

CHIEF FORESTER EXPECTATIONS

For Optimization of Silvicultural Investments



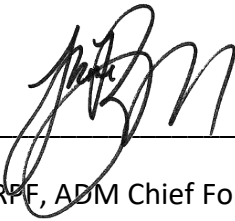
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Office of the Chief Forester Division

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Chief Forester Expectations
For Optimization of Silviculture Investments

Approved by:

A handwritten signature in black ink, appearing to be 'Shane Berg', written over a horizontal line.

Shane Berg RPF, ADM Chief Forester, Ministry of Forests

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ABOUT THIS DOCUMENT

The following document from the Ministry of Forests provides the chief forester's expectations to forest professionals who plan and implement harvesting in British Columbia. The expectations are on pages 6 through 8. This document does not replace or preclude legal requirements or other sources of guidance that are issued by the Ministry of Forests.

INTRODUCTION

One way to optimize available timber supply, to sequester more carbon, or to enhance habitat, is to invest in forest stands to grow more quickly, develop specific stand structures, and/or support a forest stand's overall health. This can be achieved through silviculture investments. Silviculture investments can cover a wide range of activities like using seeds with a higher genetic worth for new seedling growing stock, tree fertilization, tree pruning, tree spacing and commercial thinning. Silviculture investments are made by federal, provincial and Indigenous government programs; investments may also be funded by a forest tenure holder or a non-governmental organization. The Province of British Columbia (the Province) currently invests more than \$80 million annually in silviculture activities. This is in addition to investments completed by industry to meet or exceed legal requirement for following timber harvesting or to achieve other non-timber objectives.

Presently, there is not a legal mechanism to prevent timber harvesting in areas that have received silviculture investment. For instance, fertilization investments to increase timber supply only realize a maximum benefit if they can remain unharvested (and otherwise unharmed, such as from wildfire), for at least 7 years and preferably 10 years post-treatment. This guidance document states my expectations, as chief forester, related to the protection of silviculture investments.

As chief forester, in expressing these expectations I have considered the environmental, socio-cultural and economic effects to short, mid and long-term sustainability of our forest resources. In stating my expectations regarding optimizing silviculture investments, I have carefully weighed the loss of short-term harvesting opportunities with the need to maintain future harvest opportunities and non-timber values provided by our Province's forests.

I expect that forest professionals will work cooperatively with Indigenous peoples to seek to understand and incorporate Indigenous interests when considering management of areas that have received silvicultural investments.

Examples of objectives for silviculture investments include:

- To improve timber quality and quantity;
- To reduce the impacts of the mountain pine beetle outbreak to mid-term timber supply;
- To mitigate climate change impacts through carbon sequestration;
- To reduce wildfire hazard or risk;
- To reduce risks of flooding and/or landslides; and/or
- To provide ecosystem structure for wildlife habitat or biodiversity.

Ministry of Forests staff have created a [Silviculture Investments spatial layer](#) that is available to forestry licensees, Indigenous nations, stakeholders, the public and statutory decision makers in the BCGW.

I expect that the Ministry of Forests will continue to monitor implementation of the provincial silviculture investments and management activities in these areas. If, in my professional judgement, there is a risk to the long-term sustainability of timber and/or non-timber resources in a management unit (timber supply area or tree farm licence), I may exercise my statutory authority under S.8 of the Forest Act in order to ensure the stewardship and sustainability of the Province's forest resources.

The following document includes guidance for planning and operations for forest management in areas where there have been silviculture investments in areas of the Province of British Columbia.

DEFINITIONS

For the purpose of this document, the following terms are defined as:

Carbon sequestration – The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen and store the carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned.

Commercial thinning - Commercial thinning is a partial cutting treatment applied to immature forests where the value to the province exceeds the cost of the treatment. Commercial thinning applies to even-aged forest stands and is an interim treatment that exists in the context of a broader stand management regime to provide for specific prescribed stand volume and value attributes over time. Value may be economic as a measure of quality and quantity of fibre in the future, providing ecological function or social in nature as a steady flow of fibre for producers.¹

Fertilization - The addition of fertilizer to promote tree growth on sites deficient in one or more soil nutrients. Primarily applied within 10-15 years of harvest but can also be used to improve the vigour of crop trees following juvenile spacing or commercial thinning.

Forest stand - A community of trees sufficiently uniform in species composition, age, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity.

Genetically improved stock - Seed or propagules that originate from a tree breeding program and that have been specifically designed to improve some attribute of seeds, seedlings, or vegetative propagules selection.

Pruning – The manual removal of the lower branches of crop trees to a predetermined height to produce clear, knot-free wood.

¹ Ministry of Forests. 2021. [Interim Guidance for Commercial Thinning – Interior British Columbia](#). 42 pages. May 2021.

Juvenile Spacing - The removal of undesirable trees within a young stand to control stocking, to maintain or improve growth, to increase wood quality and value, or to achieve other resource management objectives.

SILVICULTURE INVESTMENT TRACKING

More than one million site specific silviculture treatments have been completed on crown land in BC since 1980. Records describing the treatment type, location, completion date and funding source for these treatments are currently stored in the Reporting Silviculture Updates and Land Status Tracking System (RESULTS) application. These records can be viewed in the RESULTS application or via several reporting portals including the [BC Data Catalogue](#), [RESULTS JCRS Reports](#) and [iMapBC](#).

Since only a fraction of the silviculture treatment records in RESULTS are government funded silviculture investments, a “Silviculture Investments” spatial BCGW layer was created. This layer ensures that licensees, stakeholders, and statutory decision-makers from the Ministry of Forests are referring to a standardized product. This spatial layer is limited to only the treatment types and funding sources of interest at this time.

The Silviculture Investments layer includes only the following funding programs:

Investment Program	SILV_FUND_SOURCE_CODE
Forests for Tomorrow ²	FTL & FTM
Forest Carbon Initiative	FCE
Forest Enhancement Society of BC	FES & FCE
Habitat Trust Conservation Foundation	ERP
Appraisal (Commercial thinning only)	IA

The Silviculture Investments layer includes only the following treatments and minimum protection criteria:

Silviculture Treatment	HARVEST PROTECTION CRITERIA
Fertilization	Protect from harvest for 10 growing seasons post-treatment for fertilization funded by the Forest Carbon Initiative (FCE and FCM) Protect from harvest for 7 growing seasons for non-Forest Carbon Initiative fertilization
Commercial Thinning	Protect from harvest for 20 growing seasons for coastal or Pli-leading stands. Protect from harvest for 30 growing seasons for Sx- and Fdi-leading stands.
Juvenile Spacing	Protect from harvest until stand exceeds the minimum harvest criteria defined in the latest TSR or Management Plan.
Pruning	Protect from harvest until stand exceeds an average of 15cm of post-treatment radial growth.

*Details on how the above minimum protection criteria were defined are available in Appendix 2.

² As of August 2022 government funded programs will be represented by the Forest Investment Program – FIP

STEPS TO ENSURE SILVICULTURE INVESTMENTS ARE OPTIMIZED

The following section provides guidance for licensees on the steps that should be followed in order to ensure that the provinces' historic silviculture investments achieve their objectives before they are harvested. These are the expectations of the chief forester, they are currently not legally enforced.

Steps 1-4 are for those developing harvest plans while steps 5-6 are for district staff overseeing cutting permit reviews and managing sustainable forest practices in the district.

STEP 1. REVIEW THE SILVICULTURE INVESTMENTS LAYER

Determine if the planning location has had silvicultural investment(s) implemented by overlaying the silviculture investments layer with planned development. If the planning location has no overlapping silviculture investments, no more work is required.

If the planning location has had silvicultural investment(s) implemented, refer to the protection criteria in the silviculture investments layer to ensure the area has exceeded the minimum protection criteria. If the planning location has exceeded the minimum protection criteria, continue to step 2.

If the area has not exceeded the minimum protection criteria, I expect forest professionals to modify their planning locations and/or timing to the extent practicable to ensure that the return on the silviculture investment(s) has been realized. If there is a need to continue before the minimum protection criteria have been realized, I expect that forest professionals will provide a rationale for the early intervention to the reviewing Ministry office to support informed decision-making and monitoring of the outcome.

STEP 2. REVIEW INVESTMENT OBJECTIVES

Determine the objectives for the investment, it may be the investment has met a minimum threshold but may still not have reached the optimum investment objective. This can be gleaned from searching attachments in the RESULTS App using the OPENING_ID(s) from the Silviculture Investment layer. If the objectives for the investment are not defined in the treatment attachments, continue to step 3.

If the area has not achieved the objective(s) outlined in the RESULTS attachments, I expect forest professionals to modify their planning locations and/or timing to the extent practicable to ensure that the return on the silviculture investment(s) has been realized. If there is a need to continue before the objective(s) have been realized, I expect that forest professionals provide a rationale for the early intervention to the reviewing Ministry office to support informed decision-making and monitoring of the outcome.

STEP 3. DETERMINE OPTIMAL HARVESTING WINDOW

Determine the timing at which the optimal harvest window will be met or exceeded. This can be gleaned from first searching attachments in the [RESULTS App](#) using the OPENING_ID(s) from the Silviculture Investment layer. If the optimal harvest window is not defined in the attachments with dates or target stand characteristics, refer to the estimated OPTIMAL HARVEST DATE in the silviculture investments layer to ensure operations are planned as near to the optimal harvest dates as possible. Appendix 2 provides further detail on harvest criteria which will help with determining optimal timeframes for harvest.



STEP 4. IMPLEMENT MANAGEMENT PLAN

It is my expectation that forest professionals will consider the need to harvest timber from a site where silviculture investments have been made with public monies. The appropriate management plan may be to harvest the site immediately, in the near future or to avoid harvest in the planned location.

I expect that management plans for management in forest stands where silvicultural investments have been implemented will consider the following:

- Use the Silviculture Investments layer to be aware of forest stands where silvicultural investments have been implemented.
- Avoid harvesting in stands where silviculture investments have been implemented before the minimum harvest criteria and/or treatment objectives have been realized.
- If/when harvesting is proposed in an area where silviculture investments have been implemented before the funding objectives have been realized, I expect that forest professionals will provide a rationale for early intervention (i.e., harvesting before objectives have been achieved) to the statutory decision maker for discussion.
- Consider the sustainability and stewardship of timber and non-timber forest resources.



STEP 5. FTA Status and Clearance Permit Review – For District staff

The silviculture investments layer is one of the spatial layers included in the FTA Status and Clearance Permit Review process. I strongly encourage statutory decision-makers to assess whether steps 2-4 have been adequately addressed by licensees who are considering harvesting in areas where silviculture investments have been carried out.

STEP 6. Monitoring

I expect that Office of the Chief Forester staff will monitor and report regularly regarding harvest in stands where silviculture investments have been implemented.

In my role as chief forester, I am aware that changes to the forestry planning regime are beginning to be implemented under the *Forest and Range Practices Act*. These changes include the forest operations maps, forest landscape plans and forest operations plans. As this planning framework is implemented throughout the provincial landbase, the Province will have tools to ensure that the full potential for silviculture investments are realized.

ADDITIONAL GUIDANCE

I expect that guidance which has been provided by government will be considered in forest management planning and operations in areas where silviculture investments have been implemented. This includes:

Silvicultural Systems Handbook for British Columbia

<https://www.for.gov.bc.ca/hfp/publications/00085/silvsystemshdbk-web.pdf>

Post-Natural Disturbance Forest Retention Guidance – 2017 Wildfires

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/2017_fire_report_revised.pdf

Guidelines for Commercial Thinning

<https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stand-tending/ct0726.pdf>

Interim Guidance for Commercial Thinning – Interior British Columbia (2021)

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stand-tending/interim_guidance_for_commercial_thinning.pdf

Forest Fertilization Guidebook

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/silvicultural-systems/silviculture-guidebooks/forest-fertilization-guidebook>

General Standards for Ministry Funded Programs – Land Based Investment Strategy

<https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/fs1001.pdf>

Guidelines for Developing Stand Density Management Regimes

<https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/silviculture/developingstanddensitymanagementregimes.pdf>

Additional resources related to stand tending in British Columbia can be found [here](#).

Appendix 1 - FUNDING PROGRAM OBJECTIVES

There are multiple programs that use government funds to invest in forest stands. The strategic objective for each investment program is different, and the expectation for how each investment will contribute to the health and wellness of the province's forest resources is varied.

Understanding the funding source for individual silvicultural investment provides insight into the objectives for a specific silviculture investment. Additional information will be needed to determine if or when a forest stand can be optimally harvested.

Over the last few decades silviculture funding has come from many sources, the majority being Forest Renewal BC, Forest Investment Account, Forests for Tomorrow and briefly the Forest Carbon Initiative. FRBC focused investments in incremental activities such as spacing, pruning and fertilizing while more recently FFT and FCI have invested mainly to counteract the impact of mountain pine beetle and wildfires. Moving forward provincial investment will increasingly be aligned with Forest Landscape Plans and the objectives identified within them.

Information regarding the various funding sources can be found on websites related to the specific initiative. Examples include:

- **Forest Enhancement Society of British Columbia** information can be found [here](#).
- **Forests For Tomorrow** program information can be found [here](#).
- **Forest Carbon Initiative** information can be found [here](#).
- **Habitat Trust Conservation Foundation** information can be found [here](#).

Moving forward government funded investment will be through the Forest Investment Program.

This list is not exhaustive. Funding sources for silviculture investments change over time. It is the responsibility of a forest professional to ensure planning information is current and accurate.

Silviculture investments have been implemented across the Province's landbase, to achieve the objectives of each funding program. Detailed information regarding the objectives and timing of specific silviculture investments can be explored through the individual investment programs. Ministry of Forests staff from Office of the chief forester or natural resource districts can also provide resources.

Where new timber harvesting is proposed and silviculture investments are identified within the area a forest I expect that the professional will identify the objectives for the funded activities. These may be achieved in the short term (5 to 10 years), may not be achieved until the stand reaches culmination age (70 to 100 years) or may require long term avoidance.

I am aware that forestry tenure holders may choose to invest in forest stands using private funding or other non-government funding sources. I expect forest professionals to work collaboratively within the forestry community to ensure that silviculture investments from other funding sources are also optimized.

Appendix 2 – TREATMENT TYPES AND MINIMUM PROTECTION CRITERIA

JUVENILE SPACING

Juvenile spacing has often been done to make stands merchantable sooner, address mid-term supply gaps or age class imbalance, influence stand composition, or prepare stands for future treatments. Other objectives such as mitigating wildfire risk, wildlife habitat and risk reduction from damaging agents can determine treatment types. Treatment objectives would affect which minimum harvest criteria (MHC) would be most appropriate. For the purposes of this exercise, we will just focus on a timber supply objective.

MHC assumptions could be drawn from Timber Supply Review (TSR) documents and include the following criteria, often used in combination.

- Minimum harvest volume
- Minimum average stand diameter, top height
- Minimum stand age
- Culmination of Mean Annual Increment (MAI) or a percentage of MAI.

As an example of the complex nature of this question, [de Montigny et al \(2019\)](#) present a comprehensive analysis using the results of a coast trial to compare the cost and benefits of pre-commercial thinning (PCT) to no treatment. The discount rate used greatly affects results of the economic analysis. Thinning generally reduces site occupancy so unthinned stands have the highest merchantable volume and MAI. Average diameter as a minimum harvest criterion provides a narrow view of the stand. Heavily thinned stands have a large diameter since smaller stems were selected out but take longer to achieve merchantable volumes comparable to unthinned stands.

Each Timber Supply Area (TSA) establishes a set of MHC for age and/or volume that models use when scheduling stands for harvest ([FPB 2018](#)). For example, the recent TSR for the Okanagan used the age at which the stand reaches 90% of the culmination of mean annual increment, unless the stand has not yet reached 150 m³/ha by that age. Failing that, the age that 150 m³/ha is reached is used ([BC MFLNRD 2017](#)).

It is suggested that we use an approach like above that relies on the assumptions each TSA uses for MHC, whether as an assessment of MAI culmination or total volume. This would leave the assessment up to the licensee to establish whether the stand has achieved this target and is available for harvest. For JS treatments that were carried out for other resource objectives, the proponent should to confirm that the objective identified in the treatment plan has been achieved. This will make it important for these plans to be attached to the Results submissions (which currently is rarely the case).

It is the chief forester's expectation that this confirmation will be made available as requested by district staff through the Cutting Permit approval process.

The minimum protection criteria for government funded juvenile spaced stands are:

Licensees are expected to confirm that the treated area has exceeded the minimum harvest criteria defined in the latest Timber Supply Review (TSR) or in the Management Plan. Where JS objectives were non timber values, the licensee must determine the objective has been met.

PRUNING

Removing the lower branches, live or dead, from trees in a pruning operation has been carried out across BC primarily for timber quality purposes. Almost no funding has been spent on this activity over the last 15 or more years, since FRBC was wound up. Pruning to 3m or 6m was the common goal and Douglas fir, western red cedar and Sitka spruce (in Haida Gwaii) the commonest species treated. The objective was to produce some clear wood without knots, to mimic higher quality wood from old growth stands or older second growth which had gone through a self pruning stage. Generally, the target was to achieve at least 15cm of clear wood at breast height on the outside of the tree. Achievement of the target will depend on the site index and stocking density of the stand and hence will vary considerably from stand to stand. Even on productive coastal sites with Douglas fir this amount of clear wood is unlikely to be produced in less than 20-25 years and more likely 30.

It is the chief forester's expectation that this confirmation will be made available as requested by district staff through the Cutting Permit approval process.

The minimum protection criteria for government funded pruned stands is:

Licensees are expected to confirm that the treated area has achieved an average of 15cm of new radial growth post treatment.

AERIAL FERTILIZATION

Aerial fertilization is a proven method for increasing carbon sequestration, harvest volume, and for accelerating stand operability. As a silvicultural treatment, it provides an opportunity to increase the merchantable yield and value of established forests. By adding key nutrients that are known to be limited on a specific site, fertilization can improve stand growth and productivity. Based on the predicted timber supply profile, and on the timing and magnitude of wood supply needs, fertilization can also be strategically used to accelerate the development of specific age classes, timber types and facilitate an even supply of wood at the forest level. Fertilized trees grow more quickly, reach a target merchantable size sooner, and are thus available for harvest sooner than unfertilized trees.

Estimated volume gains are based on an average expected increase over 10 years of 15 cubic metres per hectare in the Interior and 30 cubic metres per hectare on the Coast. The vast majority of volume gain has been achieved within 7 growing seasons of treatment and operational harvest of these stands for timber supply purposes can be considered once this time frame has passed. Although the prescribed preferred goal is a single application within about ten years of harvest, it is not uncommon for stands to be targeted for more than one treatment approximately 7-10 years after the first. From this timber supply perspective and a return on investment, harvest should be scheduled in a timely manner assuming minimum harvest criteria have been achieved. For both timber and carbon objectives, a minimum of 7 years must elapse before harvest and where possible 10 years is the preferred time period.

It is the chief forester's expectation that this confirmation will be made available as requested by district staff through the Cutting Permit approval process.

The minimum protection criteria for government funded fertilized spaced stands are:

Licensees are expected to confirm the stand has achieved minimum harvest criteria from latest TSR and a minimum of 7 full growing seasons after the last scheduled fertilizer treatment.

COMMERCIAL THINNING

Commercial thinning is a partial cutting treatment applied to immature forests (with no regeneration objective) where the value to the province exceeds the cost of the treatment. Commercial thinning applies to even-aged forest stands and is an interim treatment that exists in the context of a broader stand management regime to provide for specific prescribed stand volume and value attributes over time. Value may be economic as a measure of quality and quantity of fibre in the future, providing ecological function or social in nature as a steady flow of fibre for producers.

Distribution of growing space among the residual trees post thinning is a key factor that determines site occupancy and future stand growth. Ideally, harvesting pattern used in CT should create narrow canopy gaps and redistribute the growing space equally to the residual trees. Current thoughts around a final harvest for the stand is that the cumulative volume harvested (thinning plus final harvest) should be >0.95 of the unthinned control stand in order to maintain future timber supply. Recent TASS modeling work by FAIB identified Thinning Priority 1 (Thin P1) stands, referred to as "yield positive", as having the best potential for CT as the cumulative volume harvested is >1.05 of the control (i.e. $>5\%$ more than an unthinned stand), while Thinning Priority 2 (Thin P2) stands, referred to as "yield neutral" or "volume growth neutral", are between 0.95 and 1.05 (within 5%) of the control.

Using a Culmination of MAI would be consistent with the interior TSR's minimum harvest criteria as suggested for JS, but current VRI and Results data will not provide a licensee with information as to the volume removed from stands 20-30 years previously and so it will be difficult to easily determine this as a prerequisite for cutting permit. Although developing a lookup table for 95% of CMAI for the leading species/site index from is feasible, in the interim it may be simpler to use a minimum time period. Modeling for the CT project suggests 20-40 years post treatment will be necessary to achieve the minimum harvest criteria for interior forests, with the shorter time frame applicable to lodgepole pine (Pli) leading stands and considerably more for interior Douglas fir (Fdi) or hybrid spruce (Sx) stands. On the coast a time frame of 20 years will also likely be adequate for both coastal Douglas fir or western hemlock leading stands.

It is the chief forester's expectation that this confirmation will be made available as requested by district staff through the Cutting Permit approval process.

The minimum protection criteria for all commercially thinned stands are:

Licensees are expected to confirm that for stands which have been commercially thinned at least 20 growing seasons have passed since treatment for Pli -leading stands or coastal stands and at least 30 years for Sx or Fdi leading stands.