Integrated Stewardship Strategy for the Merritt TSA

Final Report

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Project 419-36

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1 Introduction

The British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development initiated an Integrated Stewardship Strategy (ISS) – sustainable forest management analysis – in the Merritt TSA. This document is the sixth in a series of seven documents developed through the ISS process and summarizes all work completed. This document was intentionally developed to succinctly summarize results, key observations, and recommendations developed through this ISS iteration. Detailed information can be found in the other six documents of the series, which include: Situation Analysis, Scenario Development, Data Package, Analysis Report, Tactical Plan, and Implementation Monitoring Plan.

2 Key Observations

ISS Objectives	To mitigate forest health impacts on mid-timber supply by facilitating a respectful and collaborative planning process that supports the delivery of defined stewardship outcomes - which in turn improves business certainty for licensees operating within the Mackenzie TSA.
Land Base	The Merritt TSA is situated in south-central BC, and has a gross area of approximately 1.13 million ha. It includes the mountainous terrain and steep river valleys of the Cascade Mountains in the west and the relatively dry, flat Thompson Plateau in the east. The Crown Forested Land Base is approximately 805,370 ha, and the current Timber Harvesting Land Base is approximately 562,670 ha.
AAC History	Over the last 20 years, the Allowable Annual Cut (AAC) established for the Merritt TSA has fluctuated by nearly 100% to accommodate salvage uplifts and emerging harvest opportunities. At this time, a further reduction is planned in 2021 (see below).

Year	AAC (m^3/yr)	Notes
1996	1,454,250	with small-diameter Pl partition of 250,000 m^3/yr
1999	2,004,250	1998 Lawless Creek Wildfire and MPB salvage
2002	1,508,050	with small-diameter Pl partition of 312,500 m^3/yr
2004	1,838,750	IFPA support
2005	2,814,171	MPB salvage
2010	2,400,000	with max 720,000 m^3/yr non-pine partition
2016	1,500,000	
(2021)	1,200,000	

Related Plans and Strategies	A strategic land use plan has not been completed for the Merritt TSA. Instead, a number of planning processes and key sources of information guide forest management in addition to the legislated requirements: • Provincial Timber Management Goals and Objectives • BC Mountain Pine Beetle model (BCMPB) • Southern Interior Beetle Action Coalition • Mid-Term Timber Supply Action Plan • Multiple Resource Value Assessment • Provincial Stewardship/Timber Harvesting Land Base Stabilization • Forest Health Strategy • Partition Implementation and Stewardship Guiding Principles • Silviculture Strategies • Grassland Conversion and Ecosystem Restoration • Cumulative Effects Framework • Nicola-Similkameen Innovative Forest Society • Nicola Thompson Fraser Sustainable Forest Management Plan
Differences from TSR	The major differences between the TSR Benchmark and ISS Base Case scenarios include land base definition, and non-timber objectives. The ISS Base Case THLB is 5.1% smaller than the TSR Benchmark because the ISS Base Case excludes from harvest more area for riparian reserves and wildlife habitat areas. Additional non-timber objectives include retention for Williamson's Sapsucker, ECA limits consistent with the proposed Fisheries Sensitive Watershed GAR Order, and exclusion of Coastal Tailed Frog point buffers.
Non-Timber Objectives	The non-timber objectives include stand- and landscape-level biodiversity, maximum disturbances within community watersheds and fisheries sensitive watersheds, visual landscape management, Williamson's Sapsucker Best Management Practices, identified Coastal Tailed Frog point locations, and established wildlife habitat areas and ungulate winter ranges.
Old Seral	The intent of the OGMA order was met by following a process over several years involving multiple government-appointed stakeholders and First Nations. While this approach was accepted by government, these OGMAs do not currently contain enough old seral to meet the requirements and further recruitment of new OGMAs over the next century will not meet these old seral requirements in all units. Implementing old seral requirements significantly reduced the harvest levels (~5%) in both the short- and long-terms. Implementing mature-plus-old seral requirements reduced the harvest levels in both the short- and long-terms by 2.4% and 1.3%, respectively.
Very Early Patch Size	All scenarios implemented target ranges for very early seral stage (age <20 years) by NDT with low weights to avoid affecting harvest levels. While increasing weights of the patch size targets improved the results, the desired distributions were still not achieved for all categories and periods. These adjustments did not result in a significant impact on timber supply.

Wildlife Habitat	The THLB was reduced by 36,385 ha (~4.5%) for wildlife habitat areas (Coastal Tailed Frog, Great Basin Spadefoot, Grizzly Bear, Lewis's Woodpecker, Western Screech Owl, Williamson's Sapsucker, and Data Sensitive species), Mule Deer Winter Range snow interception cover, and additional Williamson's Sapsucker Retention.
Coastal Tailed Frog	The THLB was reduced and ECAs were monitored on 152 watershed units relative to a non-legal threshold of 25%. In the Base Case Scenario, a significant number and area of CTF watershed units exceeded the 25% ECA.
Moose Winter Range	The minimum threshold of 15% of early seral was easily met throughout the planning horizon. The area of moose cover at least 16 m in height averaged 47% for the first 70 years, before declining to a long-term level of about 37%. A significant proportion (> 75%) of the cover is located within 200 m of riparian features and the majority (>90%) is in patches >=20 ha.
Marten	To provide some insight into marten habitat, the status of both early and mature-plus-old seral was reported in identified BEC units. Over time, the early seral status developed into a dampened, cyclical pattern With a few exceptions, the amount of mature-plus-old is reduced over time with most subzones remaining above 35% over all periods.
Community Watersheds	A maximum ECA threshold of 30% was applied to nine community watersheds. Three of these initially exceeded this threshold but all recovered within two decades.
Fisheries Sensitive Watersheds	The proposed FSW GAR order limits ECA to 25% above the snowline for sixteen watershed units. Two of these initially exceeded this threshold but they recovered within two decades. The proposed FSW GAR order also includes the requirement for a sustainable rate of cut within each watershed unit so a sensitivity analysis limited the area harvested per period in each unit within a specified range of the expected (based on average rotation age) area that could be harvested sustainably. When the rate of cut constraint is implemented, the number of watersheds that exceed the maximum clearcut area each period is reduced substantially; reducing the area harvested greater than the maximum (averaging 0.6 ha per year). Ultimately, this constraint had very little impact on harvest flows.
Cumulative Effects Watersheds	The ECA above the H40 and H60 snowlines was reported (only) for 136 cumulative effects assessment watersheds relative to non-legal thresholds of 35% and 25% for units with a High and Low/Moderate hazard rating, respectively. With no constraint in place, approximately 1/3 and more than half of the Low/Moderate and High hazard watersheds, respectfully, exceed these thresholds.
Small Stream Reserves	Enhanced small stream riparian reserves reduced the THLB by 10,904 ha (~1.3%). This would be greater if there weren't already enhanced buffers within the Nicola temperature sensitive stream watershed.

Timber Objectives	The Combined Scenario included harvest in four volume classes (75-100 m^3/ha, 100-150 m^3/ha, 150-200 m^3/ha, >= 200 m^3/ha) as well as partial harvesting. Volume from stands with less than 150 m^3/ha and partial harvest was not considered for slopes over 45%. TSR only considered volume >= 150 m^3/ha for all areas. Minimum harvest ages for managed stands were set to 95% of CMAI, and had to be at least 60 years except for stands managed with Enhanced Basic Silviculture.
Harvest Flow	The harvest level was established at 1.158 million m^3/year for the first 50 years, increasing to 1.259 million m^3/year for another 15 years, and then increasing to the long term level of 1.476 million m^3/year by year 66 of the 200-year planning horizon (Combined Scenario). In comparison, the ISS Base Case harvest levels were 1.151 million m^3/year for the first 65 years, increasing to 1.456 million m^3/year for the remainder of the planning horizon. Downward pressures on harvest flows in the Combined Scenario relative to the Base Case include reduced stocking in WUIs, increased minimum harvest ages for managed stands, minimum cutblock size targets, and elimination of partial harvesting on steep slopes. These are counteracted by upward pressures including harvesting of stands between 75 and 150 m^3/ha on slopes < 45%, and inclusion of rehabilitation, fertilization, and enhanced basic silviculture activities during the first 20 years. Including stands with lower volumes also improved the long-term harvest because of an effective increase in the THLB (some of these stands would never be harvested otherwise), and transition to yield tables with higher growth rates.
Harvest Opening Sizes	Each scenario incorporated patch targets and weights for grouping areas into several harvest opening size categories. This tactic aimed to limit the area harvested in the model as small openings (i.e., none less than 1 ha and up to 5% between 1 ha and 5 ha). It is likely that the weights applied in the Combined Scenario negatively impacted harvest levels.
Partial Cutting	Harvest feasibility was improved in both the Harvest and Combine Scenarios by "smoothing" the selection harvesting volume flow from period to period, rather than allowing the significant fluctuations observed in the ISS Base Case. The model was encouraged to achieve selection volumes between 34,000 m^3/year and 37,600 m^3/year.
Product Profile	A spreadsheet was built to illustrate species and grade profile according to user-defined estimates of species and grade distribution by age class.
Harvest on Steep Slopes	In the Harvest Scenario, roughly 1/3 of the volume harvested on steep slopes over short-/mid-term is from clearcut stands less than 200 m^3/ha or from selection harvesting. A similar trend was observed in the Combined Scenario where harvest on steep slopes was controlled (i.e., ~18.4% of the clearcut harvest from stands less than 150 m^3/ha; all from slopes less than 45%)
Py Contribution	Excluding ponderosa pine from the harvest flow and updating stand merchantability accordingly reduced harvest flows only slightly.

Tactical Plan	The tactical plan developed through this iteration integrates three separate plans: reserve, harvest, and silviculture. Ultimately, it provides operational direction and bridges strategic, forest-level analyses, and operational planning processes.
Candidate Reserves	To efficiently meet non-timber objectives while minimizing impacts on the working forest, candidate reserves were identified through an advanced modelling exercise that grouped reserved areas, as much as possible, to meet landscape-level requirements - including old interior forest. The candidate reserves determined in this exercise resulted in a net area of 22,596 ha that would be released back as THLB. As well, the overall score of the candidate reserves was 57% higher than the non-legal, spatial OGMAs; suggesting that there was an improvement in the quality of areas reserved through this process.
	Implementing the candidate reserves developed in the reserve scenario for 40 years and allowing harvest within the spatial OGMAs reduced the harvest flow by 5.5% over the first 50 years - primarily because this run also implemented the old seral requirements from the Non-Spatial Old Growth Order. Due to the significance of this impact, the candidate reserves were **not used** for developing the tactical plan.
Wildfire Management	Mitigating risk of loss due to wildfire was managed by influencing the forest estate model to focus harvesting, over the first 10 years, on stands located within Wildland Urban Interfaces (THLB Area ~ 79,600 ha), proposed Fire Breaks (THLB Area ~69,250 ha), and areas rated as extreme fire threat (THLB Area ~218,650 ha). After accounting for overlaps, the THLB area where harvest was prioritized for wildfire management was approximately 317,700 ha. To mimic a fuel treatment regime in the Combined Scenario, harvested stands within the Wildland Urban Interface were regenerated with reduced stocking (600 sph, “clumped” regeneration method).
Silviculture Tactics	Subject to a combined budget of $3 million per year, three silviculture tactics were implemented over the first 20 years of the planning horizon. These tactics contributed directly to the timber harvest over the next 30 to 120 years. These advantages combined to allow stands to cycle (i.e., harvest, reforest, harvest, etc.) more often over the 300-year planning horizon and allow some stands to be harvested sooner to make more volume available during key periods (e.g., mid-term trough). In the short-/mid-term, these silviculture tactics contributed to increasing the harvest level by 6%. Most of the $3 million per year budget was spent on the enhanced basic silviculture and fertilization tactics. These were favoured because they contributed to making more volume available at critical periods over the 300-year planning horizon and allow some stands to be harvested sooner to make more volume available during key periods (e.g., mid-term trough). In the short-/mid-term, these silviculture tactics contributed to increasing the harvest level by 6%.

Implementation Monitoring Plan	While forest licensees are not legally required to follow the tactics proposed in 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 inform future ISS iterations and other forest-level analyses.

3 Recommendations

Harvest Flow	Implement different rules to prepare a more comprehensive harvest flow. To facilitate easier comparisons between subsequent scenarios, the ISS Base Case scenario applied a single-step transition between the mid- and long-term harvest levels than the multiple steps transition used in the TSR Benchmark scenario. A modified harvest flow could be developed for the Combined Scenario.
Harvest opening size	Continue to explore trade-offs between creating operationally-feasible harvest opening sizes and acceptable impacts to timber supply. This could be done to ensure that harvested blocks are operationally feasible.
Patch Size	Continue to explore target patch size distributions. This will result in trade-offs between influencing the model to create these distributions and acceptable impacts to timber supply.
Low Productivity	Exclude lower productivity stands and deciduous stands that do not meet minimum harvest criteria from the THLB. It is key to have a robust THLB definition to more accurately model standing volume and minimize impacts on harvest flow in the long-term. Ensure these stands are recognized for their biodiversity values and as possible landscape reserves.
Steep slopes	Confirm that stand volume limits for harvesting on slopes greater than 45% are appropriate. In the Harvest Scenario, we observed that ~67% of the volume harvested on steep slopes came from clearcut stands greater than 200 m^3/ha or from selection harvesting. In the Combined Scenario, we arbitrarily assigned a minimum harvest volume of 150 m^3/ha and dropped selection harvest from steeper slopes which increased the proportion of volume harvested (~83%) from steep slope stands greater than 200 m^3/ha.
Minimum Harvest Criteria	Natural stands – Refine the minimum harvest criteria for existing natural stands to develop a realistic estimate of stands that can be harvested, including a consideration of slope and access.

	Managed stands – Evaluate the economic viability of harvesting younger stands and refine minimum harvest criteria. The TIPSY yield tables indicate that some future managed stands will achieve 150 m^3/ha earlier than 60 years, which could help mitigate mid-term harvest provided wood quality is acceptable. Including the 95% CMAI criterion increased the weighted minimum harvest age by approximately 13 years. While this new criterion constrains harvest levels, it demonstrated an improved harvest profile (age and product).
Watershed Reporting Units	Identify the key watersheds and h-lines to monitor and constrain in the model. ECA targets were monitored and implemented on over 500 watershed reporting units including community watersheds, proposed FSWs, coastal tailed frog watersheds, and cumulative effects watersheds. This was done primarily for district and regional FLNRO staff to review and provide further guidance on the key watershed reporting units for future analyses.
Visual Landscape Inventory	Review the visual landscape inventory to correct issues that may be artificially constraining timber supply in the modelling framework. This primarily includes rationalizing VLI polygons to reflect the original intent of the inventory (many polygons have been subdivided into much smaller units as different inventories were aggregated).
Wildfire Management	Refine assumptions related to implementing fire management stocking standards. The sensitivity developed in the Harvest Scenario implemented modified (reduced) stocking to all harvested stands within WUI areas. These assumptions may be refined based on actual operational experience.
Dry Belt Fir	Improve the approach used for modelling harvest in dry belt fir. The current analysis used a generic selection harvest yield table (50% volume removal, re-growth at 1.74 m^3/year increment) on 80% of the area identified as dry belt fir.

Candidate Reserves	Revise approach for selecting candidate reserves in reserve scenario, specifically: • Refine key elements of stand scoring, criteria, and thresholds. • Revise the order that candidate reserves are selected. • Include other key information to use as potential anchors or constraints. • Revise patch size criteria to reflect a biologically-appropriate condition. • Implement controls on interior old forest. • Undertake a post-processing exercise to assess the interior old forest selected. • Apply a minimum size threshold to wildlife tree retention areas applied as constraints (these were not anchors/default OGMAs). • Adjust weights on patch sizes. • Apply a harsher penalty in the constraints to avoid pine-leading stands. • Include spatial data layers to compare candidate reserves and identify replacement reserves (e.g., slope, elevation, slope position, aspect, soil moisture). • Group small riparian reserves with adjacent stands and delete others as required. • Explore ways to measure and monitor landscape connectivity.
	Utilize the candidate reserves to provide context for reviewing existing OGMA locations and considering co-location opportunities to meet old seral and other non-timber objectives. This process should involve stakeholders that work collaboratively – for each landscape unit – to verify values are addressed appropriately.
Silviculture Tactics	Explore different funding levels to identify trends associated with different silviculture tactics. Treatments in both the Silviculture and Combined Scenarios were limited to a total annual budget of $3 million over the first 20 years of the planning horizon. Decreasing and increasing this limit could identify specific trade-offs between tactics.
	Develop and incorporate more precise definitions of eligible stands and treatment responses. In both the Silviculture and Combined Scenarios, all future clearcut stands were deemed eligible for enhanced basic silviculture treatments, which maximizes the opportunities for this tactic. We recommend further exploration of eligible stands as enhanced basic stocking standards must be developed and approved before an operational cost allowance will be considered.
	Determine the most cost-effective treatment schedule to achieve the highest potential gains in harvest. This might be done by calculating and comparing the net present value for the incremental volume realized over the planning horizon and under increasingly higher funding levels (i.e., multiple runs).
	Explore additional opportunities to mitigate reductions to short- and mid-term harvest rates (e.g., partial cutting and commercial thinning).