

Integrated Stewardship Strategy for the Invermere TSA

Implementation Monitoring Plan

Version 1.0

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Project 419-38

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Executive Summary

Implementation monitoring is intended to provide statistics that 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 adjust operational practices to align better with planned results or update the 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 Plan developed through the Integrated Stewardship Strategy for the Invermere TSA. The following monitoring details were developed for a total of seven 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
0.1	Oct 17, 2019	First version distributed to project team for review and comment.
0.2	Nov 25, 2019	Included note regarding cable harvest systems profile and switched targets to percentages (Table 2).
1.0	Nov 28, 2019	No further edits at this time. Made available for distribution on website. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silviculture-strategy-areas

1 Introduction

This document describes an Implementation Monitoring Plan for the Invermere TSA as it relates to the Tactical Plan¹ developed for the Integrated Stewardship Strategy (ISS). While forest licensees are not legally required to follow the tactics developed through the ISS planning exercise, 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 provide statistics that inform future ISS iterations and other forest-level analyses.

This Implementation Monitoring Plan reflects the outcomes generated through the Combined Scenario described in the Analysis Report² and used to develop the Tactical Plan: Reserve Plan, Harvest Plan and Silviculture Plan. For each plan, an indicator table was developed that captures the concepts and tactics from various scenarios and sensitivity analyses and provides 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 of the Implementation Monitoring Plan.

¹ Forsite Consultants Ltd. 2019. Integrated Silviculture Strategy for the Invermere TSA – Tactical Plan. Version 0.1. October 2019.

² Forsite Consultants Ltd. 2019. Integrated Silviculture Strategy for the Invermere TSA – Analysis Report. Version 0.4. October 2019.

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 for the focus of a monitoring plan.

- *Effectiveness monitoring* is meant to assess whether the intent of the plan is being achieved. For example, if the plan is trying to maintain a healthy population of wildlife species, then indicators to assess the population on the ground need to be developed. Because these measures can only be assessed on the ground, they are quite different from modelling indicators.
- *Validation monitoring* is meant to test the assumptions made in a modelling 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 Invermere TSA are not legally binding, implementation monitoring is considered the better approach in order to understand if the forest management activities within the Invermere TSA are moving key metrics toward 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 Plan aimed to identify where and how we should reserve forested stands to address landscape-level biodiversity and where possible, non-timber values, while minimizing impacts to the working forest. While it considers strategies already in place (e.g., spatial OGMA and MMA), this scenario incorporates operational factors to identify alternative areas to maintain for non-timber values.

Based on the above, the following indicator table was developed to establish methods to monitor progress towards targets and objectives.

Table1 Reserve Plan indicator table.

Matrix Element	Description
Indicator(s)	1) The area and location of candidate reserves that remain intact (i.e., not harvested).
Objective	Maintain candidate reserves identified to address landscape-level biodiversity, and possibly other non-timber values, while minimizing impacts to the working forest.
Strategy	The Reserve Plan process determined that the landscape-level biodiversity objectives are currently below the minimum target levels, for old seral by 10,399 ha (11%) in 54 of the 202 reporting units, and for mature-plus-old seral by 2,259 ha (7%) in 6 of the 24 reporting units. Relative to the ISS Base Case, the FMLB selected as Candidate Reserves totalled 109,744 ha (18.0%) – 32,000 ha more area than the current OGMA/MMA – from which 6,178 ha (3.6% of total THLB) was THLB. Relative to the ISS Combined Scenario, where the Candidate Reserves were 100% excluded from the THLB over the entire 300-year planning horizon, the effective THLB was 0.2% more than the ISS Base Case. The reserve strategy identifies areas that have not yet been field checked. Revisions to these candidate reserves are expected provided suitable replacements are identified (area-for-area with similar or better quality) within the same LU/BEO/NDT/BEC variant assessment unit.

⁴ Contributions from Ken Zielke, May 5, 2017

Matrix Element	Description
Means of Achieving Objective	Forested candidate reserves identified within the non-THLB were not sufficient to meet the landscape-level biodiversity objectives; an additional 16,562 ha was recruited and excluded from harvesting for the entire 300-year planning horizon, which resulted in more effective THLB compared to the ISS Base Case (0.2% higher). Licensees will be informed of the candidate reserves identified in the tactical plan to potentially incorporate during operational planning.
Current Status	The spatial OGMA/MMAs currently applied were designed to meet 1/3 of the landscape-level biodiversity old seral objectives for the low BEO. The current process does not meet landscape-level biodiversity objectives in 54 out of 202 units. The Candidate Reserves were designed to select the stands with the highest value (identified via a scoring scheme), to reduce THLB impact, and to meet the full old seral objectives regardless the BEO. This Reserve Plan provides more options for selecting future OGMA/MMAs with no impact on the THLB compared to the ISS Base Case.
Target	The Candidate Reserves are excluded from harvesting for the entire 300-year planning horizon, with no impact on the effective THLB compared to the ISS Base Case (0.2% higher).
Monitoring & Reporting	Annual harvesting information with 10-year roll-up. Within each LU/BEO/NDT/BEC variant unit, all harvest-related clearings (blocks and roads) will be spatially overlaid with candidate reserves (amended as required) to determine overlap. Report: - o areas of candidate reserves by LU/BEO/NDT/BEC variant and contributing class (Non-THLB and THLB), - o total block and road area within each LU/BEO/NDT/BEC variant, - o area of blocks and roads overlapping with candidate reserves by LU/BEO/NDT/BEC variant, and - o reserved area remaining by LU/BEO/NDT/BEC variant and contributing class. Report will be in a table or graph and will identify if reserve area is above, at, or under the area of candidate reserves along with the % of THLB reserved.

2.2 Harvest Plan

The Harvest Plan aimed to prioritize stands for harvest over the short-term that align with mid- and long-term strategy developed in this ISS project. While no harvest partitions were formally implemented to influence harvest performance, this Harvest Plan incorporated harvest profiles for harvest system and haul time, as well as, opening size criteria to reduce the amount of small (<5 ha) openings.

Based on the above, the following indicator table was developed to establish a method to monitor progress towards targets and objectives.

Table 2 Harvest Plan indicator table.

Matrix Element	Description
Indicator(s)	2) Harvested locations relative to the locations identified in the Harvest Plan (cumulative variance of overlapping areas - planned vs. actual). 3) Harvest area by LU and harvest system (Ground, Cable, Partial cut in Open Forest, Clearcuts in Open Range). 4) Harvest area by LU and one-way haul time (hours). 5) Harvest percent by LU and species group (FdLw, HwBl, PyCw, and SxPl).
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	o A sensitivity analysis in the ISS Base Case showed that grouping blocks into early-seral patch size targets by operator (Canfor and BCTS/Galloway), reporting unit (Ecosection for Canfor, LU for BCTS/Galloway), and NDT resulted in a -10.2% harvest rate impact in the short-term and -1.0% in the long-term. Exploratory runs for the Combined Scenario, where early-seral patch size targets

Matrix Element	Description																																																																							
	and harvest openings were implemented with a gentle weight, indicated that significant impacts on harvest rates occurred especially in the short- and mid-term when higher weighs were implemented . Implementing the early-seral patch size targets 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. ○ The ground-based harvest systems, where slopes are ≤40%, occur on most of the area, in line with the harvest system objectives (i.e., ≤40% slope volume @ 78%). This requirement impacted the harvest schedule, but had little impact on the harvest rate. ○ The harvested area within 1 hour haul distance (one-way) from the closest processing facilities contributes the most to the harvest rate. Over the first 40 years, minimum targets were applied according to the current THLB profile (i.e., <0.5 hours @ 54% and 0.5-1.0 hours @ 38%). While this requirement influenced the harvest schedule, it had little impact on harvest rate. ○ Most of the harvested volume is white wood from spruce and lodgepole pine, followed by red wood from Douglas-fir and larch, and white wood from balsam/subalpine fir and hemlock. There are minor contributions of red wood volume from yellow pine and cedar.																																																																							
Means of Achieving Objective	Continue to focus on harvesting stands on slopes ≤40% and beyond 1 hour (one-way) from the closest processing facility. In the meantime, explore economically viable ways to harvest timber from steeper slopes using cable harvest systems and/or farther than 1 hour haul distance (one-way).																																																																							
Current Status	A summary of the current status for each of the indicators listed above was not completed.																																																																							
Targets	Harvest locations within the following Harvest Plan criteria (as described in the tactical plan): <table><tr><th>Plan Years</th><th>Variance from Planned Harvest Locations¹/Areas²</th><th>Variance from Planned Opening Size Levels³</th></tr><tr><td>1-10</td><td><33%</td><td><33%</td></tr><tr><td>11-20</td><td><20%</td><td><20%</td></tr></table> ¹ Cumulative variance of overlapping areas (planned vs. actual) ² Cumulative variance of area summarized by LU (planned vs. actual) ³ Cumulative variance of minimum, mean, maximum areas Harvest % for key harvest profiles (as described in the tactical plan): <table><tr><th rowspan="2">Harvest System</th><th colspan="2">Years 1-10</th><th colspan="2">Years 11-20</th></tr><tr><th>Ground</th><th>Cable*</th><th>Ground</th><th>Cable*</th></tr><tr><td>Clearcut</td><td>69%</td><td>24%</td><td>67%</td><td>24%</td></tr><tr><td>Partial Cut – Open Forest</td><td>6%</td><td>0%</td><td>9%</td><td>0%</td></tr><tr><td>Clearcut – Open Range</td><td>2%</td><td>0%</td><td>0%</td><td>0%</td></tr><tr><td>Total</td><td>76%</td><td>24%</td><td>76%</td><td>24%</td></tr></table> * Note that we based the Cable Harvest Systems profile on the THLB defined in TSR4, which was reduced by half in the AAC determination. These percentages should be increased to demonstrate performance for a potential AAC increase in future TSRs. <table><tr><th>Haul Time</th><th>Years 1-10</th><th>Years 11-20</th></tr><tr><td>< 0.5 hrs</td><td>54%</td><td>52%</td></tr><tr><td>0.5 to 1.0 hrs</td><td>37%</td><td>41%</td></tr><tr><td>1.0 to 1.5 hrs</td><td>9%</td><td>7%</td></tr><tr><td>>1.5 hrs</td><td>0%</td><td>0%</td></tr><tr><td>Total</td><td>100%</td><td>100%</td></tr></table> <table><tr><th>Species Group</th><th>Years 1-10</th><th>Years 11-20</th></tr><tr><td>FdLw</td><td>39%</td><td>46%</td></tr><tr><td>HwBl</td><td>9%</td><td>6%</td></tr><tr><td>PyCw</td><td>1%</td><td>2%</td></tr><tr><td>SxPl</td><td>52%</td><td>46%</td></tr></table>	Plan Years	Variance from Planned Harvest Locations ¹ /Areas ²	Variance from Planned Opening Size Levels ³	1-10	<33%	<33%	11-20	<20%	<20%	Harvest System	Years 1-10		Years 11-20		Ground	Cable*	Ground	Cable*	Clearcut	69%	24%	67%	24%	Partial Cut – Open Forest	6%	0%	9%	0%	Clearcut – Open Range	2%	0%	0%	0%	Total	76%	24%	76%	24%	Haul Time	Years 1-10	Years 11-20	< 0.5 hrs	54%	52%	0.5 to 1.0 hrs	37%	41%	1.0 to 1.5 hrs	9%	7%	>1.5 hrs	0%	0%	Total	100%	100%	Species Group	Years 1-10	Years 11-20	FdLw	39%	46%	HwBl	9%	6%	PyCw	1%	2%	SxPl	52%	46%
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Matrix Element	Description
Monitoring & Reporting	- Summarize timber harvest data for the Harvest Plan criteria over each 10-year period. Reporting will include tables, graphs, and/or maps. - Summarize timber harvest data for the Harvest Plan criteria over each 10-year period. Reporting will include tables, graphs, and/or maps.

2.3 Silviculture Plan

The Silviculture Plan aims 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) enhanced basic silviculture capped at 10% of treated area and limited to first 20 years, 2) fertilization limited to first 20 years, and 3) commercial thinning capped at 5% of treated area and limited to first 60 years. The Silviculture Plan reflects the best combination of these treatments given a speculative funding level of \$300,000 per year for all treatments.

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)	6) Annual funding available and spent to support silviculture investments. 7) Area treated by LU for each tactic: enhanced basic silviculture, fertilization, and commercial thinning (Cumulative variance of area summarized by LU - planned vs. actual). 8) Area treated by BEC variant for each tactic: enhanced basic silviculture, fertilization, and commercial thinning (Cumulative variance of area summarized by BEC variant - planned vs. actual).
Objective	Enhance timber quantity and quality over the mid- and long-term.
Strategy	The Silviculture Plan reflects an opportunity to mix 3 tactics at an annual funding level of \$300,000 /yr that results in timber supply gains (approximately 1.4% over the mid-term and reducing the mid-term shortage by 10 years) that may be used to stabilize the harvest flow or to offset future reductions associated with enhancing non-timber values. 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. Note: funding for enhanced basic silviculture regimes, through an operational cost allowance, must be developed for this project area.
Means of Achieving Objective	- 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. - To increase the amount of harvestable timber, apply fertilizer on eligible stands at least 7 years prior to harvest. Where possible, undertake multiple applications of fertilizer at least 7 years apart. - Commercially thin stands to capture volumes otherwise unavailable over the most constraining periods and contribute to mitigating wildfire risk and improving ungulate winter range habitat.
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.

Matrix Element	Description																
Target	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 \$300,000/yr funding level for all activities, which is uncertain.																
	Treat within the following Silviculture Plan criteria (as described in the tactical plan):																
	<table><tr><th>Plan Years</th><th>Variance from Areas¹ Planned for Enhanced Basic Silviculture</th><th>Variance from Areas¹ Planned for Fertilization</th><th>Variance from Areas¹ Planned for Commercial Thinning</th></tr><tr><td>1-10</td><td><25% (at least 3,247 ha)</td><td><50% (at least 1,282 ha)</td><td><25% (at least 9 ha)</td></tr><tr><td>11-20</td><td><25% (at least 3,196 ha)</td><td><50% (at least 550 ha)</td><td><25% (at least 6 ha)</td></tr><tr><td>21-60</td><td colspan="3"><25% (at least 102 ha)</td></tr></table>	Plan Years	Variance from Areas ¹ Planned for Enhanced Basic Silviculture	Variance from Areas ¹ Planned for Fertilization	Variance from Areas ¹ Planned for Commercial Thinning	1-10	<25% (at least 3,247 ha)	<50% (at least 1,282 ha)	<25% (at least 9 ha)	11-20	<25% (at least 3,196 ha)	<50% (at least 550 ha)	<25% (at least 6 ha)	21-60	<25% (at least 102 ha)		
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21-60	<25% (at least 102 ha)																
¹ Cumulative variance of area summarized by LU (planned vs. actual)																	
Monitoring & Reporting	Summarize treated area data for the Silviculture Plan criteria over each 10-year period. Reporting will include tables, graphs, and/or maps.																

3 Monitoring and Reporting Requirements

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

Table 4 Monitoring and Reporting Requirements

Plan	Indicator #	Data	Reporting Period	Reporting Format
Reserve	1) The area and location of candidate reserves that remain intact (i.e., not harvested).	Spatial layer(s) of the following: - assessment unit (LU/BEO/NDT/BEC variant) - 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	2) Harvested locations relative to the locations identified in the Harvest Plan (cumulative variance of overlapping areas - planned vs. actual).	Spatial layer(s) of the following: - openings developed in the Harvest Plan. - cutblocks and buffered road widths (dissolved on opening id) harvested over the reporting period. - assessment unit (LU).	5 year	Table
	3) Harvest area by LU and harvest system (Ground, Cable, Partial cut in Open Forest, Clearcuts in Open Range).	Spatial layer(s) of the following: - openings developed in the Harvest Plan. - cutblocks and buffered road widths (dissolved on opening id) harvested over the reporting period. - assessment unit (LU). - harvest system (ground, cable, open range, open forest) used in the Harvest Plan.	5 year	Table, Graph, and Map
	4) Harvest area by LU and one-way haul time (hours).	Spatial layer(s) of the following: openings developed in the Harvest Plan.	5 year	Table and graph

Plan	Indicator #	Data	Reporting Period	Reporting Format
		○ cutblocks and buffered road widths (dissolved on opening id) harvested over the reporting period. ○ assessment unit (LU). ○ haul distance (in one-way hours) used in the Harvest Plan.		
	5) Harvest percent by LU and species group (FdLw, HwBl, PyCw, and SxPl).	Spatial layer(s) of the following: ○ openings developed in the Harvest Plan. ○ cutblocks and buffered road widths (dissolved on opening id) harvested over the reporting period. ○ assessment unit (LU). ○ species group (FdLw, HwBl, PyCw, and SxPl) used in the Harvest Plan.	5 year	Table and graph
Silviculture	6) Annual funding available and spent to support silviculture investments.	Summary data of the following: ○ annual funding allocated to the TSA by source ○ annual expenditures over the TSA by activity and funding source	5 year	Table
	7) Area treated by LU for each tactic: enhanced basic silviculture, fertilization, and commercial thinning (Cumulative variance of area summarized by LU - planned vs. actual).	Spatial layer(s) of the following: ○ LU and BEC variant ○ areas reforested under an enhanced basic silviculture regime ○ areas fertilized ○ areas commercially thinned	5 year	Table and graph
	8) Area treated by BEC variant for each tactic: enhanced basic silviculture, fertilization, and commercial thinning (Cumulative variance of area summarized by BEC variant - planned vs. actual).	Spatial layer(s) of the following: ○ BEC variant ○ areas reforested under an enhanced basic silviculture regime ○ areas fertilized ○ areas commercially thinned	5 year	Table and graph

4 Discussion

As described above, implementation monitoring is intended to provide statistics that inform 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 results. At each reporting period, the indicators, objectives, and targets should also be reviewed to ensure they continue to align with planned outputs and expectations.

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. 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 (enhanced basic silviculture, fertilization, and commercial thinning), monitoring efforts should note other silviculture activities being conducted to enhance timber quantity and quality.

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