwood sites where spruce has not been planted.

Planted conifer regeneration success is dependent upon desirable seedling microsites, effectively managing slash loading, planting large high-quality seedlings, planting after harvest, before hardwoods become established, and proper microsite selection.

Areas harvested utilizing understorey protection are identified as ‘leave for natural regeneration’ (LFN) spruce regenerated areas. Typically, the skid trails within the protected white spruce understorey areas are directly planted.

2.1.4 White Spruce Dominant V-Types

White Spruce Dominant v-types have excessive slash loading from spruce limbs, which reduces the number of available microsites for reforestation. Logging the site whole tree alleviates this. The trees are delimbed at roadside and the limbs are piled and burned.

Historically, white spruce has been grown as an early successional species. This is done by clear cutting, site preparation, then planting and tending to remove all other tree and shrub species. The silvicultural systems used in this v-type will be natural regeneration, assisted and advanced regeneration strategies.

A variety of silvicultural systems are prescribed within the white spruce dominant v-types. Natural regeneration will be used when a single/group seed tree, understorey protection, selection or shelterwood silvicultural systems may be prescribed.

Areas that have been clear-cut will be scheduled for direct planting, 1,800 to 2,000 stems per hectare, immediately following harvest.

2.1.5 Black Spruce Dominant V-Types

Black Spruce grows on wet organic, wet mineral, and upland mineral soils. Black Spruce most commonly grows as pure stands on organic soils, and it occurs as mixed conifer stands with Jack Pine or mixedwood stands on mineral soils. These v-types are clear-cut then planted and/or left for natural. Lowland Black Spruce will be left for natural or site prepared and/or area planted with Black Spruce.

Upland Black Spruce sites are scarified and/or planted immediately after harvest. The Black Spruce planted will be medium to large stock.

The Black Spruce/Jack Pine v-type will be scarified with barrels and chains then planted with Black Spruce and Jack Pine seedlings. The density of planted spruce and pine will range from 1,800 to 2,200 seedlings per hectare. Scarification will promote natural regeneration of spruce and pine and create a favorable planting microsite for spruce and pine seedlings.

2.2 White Spruce Understorey Protection

Clear cutting is the dominant harvest system prescribed; MFSRC will identify areas where alternative silvicultural systems make better ecological and economical sense. An example is the hardwood and hardwood-dominated mixedwood stands where advanced white spruce regeneration is in the understorey. A modification to the clear-cut harvest system has allowed MFSRC to protect the existing white spruce understorey refer to LP's Standard Operating Guideline titled 'Protection and Preservation of Advanced White Spruce Regeneration'.

3.0 Seed Inventories

MFRSC will maintain enough seed inventory to ensure that there are an adequate number of coniferous seedlings to plant into harvested areas. Ideally, a minimum of ten years of seed for each conifer species is kept. All seed is locally collected within the proper seed zone, and is stored at Pineland Forest Nursery located in Hadashville, MB.

MFSRC will maintain the seed inventory numbers. MFSRC will collect the seed for Jack Pine, Black and White Spruce. This will be done, when required, during high yielding years.

3.1 Seedling Requirements

MFSRC will annually plant high quality coniferous seedling/stock of 1.4 to 2.0 million seedlings annually in the Mountain Forest Section.

Seedling orders will be comprised of White Spruce, Black Spruce and Jack Pine. Over-wintered container stock will be used due to access limitations within many of the harvested areas in the Mountain Forest Section. A large number of seedlings will be snow cached every year, usually mid February to mid March, because of access limitations.

4.0 Scarification & Site Preparation

Mechanical site preparation methods will be used on selective sites to encourage natural or assisted regeneration of harvested areas. This will create suitable microsites for planting. MFSRC's silviculture forester will determine the site preparation equipment best suited for the site using the pre-harvest survey as well as a post harvest assessment. This information will be included in the forest renewal section of the LP and MQHA OP.

MFSRC's philosophy towards site preparation is "less is best". The intensity of the treatment is site-specific to each forest ecosystem. Site preparation prescriptions are developed after reviewing the pre-harvest survey data. All areas identified for treatment will be inspected during or immediately after harvesting. Supervision of the site preparation equipment is continuously performed during active treatment to ensure that the desired results are achieved.

To determine the desirable number of microsites per hectare to be created within an area the appropriate provincial stocking standards, stand management objective and pre-harvest V-Type must be considered. The acceptable seeding/planting microsites to be created must be clearly defined before site preparation can begin. Based on current forest renewal standards, MFSRC will have the following microsites per hectare targets for coniferous tree species (Jack Pine, Black and White Spruce):

- Softwood Sites - 1,800 to 2,200 microsites per hectare; and
- Mixedwood Sites - 1,400 to 1,800 microsites per hectare.

Seedling mortality and natural regeneration must be considered when determining the actual number of microsites to be created on a specific site.

Scarification/Site Preparation is not required on the pure/dominant hardwood and mixedwood vegetation types. These sites aggressively regenerate by suckering after harvesting. The clear-cut silvicultural system promotes sufficient regeneration on these sites.

Scarification is used for the pure and dominant Jack Pine and Black Spruce v-types. Barrels and chains are used to expose mineral soil to create germination microsites, and to distribute cones to promote natural regeneration and assist tree planting. This has effectively achieved disturbance to the organic soil layer promoting Jack Pine and Black Spruce regeneration.

Field assessments of quality and spacing (number of microsites created per hectare) are performed during or after each treatment. A 50 m^2 circular plot per hectare sample size is used to assess the treatment. Planting spots are tallied as to acceptability and quality. The acceptable planting spots are totaled within the plot and multiplied by a factor of 200. This is to determine the total number of microsites per hectare. This will ensure there are an adequate number of planting spots achieved and maintained. The assessment ensures that favorable microsites (quality and quantity) for seed/seedlings are being created/achieved and detrimental site disturbances (excessive soil displacement) are not occurring.

5.0 Snow Cache

Snow caching is a method of storing seedlings in harvested areas that are restricted to winter access only. Frozen conditions in February and March allow seedlings to be transported to the site by truck and trailer, rather than by ATV, track vehicle, or helicopter in the spring. This restriction makes snow caching of seedlings an inexpensive way of storing seedlings in the field aiding in renewal expenses. Seedlings have been snow cached successfully in Manitoba over the past several decades. The advantages of snow caching is reduced excessive handling stress on seedlings, reduced seedling transport and tree plant costs, and minimized damage/disturbance to access roads and water-crossings.

6.0 Tree Plant

The majority of the seedlings will be planted in the spring from mid-May to the end of June. The start up date will be dependent upon spring weather conditions and the surface soil thawing. When temperatures become warm and the risk of frost is low, spring planting will commence.

To allow seedlings to maximize their growth potential and minimize the risk of loss to frost damage and drought, the right planting window and dates must be considered carefully. Over-wintered seedlings are planted in the spring. They will flush and initiate shoot and root growth soon after planting. For this reason, spring planting must be completed by the end of June. This allows the seedlings adequate time to grow, set bud and harden-off prior to the fall frosts, which usually occurs by early to mid- September. Seedlings that do not have adequate time to harden-off will suffer from frost damage, a reduction in potential growth rate and survival rate.

7.0 Assessments and Surveys

MFSRC will assess all the blocks that have been treated and planted in the Mountain Forest Section. Plantation assessments will be conducted to ensure the seedlings have survived. Regeneration surveys will be performed in five to seven years to ensure the harvested area has reached the appropriate regeneration standard. In ten to twenty years, the harvested area receives a Free to Grow survey to ensure the harvested areas have achieved its original covertype.

7.1 Plantation Survival Assessments Surveys

MFSRC will be conducting plantation assessments within the Mountain Forest Section. Plantation assessments established measures seedling survival, seedling vigour, and competition. The objective of this survey is to measure the success of the plantation with respect to seedling survival and vigour; the density of planted and natural occurring seedlings; and provide data for future prescriptions and silvicultural treatments. This assessment provides information on harvested areas that have been planted that may require refill planting.

7.2 Forest Regeneration Surveys

MFSRC will be performing forest regeneration surveys on mixedwood and softwood areas that have been treated by site preparation, scarification, and/or planting. Provincial forest regeneration survey methodology and standards will be used. The information collected from these surveys provides stocking, density, and measurements of tree species; potential problems that may require additional treatment; and measure success of forest regeneration. The surveyors performing the surveys are certified and follow the procedures within the Manitoba Forest Regeneration Survey Manual (SD, 2018).

This survey will measure the regeneration success of the softwood and mixedwood sites in the Mountain Forest Section. The data collected from the surveys can also provide status of the harvest areas and analysis of specific treatment responses.

7.3 Free to Grow Surveys

The Province of Manitoba has developed Free to Grow (FTG) standards for Jack Pine and Black and White Spruce. This standard quantifies whether a harvested site is not free growing or free growing and determines an appropriate forest cover class classification. The FTG survey is designed for application 10 years after harvest on softwood and mixedwood harvested sites. The first plantation was on a 1996 harvested site; FTG surveys were underway in 2011.

Licensed surveyors following the Manitoba Free to Grow Survey Procedures Manual are performing these surveys.

A FTG survey is being developed that is a mix of the regeneration and FTG survey; the Forest Renewal Assessment Survey. It measures the stocking, stems per hectare and height of the tress. Trees over a certain height are considered performing.

Provincial Forest Regeneration Standards

Harvested areas receive a certificate when they have reached a species mixture approximate to the original forest type before harvest. The area might be satisfactorily regenerated (SR), but with the wrong original covertype, a certificate will not be awarded. Since the area is SR and it satisfies any of the other forest renewal standards, no more treatment is required.

These standards are located in the 'Development of Forest Renewal Standards for Forest Regeneration in Manitoba' through Manitoba Conservation. Table 1 shows examples of the regeneration acceptable and certification standards.

Table 1: Regeneration Standards

Former Stand Cover Type	Regeneration Standards for Certification	Acceptable Regeneration Standards
Softwood "S"	Softwood "S" Mixedwood "M"	Mixedwood "N" Hardwood "H"
Mixedwood "M"	Softwood "S" Mixedwood "M" Mixedwood "N"	Hardwood "H"
Mixedwood "N"	Mixedwood "M" Mixedwood "N" Hardwood "H"	Softwood "S"
Hardwood "H"	Mixedwood "N" Hardwood "H"	Softwood "S" Mixedwood "M"

The Forest Renewal Assessment survey result will be either sufficiently performing, sufficiently regenerating or not sufficiently stocked.

8.0 Stand Tending

MFSRC may do some stand tending on successfully regenerated harvested areas to ensure maximum growth potential. Controlling competing vegetation would be done by aerial or manual release using brush saws or applying herbicides. This controlling of vegetation will give the harvested stands the opportunity to become FTG.

9.0 Access Management

MFSRC will use existing access and crossing locations to plant blocks. Temporary bridges will be constructed over stream crossings and wet areas using corduroy and mud matts. The road closure will be maintained and/or restored at the beginning of the main haul road.

References

LP Standard Operating Guidelines – Silviculture, 2006

LP Annual Operating Plan – 2008

MQHA Annual Operating Plan - 2008