

Integrated Silviculture Strategy for the Merritt TSA

Implementation Monitoring Plan

Version 1.1

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Project 419-36

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Executive Summary

Implementation monitoring is intended to inform future ISS iterations and other forest-level analyses. At each reporting period, assessments will determine how well actual performance aligns with the key indicators from the tactical plans. Significant variances or new objectives (i.e., constraints) may suggest the need to update these forest-level analyses to produce new tactical plans that reflect actual performance.

This document describes an implementation monitoring plan that includes periodic assessments of how well various aspects of the tactical plans developed through the Integrated Stewardship Strategy for the Merritt TSA. The following monitoring details were developed for a total of nine indicators across three tactical plans (Reserve, Harvest, and Silviculture): planning indicators, objective, strategy, means of achieving objective, current status, target, and monitoring & reporting. Specific monitoring and reporting requirements are also listed for each plan.

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Document Revision History

Version	Date	Notes/Revisions
1.0	March 31, 2018	First version distributed to project team for review and comment.
1.1	July 5, 2018	Included various edits through the document for clarification and context.

1 Introduction

This document describes an Implementation Monitoring Plan for the Merritt TSA – as it relates to the ISS Tactical Plan¹. While forest licensees are not legally required to follow the Tactical Plan developed through the ISS planning process, these tactics provide important guidance for key activities that will be monitored relative to harvesting and other performance indicators. Monitoring will focus on the implementation of these tactics over the life of the Tactical Plan. Ultimately, implementation monitoring is intended to inform future ISS iterations and other forest-level analyses and management level direction.

Both the Tactical Plan and this Implementation Monitoring Plan reflect outcomes generated through a series of forest-level modelling exercises culminating in a run called the Combined Scenario² and summarized results for three spatially-explicit plans: Reserve Plan, Harvest Plan, and Silviculture Plan. For each plan an indicator table was developed to capture the concepts and tactics involved and provide a structured process to monitor implementation of the Tactical Plan. Each table is organized with the following items³:

- Planning Indicator — a variable that measures or describes the state or condition of a value identified during the ISS process;
- Objective — a broad statement describing a desired future state or condition of a value;
- Strategy — a coordinated set of actions designed to meet established targets;
- Means of Achieving Objective – a statement describing the intended method(s) to achieve an objective;
- Current Status – description of the current status of the indicator(s);
- Target — a specific statement describing a desired future state or condition of an indicator; and,
- Monitoring & Reporting – description of procedures, timelines, and method to monitor and report on performance to achieving targets. Periodic assessment of the quality and meaningfulness of the targets and indicators is recommended.

This document also provides a table that details the ongoing data requirements to complete the monitoring and reporting components for implementation monitoring.

¹ Forsite Consultants Ltd. 2018. Integrated Silviculture Strategy for the Merritt TSA – Tactical Plan. Version 1.0. March 2018.

² Forsite Consultants Ltd. 2018. Integrated Silviculture Strategy for the Merritt TSA – Analysis Report. Version 1.1. March 2018.

³ Structure of the indicator table has been informed by the CSA Z809-16 standard, <http://shop.csa.ca/content/ebiz/shopcsa/resources/documents/codes-and-standards/2424363.pdf>

2 Implementation Monitoring Plan

Various approaches⁴ were considered as the focus for this Implementation Monitoring Plan.

- *Effectiveness monitoring* is meant to assess whether the intent of the plan is being achieved. For example, if the plan is to trying to maintain a healthy population of wildlife species, then indicators to assess the population on the ground need to be developed for that. Because these measures can only be assessed on the ground, they are quite different than modeling indicators.
- *Validation monitoring* is meant to test the assumptions made in a modeling exercise, and is often more about pure research than monitoring. There is also the possibility of conducting a monitoring plan that *Supports Research* but this is not the current requirement of a monitoring plan.
- *Implementation monitoring* is designed to understand if tactics in a plan are being followed. Because the tactics in the ISS planning exercise for the Merritt TSA are not legally binding on the Licensees, implementation monitoring is considered the appropriate approach in order to understand if the forest management activities within the Merritt TSA are moving key metrics towards the objectives and targets for each of the indicators. Monitoring indicators will keep the focus on big questions associated with the ISS planning process - what are we most interested in? Why did we use the tactics that we did use for a certain value?

This Implementation Monitoring Plan focuses on the Reserve, Harvest and Silviculture Plans as described in the Analysis Report and Tactical Plan.

2.1 Reserve Plan

The Reserve Scenario was designed to answer the question, “Where and how should we reserve forested stands to address landscape-level biodiversity and non-timber values while minimizing impacts to the working forest?” The underlying purpose of this scenario was to explore ways to maintain the harvestable area while providing a wide range of values on the land base (i.e. co-location).

The candidate reserves developed in the reserve scenario were not used in the tactical plan because of the significant impact these reserves and implementation of old seral requirements had on the harvest flow. Instead, the Reserve Plan summarized the existing non-legal, spatial Old Growth Management Areas (OGMA) established to address both non-timber values and old seral requirements.

The following indicator table (Table 1) was developed to establish a method to monitor progress towards targets and objectives.

Table 1 Reserve Plan indicator table.

Matrix Element	Description
Indicator(s)	1) The area and location of reserves that remain intact (i.e., not harvested or damaged).
Objective	Maintain candidate reserves identified to address landscape-level biodiversity and non-timber values while minimizing impacts to the working forest.
Strategy	The Reserve Plan process indicated that: <ul style="list-style-type: none"> • Approximately 109,000 hectares are managed as non-legal, spatial OGMA that are removed from the timber harvesting land base (THLB). • While existing OGMA considered landscape-level thresholds, they appear to have been combined with maintaining other values and do not actually achieve some required old forest thresholds at this time.

⁴ Contributions from Ken Zielke, May 5, 2017

	<ul style="list-style-type: none"> • Non-legal, spatial OGMA's meet the LU-combined targets in 4 of the 12 LUs while candidate reserves meet these targets in all but one LU (i.e., Otter). • Non-legal, spatial OGMA's meet the appropriate LU/BEC targets in 34 of the 80 assessment units while candidate reserves meet these targets in 78 of the 80 assessment units.
Means of Achieving Objective	Licenses have access to and regularly update the non-legal, spatial OGMA's to incorporate during operational planning.
Current Status	Landscape-level biodiversity objectives are addressed through non-legal, spatial OGMA's. This approach appears to have less impact on THLB and forest operations than the preliminary candidate reserves developed in the ISS reserve scenario.
Target	Maintain at least the area identified as reserves within each assessment unit throughout the 20 year tactical plan.
Monitoring & Reporting	<p>Annual harvest information with five (5) year roll up.</p> <p>Within each assessment unit, all harvest-related clearings (blocks and roads) will be spatially overlaid with candidate reserves (amended as required) to determine overlap. Report:</p> <ul style="list-style-type: none"> ○ area of non-legal, spatial OGMA's by assessment unit and contribution class (Non-THLB and THLB), ○ total block and road area harvested within each assessment unit, ○ area of blocks and roads overlapping with non-legal, spatial OGMA's by assessment unit, and ○ non-legal, spatial OGMA area remaining by assessment unit and contribution class. <p>Report will be in a table or graph and will identify if reserve area is above, at, or under the area of non-legal, spatial OGMA's along with hectares of THLB reserved.</p>

2.2 Harvest Plan

The Harvest Plan aimed to answer the question “Which stands should be prioritized for harvest/salvage in the short-term (and what are the mid/long-term consequences of not following this strategy)?” The underlying purpose of this plan was to improve timber harvesting opportunities while mitigating the risk of economic loss to natural disturbances like insects and fire.

The following indicator table (Table 2) was developed to establish a method to monitor progress towards targets and objectives.

Table 2 Harvest Plan indicator table.

Matrix Element	Description
Indicator(s)	<ol style="list-style-type: none"> 1) Harvested locations relative to the locations identified in the Harvest Plan (cumulative variance of overlapping areas - planned vs. actual). 2) Harvested area by designated harvest system (i.e., slope class <45% and ≥45%). 3) Harvest area by stand volume class (75 – 100 m³/ha, 100 to 150 m³/ha, 150 to 200 m³/ha, and >200 m³/ha). 4) Harvested area from stands within Wildland Urban Interfaces, proposed Fire Breaks, or rated as extreme fire threat according to the 2015 Provincial Strategic Threat Analysis (PSTA) – wildfire threat component dataset for Merritt TSA. 5) Reforestation and stocking levels within the Wildland Urban Interfaces.
Objective	Focus timber harvesting on stands that are forecasted to achieve the best balance of non-timber values and timber harvest levels into the long-term.
Strategy	<ol style="list-style-type: none"> 1) The Harvest Plan showed that grouping blocks into larger harvest openings was possible without significantly impacting the harvest flow. Increasing block size can help to minimize impacts to other non-timber resources and improves efficiency of harvest operations leading to long-term use of the forest resource.

	<ol style="list-style-type: none"> 2) The ISS Base Case Scenario relied on harvesting younger (< 60 yrs) managed stands starting about 35 years from now. In contrast, the Harvest Plan developed from the Combined Scenario required that managed stands be at least 60 years of age and attain 95% CMAI. There is a noticeable difference in the length of time that natural stands contribute to harvest flows between Run 1 – MHC 200 m³/ha and Run 2 – MHC 75 m³/ha. For Run 2, there is virtually no contribution from natural stands after 50 years, while Run 1 is harvesting natural stands well into the future. This is likely the result of younger natural stands being available for harvest sooner because of the lower minimum harvest criteria. 3) Overall, volumes from steep slopes average ~3.2% of the total harvest volume in the short/mid-term and ~2.6% of the total harvest volume in the long-term. However, there is significant fluctuation in the harvest flow contribution from steep slopes over the planning horizon, ranging between approximately 1% and 5% of the total harvest volume. In the short/mid-term, roughly 1/3 of the volume harvested on steep slopes is from clearcut stands less than 200 m³/ha or from partial cutting. This changes in the long-term as harvest transitions to managed stands, with only 7% of the volume harvested from lower volume stands or partial cutting. 4) The wildfire management tactics were developed to incorporate stand- and landscape-level wildfire management strategies to mitigate wildfire risk. The forecasted harvest was prioritized for stands identified within Wildland Urban Interfaces, proposed Fire Breaks, or rated as extreme fire threat according to the 2015 Provincial Strategic Threat Analysis (PSTA) – wildfire threat component dataset for Merritt TSA. 5) Reduce stocking density in harvest blocks located within the wildland urban interfaces to improve future wildfire management without unduly reducing short/midterm and long term harvest levels below ISS Base Case. 																																			
<p>Means of Achieving Objective</p>	<ol style="list-style-type: none"> 1) Continue to focus on harvesting stands at least 60 years of age. 2) Create opening sizes similar to those developed in the Harvest Plan. 3) Continue to explore economically viable ways to harvest timber from steeper slopes using cable harvest systems. 4) Prioritize harvesting of stands identified with extreme wildfire risk and conifer-leading stands landscape-level fuel break. 5) Adjust planting density in harvest blocks located within the wildland urban interface to 600 seedlings/ha. 																																			
<p>Current Status</p>	<p>A summary of the current status for each of the indicators listed above was not completed.</p>																																			
<p>Target</p>	<ol style="list-style-type: none"> 1) Harvest locations within the following Harvest Plan criteria (as described in the tactical plan): <table border="1" data-bbox="430 1241 1062 1423"> <thead> <tr> <th>Plan Years</th> <th>Variance from Planned Harvest Locations¹/Areas²</th> <th>Variance from Planned Opening Size Levels³</th> </tr> </thead> <tbody> <tr> <td>1-5</td> <td><25%</td> <td><25%</td> </tr> <tr> <td>6-10</td> <td><25%</td> <td><25%</td> </tr> <tr> <td>11-15</td> <td><20%</td> <td><20%</td> </tr> <tr> <td>16-20</td> <td><20%</td> <td><20%</td> </tr> </tbody> </table> <p>¹ Cumulative variance of overlapping areas (planned vs. actual) ² Cumulative variance of area summarized by mBEC and LU (planned vs. actual) ³ Cumulative variance of minimum, mean, maximum areas</p> 2) Cumulative proportion of harvest area for key harvest profiles (as described in the tactical plan): <table border="1" data-bbox="430 1581 1000 1764"> <thead> <tr> <th>Plan Years</th> <th>Steep Slopes</th> <th>Avg Stand Volume <150 m³/ha</th> <th>Selection Systems</th> </tr> </thead> <tbody> <tr> <td>1-5</td> <td>≥3.3%</td> <td>≥29.9%</td> <td>≥3.6%</td> </tr> <tr> <td>6-10</td> <td>≥2.6%</td> <td>≥30.9%</td> <td>≥3.6%</td> </tr> <tr> <td>11-15</td> <td>≥2.5%</td> <td>≥30.8%</td> <td>≥3.6%</td> </tr> <tr> <td>16-20</td> <td>≥2.0%</td> <td>≥31.6%</td> <td>≥3.6%</td> </tr> </tbody> </table> 3) Cumulative proportion of harvest area for fire management profiles (as described in the tactical plan): 	Plan Years	Variance from Planned Harvest Locations ¹ /Areas ²	Variance from Planned Opening Size Levels ³	1-5	<25%	<25%	6-10	<25%	<25%	11-15	<20%	<20%	16-20	<20%	<20%	Plan Years	Steep Slopes	Avg Stand Volume <150 m ³ /ha	Selection Systems	1-5	≥3.3%	≥29.9%	≥3.6%	6-10	≥2.6%	≥30.9%	≥3.6%	11-15	≥2.5%	≥30.8%	≥3.6%	16-20	≥2.0%	≥31.6%	≥3.6%
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	Plan Years	Extreme Fire Risk	Fuel Breaks	WUI Regen 600 sph
	1-5	55.4%	13.6%	10.4%
	6-10	55.9%	13.9%	16.5%
	11-15	n/a	n/a	19.7%
	16-20	n/a	n/a	22.6%

Monitoring & Reporting	<ol style="list-style-type: none"> Summarize timber harvest data for the Harvest Plan criteria over each 5-year period. Reporting will include tables, graphs, and/or maps. Summarize annual planting program densities (trees/ha by harvest area) within wildland urban interface.
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2.3 Silviculture Plan

The Silviculture Plan aims to explore tactics to enhance timber quantity and quality over the mid- and long-term, as well as, improve biodiversity, wildlife habitat, and cultural interests. The plan was developed from the combined scenario by integrating three key silviculture tactics: 1) fertilization 2) enhanced basic silviculture, and 3) rehabilitating MPB impacted stands. The Silviculture Plan reflects the best combination of these treatments given a speculative funding level of \$3 million per year over the first 20 years of the planning horizon.

The following indicator table (Table 3) was developed to establish a method to monitor progress towards targets and objectives.

Table 3 Silviculture Plan indicator table.

Matrix Element	Description
Indicator(s)	<ol style="list-style-type: none"> Annual funding available and spent to support silviculture investments. Rehabilitated/harvest area of MPB-impacted stands. Area treated for each tactic: fertilization, enhanced basic silviculture, and rehabilitation (Cumulative variance of area summarized - planned vs. actual).
Objective	Enhance timber quantity and quality over the mid- and long-term.
Strategy	<p>The Silviculture Plan reflects an opportunity to mix of 3 tactics at an annual funding level of \$3 million/year that results in timber supply gains (Run 2 showed a 6.3% increase compared to base case) that may be used to increase harvest levels in short & mid-term. These gains are also associated with enhancing non-timber values. The actual future realized gains depend entirely on the area treated and, by extension, the investment level throughout the 20-year plan period. Tracking these investments and areas treated will provide the data needed to reflect actual gains into future analyses and plans.</p> <p>Note: funding for enhanced basic silviculture regimes, through an operational cost allowance, must be developed for this project area.</p>
Means of Achieving Objective	<ol style="list-style-type: none"> Rehabilitate eligible MPB-impacted stands to capture the economic benefit of any remaining timber from the stand and to quickly reforest these areas so that they will contribute to mitigating wildfire risk, ameliorating watershed health, improving habitat, and increasing the amount of harvestable timber sooner. To increase the amount of harvestable timber, apply fertilizer on eligible stands at least 10 years prior to harvest. Where possible, undertake multiple applications of fertilizer at least 10 years apart. Incorporate enhanced basic silviculture treatments that increase stocking levels of the best trees available on eligible stands. This aims to mitigate forest health issues, reduce the time to crown closure and ultimately increase the amount of available timber at harvest.

Current Status	A summary of the current status for each of the indicators listed above was not completed. These silviculture investments are expected to be supported through various funding sources (e.g., Land Based Investment, Forest Enhancement Society, and Operational Cost Allowance). Factors involved to allocate funds are outside the scope of this Silviculture Plan.																				
Target	<p>There are no requirements or funding commitments established towards the opportunities presented in the silviculture plan. Accordingly, targets – and associated benefits – described under this plan only relate to the \$3 million/year funding level for all activities, which is uncertain.</p> <p>1) Locations treated within the following Silviculture Plan criteria (as described in the tactical plan):</p> <table border="1"> <thead> <tr> <th>Plan Years</th> <th>Variance from Areas¹ Planned for Rehabilitation</th> <th>Variance from Areas¹ Planned for Fertilization</th> <th>Variance from Areas¹ Planned for Enhanced Basic Silviculture</th> </tr> </thead> <tbody> <tr> <td>1-5</td> <td><25%</td> <td><50%</td> <td><25%</td> </tr> <tr> <td>6-10</td> <td><25%</td> <td><50%</td> <td><25%</td> </tr> <tr> <td>11-15</td> <td><25%</td> <td><50%</td> <td><25%</td> </tr> <tr> <td>16-20</td> <td><25%</td> <td><50%</td> <td><25%</td> </tr> </tbody> </table> <p>¹ Cumulative variance of area summarized by mBEC and LU (planned vs. actual)</p>	Plan Years	Variance from Areas ¹ Planned for Rehabilitation	Variance from Areas ¹ Planned for Fertilization	Variance from Areas ¹ Planned for Enhanced Basic Silviculture	1-5	<25%	<50%	<25%	6-10	<25%	<50%	<25%	11-15	<25%	<50%	<25%	16-20	<25%	<50%	<25%
Plan Years	Variance from Areas ¹ Planned for Rehabilitation	Variance from Areas ¹ Planned for Fertilization	Variance from Areas ¹ Planned for Enhanced Basic Silviculture																		
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16-20	<25%	<50%	<25%																		
Monitoring & Reporting	1) Summarize treated area data for the Silviculture Plan criteria over each 5-year period. Reporting will include tables, graphs, and/or maps.																				

3 Monitoring Requirements

The following table summarizes the data and reporting requirements for each indicator.

Table 4 Monitoring Requirements

Plan	Indicator #	Data	Reporting Period	Reporting Format
Reserve	1	Spatial layer(s) of the following: <ul style="list-style-type: none"> assessment unit (LU/BEC zone) contribution class (Non-THLB and THLB) candidate reserves developed in the Reserve Plan cutblocks and buffered road widths (dissolved on opening id) harvested over the reporting period. 	5 year	Table and graph
Harvest	1	Spatial layer(s) of the following: <ul style="list-style-type: none"> openings developed in the Harvest Plan harvested blocks (dissolved on opening id) 	5 year	Table and graph
	2	Spatial layer(s) of the following: <ul style="list-style-type: none"> openings developed in the Harvest Plan harvested blocks (dissolved on opening id) slope classification (i.e., ground vs. cable) used in the Harvest Plan 	5 year	Table and graph
	3	Spatial layer(s) of the following: <ul style="list-style-type: none"> openings developed in the Harvest Plan harvested blocks (dissolved on opening id) volume/ha of harvested areas 	5 year	Table and graph
	4	Spatial layer(s) of the following: <ul style="list-style-type: none"> openings developed in the Harvest Plan 	5 year	Table, Graph, and Map

		<ul style="list-style-type: none"> ○ harvested blocks and buffered road widths (dissolved on opening id) ○ stands within a wildland urban interface ○ stands identified in the Harvest Plan with extreme fire risk ○ stands identified in the Harvest Plan within landscape-level fuel breaks 		
	5	Spatial layer(s) of the following: <ul style="list-style-type: none"> ○ openings developed in the Harvest Plan ○ harvested blocks (dissolved on opening id) ○ stands within a wildland urban interface Summary data of the following: <ul style="list-style-type: none"> ○ silviculture planting records for harvest areas within wildland urban interface 	5 year	Table and graph
Silviculture	1	Summary data of the following: <ul style="list-style-type: none"> ○ annual funding allocated to the TSA by source ○ annual expenditures over the TSA by activity and funding source 	5 year	Table
	2	Spatial layer(s) of the following: <ul style="list-style-type: none"> ○ mBEC/LU ○ areas rehabilitated ○ areas fertilized ○ areas reforested under an enhanced basic silviculture regime 	5 year	Table and graph

4 Discussion

As described above, implementation monitoring is intended to inform management direction and future ISS iterations and other forest-level analyses. At each reporting period, results are compiled and compared to determine how well actual performance aligns with the key indicators from the tactical plans. Similar results indicate that we are on track towards achieving the future forest conditions described in the Combined Scenario, while large deviations would suggest that we are not. In fact, significant variances or new objectives (i.e., constraints) may also suggest the need to update these forest-level analyses to produce new tactical plans that reflect actual performance. At each reporting period, the indicators, objectives, and targets should also be reviewed to ensure they continue to align with planned outputs and expectations (e.g., new direction for Species at Risk, additional First Nations input, better understanding of climate change impacts, etc.).

Many of the indicators described above are designed to compare the current status against results from the tactical plans. This warrants a complete package of summaries and spatial datasets developed in these plans to help simplify the monitoring steps in future assessments.

To fully understand the key elements for the monitoring steps described above, a preliminary assessment of all indicators should be undertaken within the first year, rather than waiting until the first reporting period to undertake. This will help to identify new reporting and analysis needs that are unforeseen at this time. For example, reporting processes within government systems (e.g., RESULTS, Forest Tenure Administration, Harvest Billing System, and Stumpage Cost Allowances) may need to be

clarified or revised. Similarly, new methods for tracking annual funding levels and treatment costs may be required.

While the Silviculture Plan focuses on three tactics (rehabilitation, fertilization, and enhanced basic silviculture), monitoring efforts should also note other silviculture activities being conducted to enhance timber quantity and quality, such as brushing, pruning, thinning.

As noted above, funding for enhanced basic silviculture regimes, through an operational cost allowance, must be developed for this project area.