



Ministry of
Forests and
Range



FFT Ministry Survey Standard 2010

FINAL May 4, 2010

These standards apply, in addition to the [General Standards for Ministry Funded Programs \(FS 1001\)](#), to all survey activities funded under FFT Program.

CONTENTS

ARTICLE 1: GENERAL STANDARDS	1	ARTICLE 4 RECONNAISSANCE (RECCE) GROUND SURVEY STANDARDS	8
Definitions	1	ARTICLE 5: STOCKING and FREE GROWING PLOT SURVEY STANDARDS	10
Information and Materials Furnished by the MFR	3	Brush Assessment	12
ARTICLE 2: PERSONNEL	3	ARTICLE 6: REQUIRED PRESCRIPTION, EVALUATIONS (ROI), LAYOUT & REPORTS (APPLICABLE TO ALL SURVEYS)	13
Crew Qualifications	3	General	13
Inspector's Qualifications	3	ARTICLE 7: SUBMISSION INTO RESULTS	14
ARTICLE 3: STANDARDS APPLICABLE TO ALL SURVEYS	3	General	14
General	3	ARTICLE 8: ADDITIONAL TSA STANDARDS	15
Format of Documentation	4	ARTICLE 9: INSPECTION	15
Survey Stratification Criteria	5	Quality Inspection - General	15
Survey Lines and Plots (where applicable)	5	Inspection Methods – Office and Field Inspection	15
Free From Brush Criteria	6	Office Inspection	15
Requirement for a Plantability Assessment	6	Field Inspection	15
Brush Assessment	6		
Recommendations	7		
Survey and Treatment Maps	8		
Survey Maps - Additional Requirements	8		
Treatment Maps - Additional Requirements	8		

ARTICLE 1: GENERAL STANDARDS

NOTE: 1 (optional) - are specific underlined clauses available for optional selection (underlined blue are hyperlinks and are not optional clauses)

2 (insertion ~) –are where specific underlined values are required to be entered (suggested values maybe listed)

3 Direction required by FFT Regional Staff highlighted in **yellow**

Definitions

1.1 In this document the following words shall have the following meanings.

- (a) **“Accredited Silvicultural Surveyor”** means a person who is registered with the Forest Practices Branch of the Ministry of Forests and Range as an Accredited Silvicultural Surveyor.
- (b) **“Approved Surveys Quality Inspection System”** or **“Approved SQI System”** means the inspection system contained in this Document **or** another similar system approved in writing by the FFT Regional Staff, prior to the commencement of Work.
- (c) **“Crew”** means one person, or two or more persons working with each other in the same Opening.

- (d) **“Inspector”** means any person who under the defined roles for Quality Assurance in the FFT Delivery model, perform a review of a survey or treatment prescription - this includes a Recipient (reviewing Contractor work); an Independent Contractor; or MoFR staff (Regional or District)
- (e) **“Mountain Pine Beetle (MPB) Impacted Stands”** means all stands that are:
- i) Age Class 2 or older;
 - ii) PI leading (overstorey) stands, and;
 - iii) successfully attacked from MPB in layers 1 and 2.
- (f) **“MPB Rehabilitation Surveys”** means all surveys performed on MPB impacted stands where:
- i) the Stocking status (SR or NSR) will be based on the WS stems per ha. using the [Stocking Standards for assessing MPB impacted stands \(Article 3.7 of this document\)](#); and
 - ii) All Treatment Prescription decisions for these stands will be based on the documents: [FFT Forest Licence to Cut \(FLTC\) / Overstorey Removal Stand Selection Criteria Standard](#) or [Memorandum of Understanding regarding Innovative Timber Sale Licence \(ITSL\) between BCTS and FFT](#) where appropriate.
- (g) **Multi-storey Stand** means a stand with a mature or pole layer present in combination with a sapling and/or regeneration layer, managed on an uneven-aged basis.
- (h) **“Non-MPB Rehabilitation Surveys”** means all other surveys performed other than MPB rehab surveys. These surveys would specifically include:
- i) All post wildfire surveys;
 - ii) All stocking/survival surveys post stand establishment;
 - iii) All free growing surveys on established stands and post MPB rehab stands.
- (i) **“Opening”** means an area identified on a vegetation resources inventory map by an opening number.
- (j) **“Overstorey Conifer”** means layer 1 and/or 2 stand structure coniferous trees as described in the [Silviculture Survey Procedures Manual](#).
- (k) **“Reconnaissance Survey or Recce”** means a form of screening walk-through survey that can be systematic or non-systematic in nature, and involves physically walking through a stand to visually note and record characteristics found in the stand and results in a next action recommendation.
- (l) **“Standards Unit”** means one or more areas of an Opening for which there is only one of each of the following: Stocking Standard and soil disturbance limit standard.
- (m) **“Stocking Standards”** means the stocking requirements applicable to an Opening that are stated in the [FFT Stocking Standards](#) link and/or in Article 3 of this schedule.
- (n) **“Stratification Criteria”** means the criteria a contractor will use to stratify an opening for survey sampling and reporting purposes, as set out in these standards.
- (o) **“Stratum”** or **“Strata”** means, respectively, a Survey area or areas for which the boundaries are determined by the Stratification Criteria for the type of Survey referenced.
- (p) **“Survey”** means, as the context requires, a reconnaissance, a stocking, plantability, or free-growing survey as set out in the [Silviculture Survey Procedures Manual](#) and includes the collection and analysis of field data, and all forms, maps, reports, photographs, Survey Summary and Treatment Prescription required by the Ministry and FFT standards.
- (q) **“Survey Map”** means a map produced according to the specifications in Article 3.
- (r) **“Survey Summary”** means a short (no more than one page) summary report from a Survey (signed by the Accredited Silviculture Surveyor), composed of the outcomes of the data compilation (minimum inventory and silviculture label, and any brush competition data/issues) and an abbreviated Treatment Prescription (if a treatment is prescribed).
- (s) **“Treatment Map”** means a map produced according to the specifications in Article 3.

- (t) **“Treatment Prescription”** means a logical, biologically-sound, cost-effective recommendation, based on survey results and anticipated stand development, which specifies any future Surveys and/or silviculture treatments that are required for a Stratum, and which also specifies the year and season during which any such Survey or treatment should take place.
- (u) **“Understorey conifer”** means layer 3 and 4 stand structure coniferous trees as described in the [Silviculture Survey Procedures Manual](#)
- (v) **“Vegetation Resources Inventory Map”** means a Vegetation Resources Inventory Map maintained by the Ministry of Forests and Range or by a holder of a Tree Farm Licence or Community Forest Agreement.

Information and Materials Furnished by the Ministry of Forests and Range

- 1.2 At the request of the Recipient, the FFT Regional Staff and/or District Representative (when applicable), will provide or facilitate access to :
 - (a) any Treatment Prescription or Work Plans applicable to the Openings, when they exist;
 - (b) copies of the Vegetation Resources Inventory Maps applicable to the Openings to be surveyed;
 - (c) applicable aerial photographs or access to ortho photos, subject to any conditions of use that may be attached; and
 - (d) all other available information considered by the **FFT Regional Staff** to be pertinent to the Work.

ARTICLE 2: PERSONNEL

Crew Qualifications

- 2.1 Each Survey Crew must include at least one Accredited Silviculture Surveyor on the ground who has been to every Opening being surveyed greater than 5 ha. All personnel performing the Work must be familiar with the Treatment Prescription options that are appropriate and generally considered acceptable for the area.
- 2.2 (optional) Previously harvested (i.e. salvage) openings less then (insertion ~ 5) ha in size, do not require an Accredited Silviculture Surveyor on the ground per each opening.

Inspector’s Qualifications

- 2.3 All Work must be internally inspected by a person who is:
 - (a) a Registered Professional Forester (RPF), or operates under the direction of a RPF;
 - (b) an accredited silviculture surveyor, experienced and competent in conducting Surveys;
 - (c) familiar with appropriate Treatment Prescription options; and
 - (d) who did not undertake the Surveys.

ARTICLE 3: STANDARDS APPLICABLE TO ALL SURVEYS

- 3.1 The standards of performance in Article 3 apply to every Survey.

General

- 3.2 All Treatment Prescriptions must be signed and sealed by an RPF.
- 3.3 All contents and sections of this document pertaining to specific FFT Survey Standards, will supersede any similar content and section procedures stated in [Silviculture Survey Procedures Manual](#).
- 3.4 Any survey procedures not specifically referenced in this FFT Survey Standard document, will default to the [Silviculture Survey Procedures Manual](#), as referenced in the text of this document.

Format of Documentation

3.5 Surveys must collect the information necessary to complete the required forms for each survey type. Where Survey data or results are summarized or represented using computerized or other electronic means, the display, content and format of the information must substantially duplicate the corresponding Ministry of Forests and Range forms – specifically the FS 657, 658 and 659 and its respective procedural requirements.

Stocking Standards and Damage Criteria

3.6 All Non MPB Rehabilitation Surveys (including post rehabilitation plantation surveys) will use the Stocking Standards applicable for each Opening by following the standards protocol outlined on the FFT website at the following link: [FFT Stocking Standards](#) (SS). Free Growing Damage Criteria for all non-MPB Rehabilitation Surveys will be applied as per the [Silviculture Survey Procedures Manual](#).

(**Note:** DDM approved local TSA or district damage criteria for specific pests, will be included in a TSA variance in Article 8 and will supersede any replaced criteria referenced in this document).

3.7 All MPB Rehabilitation Surveys will use one of the following tables:

Table 1 – Stocking Standards for FLTC or Rehab Treatments

(Preferred and Acceptable Species as per [FFT Stocking Standards](#)):

PI leading Age Class (AC)	Layer	MITD m.	TSS (Unnested total of all layers) WS per ha.	MSSpa & p (Unnested total of all layers) WS per ha.	Damage Criteria (DC)
AC 2	1	0 ₍₁₎	FFT Stocking Standards	FFT Stocking Standards	AC 2 & 3 Damage Criteria
	2	2.0 or SS			
	3 & 4	2.0 or SS			Advanced Acceptability Criteria for Layer 3 & 4 ₍₃₎ plus Dwarf Mistletoe ₍₄₎ and Height Diameter Ratio ₍₅₎ clauses
≥ AC 3	1	0 ₍₁₎	FFT Stocking Standards	60% ₍₂₎ of FFT Stocking Standards	AC 2 & 3 Damage Criteria
	2	2.0 or SS			
	3 & 4	2.0 or SS			Advanced Acceptability Criteria for Layer 3 & 4 ₍₃₎ plus Dwarf Mistletoe ₍₄₎ and Height Diameter Ratio ₍₅₎ clauses

- 1) MITD for Layer 1 is 0 meters, for a Layered Survey, as per Section 9.2.2 of the [Silviculture Survey Procedures Manual](#);
- 2) MSS for Backlog Stocking Standards is 60% of the MSS pa & p., for stands established pre-1982, as per the [Backlog Management Policy](#);
- 3) Located in Section 21 of the [FS 660](#) -Advanced regeneration acceptability guidelines for Layer 3 and 4.
- 4) An Additional criteria applies for Dwarf Mistletoe Infection: A layer 3 or 4 tree is unacceptable if it is located within 10 m of an overtopping tree, which is infected with dwarf mistletoe
- 5) An Additional criteria applies for Height to Diameter Ratio (HDR): A layer 3 or 4 tree is unacceptable if the HDR is > 100 , as outlined in the [AC 2 & 3 Damage Criteria](#).

Table 2 - Stocking Standards for ITSL Treatments

(Preferred and Acceptable Species as per [FFT Stocking Standards](#)):

PI leading Age Class (AC)	Layer	MITD m.	TSS (Unnested total of all layers) WS per ha.	MSSpa & p ⁽⁶⁾ (Unnested total of all layers) WS per ha.	Damage Criteria (DC)
> AC 2	1	0 ⁽¹⁾	FFT Stocking Standards	FFT Stocking Standards	AC 2 & 3 Damage Criteria
	2	2.0 or SS			
	3 & 4	2.0 or SS			Advanced Acceptability Criteria for Layer 3 & 4 ⁽³⁾ plus Dwarf Mistletoe ⁽⁴⁾ and Height Diameter Ratio ⁽⁵⁾ clauses

- 6) An area that meets the MSS for *preferred* and *acceptable* (MSS pa) species but does not meet the MSS for *preferred* (MSSp) species would be considered NSR, **unless** the Ministry Designated Representative is satisfied that there are an abundance of *acceptable* WS trees, (approaching target stocking), to declare the area to be stocked. This decision by the Ministry Designated Representative would be based on a field visit with the prescribing Accredited Silviculture Surveyor to confirm that the trees are of an *acceptable* species and are likely, in the judgment of the two parties, to develop into a quality stand of merchantable timber, within a reasonable timeframe for the site.

Survey Stratification Criteria

- 3.8 Unless otherwise specified in this Standard, Work Area(s) will be stratified as set out in [Silviculture Survey Procedures Manual](#) - Section 3.2: Preliminary Stratification and Section 3.8.1: Field Stratification.

Survey Lines and Plots (where applicable)

- 3.9 Survey lines and plots will be established using either Global Positioning System (GPS) units (preferred), or by manual chaining methods. Survey lines and plots must be identified as follows:
- (a) For both GPS and manual chaining methods:
 - i) point of commencement (P.O.C.) must be marked with flagging tape showing the Opening number in waterproof ink;
 - ii) flagging tape must be affixed at a height of approximately 1.3 meters above each plot centre, showing in waterproof ink the plot number, (optional) date of survey, surveyors initials (if not included with the plot number);
 - iii) flagging tape must be affixed to the ground at all plot centers;
 - (b) If a GPS is being used, plot centre UTM Coordinates must be provided;
 - (c) If a manual chaining method is being used:
 - i) survey baseline (if established) and all strip lines must be marked with flagging tape showing the baseline and strip line number in waterproof ink;
 - ii) all plot centre flagging tape affixed at 1.3 meters must have the bearing and distance to the next plot written in waterproof ink.

Minimum Height Criteria Total Tree (TT) and Total Conifer (TC) Count

3.10 All trees (conifer and deciduous) will be tallied that are greater than (insertion ~ 5) cm in height at the time of survey in the TT count, including germinants if applicable to the defined height criteria. This count can be an estimate, if initial tally exceeds 35 per 3.99 meter radius plot.

TC count will be tallied for all conifers that are greater than the height criteria defined above for the TT count, including germinants if applicable to the defined height criteria.

Minimum Height Criteria Well Spaced (WS) Count:

3.11 Within all Non MPB Rehabilitation Surveys, all WS crop trees of preferred and acceptable species will be tallied that are greater than (insertion ~ 10) cm in height.

Within all MPB Rehabilitation Surveys, all WS crop trees of preferred and acceptable species will be tallied that are greater than (insertion ~ 50) cm in height.

Free From Brush Criteria

3.12 Within all Non MPB Rehabilitation Free Growing Surveys (including post rehabilitation plantation surveys) the preferred and acceptable trees in a plot must be assessed for free growing in accordance with Appendix 9 of the [Establishment to Free Growing Guidebook](#) for the forest region.

Within all MPB Rehabilitation Surveys, for the preferred and acceptable trees in a plot to qualify as WS, the trees must be:

- greater than the height of detrimental brush competition in a 1 m cylinder about the tree, or
- in the judgment of the Accredited Silviculture Surveyor, be deemed likely to remain free from brush competition to rotation.

Requirement for a Plantability Assessment

3.13 If a stocking, free growing or recce survey indicates that a Stratum is not satisfactorily restocked (NSR), a plantability assessment must also be conducted on the Stratum while performing the stocking or free growing survey. Assess plantability at (insertion ~ 1400) targeted plantable and /or preparable spots per ha. (defining the planting target inter-tree distance), in order to determine the amount of seedlings required.

Assess plantable and / or preparable spots **utilizing** the minimum inter tree distance (from the Stocking Standards for the Stratum) **up to** the target inter-tree planting density.

Brush Assessment

3.14 For each Stratum in every survey, brush hazard must be assessed using the following codes:

- HIGH - brush has encroached on some of the crop trees (control will be necessary);
- MED - brush will encroach on some of the crop trees (control may be necessary in the future);
- LOW - some brush present but no anticipated problem; or
- NIL - no brush hazard present.

Site Index (SI) Methodology

3.15 Site index must be collected following the procedural guidelines outlined in *Land Management Handbook 12 - Selecting a Method to Estimate Site Index 2006*: [Selecting a Method to Estimate Site Index, 2006](#).

3.16 The following is a summary of a combination of the site index hierarchy process presented above in Article 3.15 and FFT specific guidelines, relative to different FFT objectives and Stratum conditions:

a) SI for Inventory Labels – RESULTS

i. Immature and Mature Stands Even-aged / Single layered or Multi-layered:

1. First if possible, use of the growth intercept (GI) method is most recommended.
Tally site index for the current dominant/co-dominant species of the leading species

in the Stratum of the largest diameter, with a minimum of 3 samples per Stratum and a target of at least 5 samples per Stratum. If a leading species growth intercept cannot be collected, a secondary species will be collected (if possible), again from dominant/co-dominants, and converted for the leading species site index. Data should be collected from non-understorey or non-suppressed trees. Data should be collected on a **live** overstorey PI trees preferably, if these are the suitable site species. Dead PI stems are acceptable if mortality due to MPB is current (<2 years). [Site Tools](#) can be used to accurately calculate all SI from growth intercept measurements.

2. Second, if the growth intercept method cannot be used, the second choice is via Site Index by BEC (SIBEC) **second** approximation data for the appropriate species (usually denoted by a sample size, standard error and decimal site index in the SIBEC table); or
3. Third, the choice would be via SIBEC **first** approximation data for the appropriate species (usually denoted by no sample size, no standard error and whole number site index in the SIBEC table). SIBEC tables for all BEC subzones/site series by species, by old Forest Service Regions, are available at [SIBEC link](#).

ii. **Immature and Mature Stands Uneven-aged / Multi storied:**

1. First, the growth intercept method cannot be used in these stands due the variable and possibly suppressed growth rates. Therefore, the preferred choice is via SIBEC **second** approximation data for the appropriate species (as described above).
2. The second choice would be via SIBEC **first** approximation data. SIBEC tables for all BEC subzones/site series by species, by old Forest Service Regions, are available at [SIBEC link](#).

b. **SI for Return On Investment (ROI) – Investment Decisions**

i. **Immature and Mature Stands Even-aged or Uneven aged:**

1. If the methods and hierarchy listed above are unable to generate an estimate of the SI of the **projected** Stratum forecast for investment analysis (ROI test) **in the Stratum being surveyed**, then use of **an adjacent stand of similar BEC** and projected leading species is permitted - to estimate the SI for ROI purposes **only**.

(optional) Dead Tree Count

- 3.17 Estimates will be made for the total number of stable and total number of unstable dead trees greater than 5 m. in height, in the plot. This estimate will be used in NSR strata to determine if a Danger Tree Assessment by a qualified assessor is required, prior to treatment.

Additional Field Notes - Access and ROI

- 3.18 **Access:** Current access and required access improvement interplot or recce notes may be collected during all Surveys and documented/summarized with the Treatment Prescription.

ROI: To assist with estimating the total trees/ha and well spaced trees/ha for the return on investment (ROI) process, interplot or recce notes may be collected during all Surveys specifying the percentage of the total trees that are unlikely to develop into merchantable timber (e.g. 90% of the layer 2 and 3 PL are suppressed and/or infected with dwarf mistletoe).

Forest Cover Inventory Label and Silviculture Label

- 3.19 Surveys must produce a complete forest cover inventory label and silviculture label for each Stratum, as specified in the [Silviculture Survey Procedures Manual](#) and the [RESULTS Information Submission Specification - Government Submission](#)

Recommendations

- 3.20 Subject to the outcome of a Survey, Treatment Prescriptions must be developed in accordance with:

- a) the procedures in the *Silviculture Survey Procedures Manual*;
- b) any previous Treatment Prescriptions for the Opening, if one exists; and
- c) All MPB Rehabilitation Surveys will have all of their Treatment Prescription decisions for these stands based on the standard document [FFT FLTC / Overstorey Removal Stand Selection Criteria Standard](#).

Survey and Treatment Maps

3.21 Survey and Treatment Maps must:

- a) be submitted in accordance with the British Columbia Mapping Standards [BC Mapping Standards](#) for use in RESULTS submissions; and
- b) the two maps can be combined into one Survey and Treatment map if directed by the FFT Regional Staff.

Survey Maps - Additional Requirements

3.22 In addition to the requirements of Article 3.21, Survey Maps must also show:

- a) the type of Survey;
- b) biogeoclimatic (BEC) classification from the subzone to the site series level;
- c) Opening and Strata area;
- d) inventory and silviculture label (including either well spaced [WS] or free growing [FG] per Stratum;
- e) points of commencement of the survey;
- f) plot centers numbered at least every fifth plot; and
- g) (optional) survey lines and direction traveled.

Treatment Maps - Additional Requirements

3.23 Treatment Maps must show:

- a) biogeoclimatic (BEC) classification from the subzone to the site series level;
- b) Opening and Strata area;
- c) inventory and silviculture label (including either well spaced [WS] or free growing [FG] per Stratum;
- d) treatment unit boundaries (treatable areas) and identifiers;
- e) abbreviated Treatment Prescription Recommendations;
- f) the direction and distance to nearest town; and
- g) gross and net treatment area.

ARTICLE 4 RECONNAISSANCE (RECCE) GROUND SURVEY STANDARDS

General

4.1 An initial reconnaissance (Recce) of a Stratum is a form of screening walk-through survey. The Recce will be either systematic or non-systematic in nature, and will involve physically walking through a Stratum to visually record information as defined in this standard. A small number of sample plots may be established if necessary (Article 4.5 and 4.6), but specified information (Article 4.4) must be collected to further define the characteristics of the Stratum and recommend the next course of action.

Recce Procedures

- 4.2 It is recommended that the Recce be performed on a transect basis so that the whole Stratum is covered. The transect can be established either on a predetermined basis or via a random walkthrough. The resultant Recce transect location will be rough mapped or GPSed.
- 4.3 Pre-stratification is recommended prior to performing the Recce in order to identify homogeneous Strata for sampling. This can be performed at a coarser (multi-Opening) scale than normally performed for a full silviculture survey scale. Photos, images and maps, and / or aerial overviews (i.e. by helicopter) are recommended in this pre-stratification procedure. Stratification criteria must follow the procedures included in Article 3.8.

Non-Plot Recce Information

- 4.4 Non-plot measurements/observations collected during the Recce and in-between plots (if established) include:
- a) BEC classification from the subzone to the site series level;
 - b) mountain pine beetle (MPB) attack levels, distribution and age of attack (where applicable);
 - c) forest health factors/damage agents (where applicable);
 - d) estimate dead tree total tally/ha. and (optional) if a Danger Tree Assessment is required (where applicable);
 - e) Overstorey stems per hectare (live and dead/dying) and live Overstorey stocking (well spaced and free growing as applicable);
 - f) Understorey conifers – species % and density, distribution, stocking (well spaced, and free growing as applicable), age and height;
 - g) competing (or potentially competing) vegetation and distribution;
 - h) site index via the hierarchy methods and protocol as outlined in Article 3.15 and 3.16;
 - i) delineation of stratum boundaries.
 - j) (optional) range of dbh's of overstorey pine;
 - k) (optional) basal area (using a prism sweep);
 - l) (optional) small mammal (especially hare) damage levels, and/or habitat;
 - m) (optional) photographs representing the stand/stratum;
 - n) (optional) germinant tally and likelihood of survival.

Recce Sample Plot Procedure and Information (if required)

- 4.5 Plots should be established “representatively” as per the representative sampling methodology outlined in the *Silviculture Survey Procedures Manual*.
- 4.6 Number of plots required are:
- a) a minimum of (insertion ~ 1) plot should be established for every (insertion ~ 10) hectare – or portion thereof, with a minimum of (insertion ~ 3) plots in total.
 - b) a minimum of (insertion ~ 5) plots should be established in any Stratum which is recommended for a Treatment Prescription, and any Stratum where a change to the inventory label is being recommended (for example a Stratum with heavy mortality in the overstorey but good understorey stocking which will now create the new inventory label).
- 4.7 The following data shall be recorded at each Recce sample plot in addition to the data requirements of Article 3 and 5 of this standard (except for Article 5.2 & 5.3 - Sampling Intensity):

- a) (optional) tally the number of Overstorey trees (Layer 1 and 2) by species, and dbh classes in a 3.99m plot or 5.64 m plot (at the surveyor's discretion);
- b) (optional) classes of dbh for Overstorey should be as follows: ≥ 7.5 cm and <12.5 cm; ≥ 12.5 cm to 15.0cm; >15 cm (or any combination of such as defined by the FFT Regional Staff);
- c) (optional) tally the number of Understorey (Layer 3 and 4) trees by species. Comment on their acceptability and height and age (average and range);
- d) (optional) do a prism sweep of alive Overstorey trees (Layer 1) and record the number and BAF of prism used;
- e) (optional) record important vegetation cover by species for hares as follows: Pink spirea; all vaccinium spp.; all rose spp.; fireweed; grasses; all legume spp. (such as peavine and vetch); all arnica spp.; Cow parsnip. (Note any browsing of conifers, especially bark, and leader or lateral branch tips);
- f) (optional) take (insertion ~ 2) photograph(s) per stratum representing the stratum.

Next Course of Action Recommendation

- 4.8 Upon completion of the Recce and/or Recce sample plot establishment, and the compilation of the data collected, there will be a recommended next course of action included in the Survey Summary. The categories are either:
- a) **Re-assess** - Do another Recce in the future and recommend a date of reassessment (For example in MPB applications, strata which have only a small amount of MPB attack currently, but are susceptible to future attack or in wildfires applications, after an initial overview recce, schedule a full survey for specific strata in 2 years after complete fader mortality or germinants appear);
 - b) **Leave as is** – No treatment or further assessment required (For example in MPB applications, Strata which have little to no MPB attack, and should not be susceptible to future MPB attack or stands which have an abundance of healthy acceptable understorey conifers which are maintaining the Strata stocked);
 - c) **Conduct a full survey** - Recommend a full survey and plot intensity. (For example in MPB applications, Strata which have a great deal of variability in levels and distribution of MPB attack, and/or in levels and distribution of potentially acceptable understorey conifers, and are therefore very difficult to accurately describe with a walk-through and limited plot establishment); **or**
 - d) **Develop a Treatment Prescription** - Includes planting, or a combination of site preparation and planting. (For example in MPB applications, Strata which are heavily attacked by MPB, and have little to no understorey conifers, and thus have very low current stocking. Therefore, it would be redundant to do a full survey, as Recce observations and possible Recce plots have provided enough information. Collection of current access and required access improvements are required, as outlined in Article 3.18).

ARTICLE 5: STOCKING AND FREE GROWING PLOT SURVEY STANDARDS

General

- 5.1 The standards contained in this Article apply to stocking and free growing MPB Rehabilitation surveys in addition to the standards specified in Article 3.

Full Silviculture Survey Sampling Plot Intensity

- 5.2 The sampling design and intensity will be driven by the degree of variability and complexity found in the Stratum during the Recce. Increased Stratum variability and complexity typically will require more sampling. Plot intensity will range from 1 plot/ha to 1 plot/5 ha. A minimum of 5 plots/Stratum is required. Regardless of the plot intensity, the surveyor must ensure that their plot locations provide uniform

coverage of the Stratum. This process will help ensure the plot data is representative of the whole Stratum.

- 5.3 (optional) Where the Recced stocking levels are between (insertion ~) and (insertion ~) WS or FG sph, then (insertion ~.) plots per ha. will be established.

Tally of TT, TC, WS and FG Trees – Relative to Layers

- 5.4 The following defines the procedure for tallying TT, TC, WS and FG trees relative to layers and management regimes:

- a) Even-aged management using single or layered survey procedures. These will be Strata that fit the FPPR definition of even-aged (FPPR Schedule 1 Sec 6: *“Even-aged means a stand of trees with 1 or 2 age classes”*). These will be Strata that are suitable for single entry harvest systems on a longer/conventional rotation age basis (for example: 80 years or older). Two types of survey procedures apply in these stand conditions:

- i. Single Layered stand structure: These Strata will be surveyed tallying all TT, TC, WS and FG stems as one layer and will follow the standard base survey procedures as outlined in [Silviculture Survey Procedures Manual](#)
- ii. Layered Even-aged stand structure: These Strata will be surveyed by tallying TT, TC, WS and FG stems by all 4 layers and will be totaled by adding all layers (without nesting) to compare estimates of the mean stocking values to the minimum Stocking Standards. Layers are defined by the following criteria for these surveys:

Layer 1 ≥ 12.5 cm dbh;

Layer 2 ≥ 7.5 cm dbh and <12.5 cm dbh;

Layer 3 >1.3 m ht and <7.5 cm dbh;

Layer 4 ≤ 1.3 m ht and ≥ the specified height in Article 3.10 and 3.11.

This procedure is outlined as well in the [Silviculture Survey Procedures Manual](#). A commonly used terminology is to group Layer 1 and 2 into the term “Overstorey” and Layer 3 and 4 into the term “Understorey”. These terms are applicable for reference purposes only, but the layer designation should be used when entering the inventory and silviculture label data into RESULTS.

- b) (optional) Uneven-aged management using Multi-storey survey procedure. These will be Strata that fit the FPPR definition of uneven-aged (FPPR Schedule 1 Sec 6: *“Uneven-aged means a stand of trees with 3 or more age classes”*). These would be Strata that have a uneven-aged management regime and would be suitable for multi-entry harvest systems on a cutting cycle shorter than conventional rotation ages (for example: targeting 20 to 40 year harvest re-entries). These Strata are to be assessed by tallying TT, TC, WS and FG stems by layer and using nested procedures as outlined in the Multi – Storey Survey procedure in [Silviculture Survey Procedures Manual](#). Layers are defined by the following criteria for these surveys:

Layer 1 ≥ 12.5 cm dbh;

Layer 2 ≥ 7.5 cm dbh and <12.5 cm dbh;

Layer 3 >1.3 m ht and <7.5 cm dbh;

Layer 4 ≤ 1.3 m ht and ≥ the specified height in Article 3.10 and 3.11;

(optional) Basal Area (BA) Sweeps

- 5.5 BA sweeps will be completed on all Strata (for all trees dead and live - immature PI, mature PI and wildfires) and at all plots for stems ≥12.5cm dbh -Layer 1 only. Select the lowest BAF prism that will provide a reasonable estimate of the residual basal area (i.e. targeting a minimum of 2 trees in each sweep as a guide for selection). Live trees must be tallied by species (i.e. 2 Pli, 1 Sx).

MPB Rehabilitation Survey Specific Tally for PI stems:

- 5.6 Where MPB is present within the Stratum being assessed, the following will be tallied:

- a) **TT and TC Count:** Only Live PI (no MPB infected stems) and all other live species will be included in these counts and the inventory label;
- b) **WS Count:** Only Live PI by layer (no MPB infected stems) and all other live preferred and acceptable species will contribute to the stocking status and be included in the silviculture label;
- c) **MPB Infected PI (IBM - forest health code):** All infected PI will be tallied separately by layer (in the Forest Health Column of the FS 658 if used) and identified as dying (green attack) or dead (red or grey attack);
- d) **(optional) classes of dbh for Overstorey** should be as follows: ≥ 7.5 cm and <12.5 cm; ≥ 12.5 cm to <15.0 cm; ≥ 15 cm (or any combination of such as defined by the FFT Regional Staff);
- e) **(optional) Overstorey PI and Understorey Regen Tallied Separately:** It is recommended to tally separately the overstorey (Layer 1 and 2) **live PI** out of the total WS count. This tally would provide a **“worst case scenario”** for the ROI analysis process (i.e. should the remaining PI die from further MPB infestation spread throughout the surveyed Stratum, how would this change the Treatment Prescription).

Brush Assessment

- 5.7 In addition to the requirements of Article 3.14, for all HIGH and MED brush hazard Strata, the species, percent cover and height of competing vegetation must to be recorded at every plot.
- 5.8 In addition to the requirements of Article 3.14, for all LOW and NIL brush hazard Strata, the species, percent cover and height of competing vegetation need only be recorded at the first and every fourth sample plot thereafter.

Required Photography

- 5.9 Stratum - One colour photograph must be taken, showing a representative view of each Stratum.
Opening - Total number of photographs for an Opening must be labeled and attached to the hard copy of the Treatment Prescription and attached into the RESULTS opening file as a PDF file.

ARTICLE 6: REQUIRED PRESCRIPTION, EVALUATIONS (ROI), LAYOUT & REPORTS (APPLICABLE TO ALL SURVEYS)

General

- 6.1 Regional FFT Staff or other MoFR representatives may at any time request the Recipient to provide any information related to the Work, and the Recipient shall supply the information within a reasonable time period.

Return On Investment (ROI) Analysis

- 6.2 For all Stratum with proposed treatments (treatment areas), a financial analysis must be carried out to determine if the proposed treatments will meet the FFT required return on investment (ROI) criteria. The ROI will be calculated using methods provided by the Ministry. All resource tools, procedures and steps are provided at the following link on the FFT website under [Return On Investment](#).

Individual **Ministry Designated Representatives** will determine if the Recipients or the Survey Contractors will be required to complete ROI analysis on potentially treatable units within their respective TSAs. Key personnel who will be completing the financial analysis will be required to take a 2 to 3 hour training course on line, accessed at the same ROI web link above.

Treatment Prescriptions

- 6.3 Treatment Prescriptions will be prepared for all separate treatment units where activities, other than future surveys, are required and the ROI criteria are met.
- A Survey Summary will be produced for all Surveys and will be submitted as outlined in Article 6.11.
- 6.4 The minimum treatment unit size is five (5) hectares.
- 6.5 Treatment Prescriptions will include all treatments and Surveys which will lead to a free growing stand and must include and/or address:
- a) a schedule of treatments including options/alternatives, preference rationale, and follow-up surveys;
 - b) appropriate Stocking Standards for the site series of the treatment unit;
 - c) danger tree assessment recommendation where applicable;
 - d) site preparation prescription if applicable, with the planned year and season;
 - e) numbers of seedlings to be planted by species, including recommended stock type, planting year and season;
 - f) a statement addressing the use of genetically improved seedlings and greater species diversity (see FFT Policy on [Management of Tree Species Composition](#));
 - g) proposed brush control treatments with the planned year and season where applicable;
 - h) a Treatment Map;
 - i) (optional) total hectares of the prescribed treatment unit as determined by a GPS traverse; and
 - j) access notes including information on accessibility and any required access improvements (e.g. 4WD, quad access only).

(optional) Traversing and Layout of Treatment Units (treatable areas)

- 6.6 In order to be eligible for layout and traversing, the prescribed treatment must yield the required return on investment (ROI).
- 6.7 The Contractor will only layout and traverse those areas approved by the **FFT Regional Staff**.

- 6.8 Traversing of treatment units, roads and spur roads will be done using GPS technology only and to [FFT GPS Standards](#).
- 6.9 All non-GPS traverses (not preferred and only permitted if GPS failure) must be aerial-photo tied and ground-tied to a mappable unit.
- 6.10 All treatment unit boundaries will be flagged using winter weight ribbon of the colour and format as defined by the **FFT Regional Staff** and TSA standard. All flagging shall be inter-visible at a glance (i.e. two consecutive ribbons are visible in one direction), and attached as high as possible, to residual stems.

Reports and Deliverables

- 6.11 For each Opening that a Survey is preformed, the Recipient (via the survey contractor where applicable) will ensure the provision of the following products to the Ministry Designated Representative (optional) and deliverables 2-5 in the following table will be included as attachments in the RESULTS submission).

Recce, Stocking, Free Growing, and Plantability Survey List of Deliverables	# of Original s	Digital Deliverable Format (insertion ~ content)
1. All original field data and summary forms.	1	<u>Not applicable</u>
2. Survey Map and Survey Summary.	1	<u>.pdf</u>
3. Treatment Map and Treatment Prescription (signed by an RPF), where future treatments are recommended.	1	<u>.pdf</u>
4. ROI printout where applicable	1	<u>.pdf</u>
5. Colour photograph for each Stratum	<u>1</u>	<u>.jpg (incorporated into report)</u>
6. <u>(optional) Digital spatial information for strata and treatment areas in a format suitable for upload into Genus</u>	<u>N/A</u>	<u>.shp</u>

ARTICLE 7: SUBMISSION INTO RESULTS

General

- 7.1 The Recipient must submit completed survey data, prescribed planning activities (where applicable), forest cover polygon data, inventory label data, silviculture label data, attachments such as ROI tables and photos (where applicable) and digital maps into RESULTS using Electronic Submission Framework or online submission (whichever is applicable).

Data Entry Standards

- 7.2 All data must be entered into RESULTS in accordance with the [FFT Standards for RESULTS Submissions](#). This standard describes the process of creating new Openings (as required with some Recce MPB and wildfire situations) and provides a link to the Provincial Standard for RESULTS submissions - “RESULTS Information Submission Specifications for Government Funded Silviculture Activities” and “Silviculture Information Submission Guidebook”.

RESULTS Quality Management

- 7.4 For the purposes of quality management, the Recipient or their service provider, must submit tabular and spatial data for 5 (five) Openings into RESULTS by a deadline specified by the **FFT**

Regional Staff. Following this initial submission, the Recipient will periodically provide to the FFT Regional Staff, a list of Openings that have been successfully submitted into RESULTS.

ARTICLE 8: ADDITIONAL TSA STANDARDS

- 8.1 Additional standards to all of the base standards above, may be requested by specific TSA **FFT Regional Staff.** These additional standards must be attached to this document and must be located on the FFT Website by TSA map for reference.
- 8.2 These additional standards will be clear as to the Articles of this base standard that are being added to and/or superseded and will contain specific rationale for a variance to this base standard.

ARTICLE 9: INSPECTION

Quality Inspection - General

- 9.1 The Inspector must inspect the Work in accordance with an Approved Surveys Quality Inspection System in a timely manner to ensure the results of the Work conform to the FFT Standards.
- 9.2 Unless otherwise Specified by a Ministry representative, the methodology given in this Article shall form the basis for the Approved Surveys Quality Inspection System.
- 9.3 The Inspector must carry out office and field inspections to an intensity necessary to confirm the items in Article 9.10 and must make a written record of the inspection – inspection report. The primary focus of an inspection is to verify that the silviculture and inventory labels, forest cover map changes, Treatment Prescriptions and Treatment Maps resulting from a Survey meet the FFT Standards.

Inspection Methods – Office and Field Inspection

- 9.4 An Inspector **must** conduct an office review inspection of the Openings. In addition the Inspector must conduct one or more of the field inspection methods listed below in Article 9.6 and must document the rationale for the choice of methods in the inspection report

Office Inspection

- 9.5 When an Inspector conducts an office review, the Inspector must review a minimum of 10% of all the Openings, including all forms, reports and maps, to ensure they meet the requirements of the FFT Standards.

Field Inspection

- 9.6 Field inspection methods are defined as the following three options:
- a) a field reconnaissance - an overview assessment of the quality of Work;
 - b) a field check on a portion of the Survey's established plots; or
 - c) an independent Survey of a selected Strata.
- 9.7 If an Inspector conducts a field inspection (all methods), the Inspector must conduct a review of a minimum of 10% of the total area, ensuring representative Opening sizes are sampled.

- 9.8 Where the Inspector checks the results of plots established by the Survey Crew, the Inspector must:
- a) target to inspect 5 plots in a Strata or 10% of the plots established (which ever is greater), or if variable outcomes are reported during this initial sample, increase the number of plots inspected to a sufficient plot intensity to verify the margins of allowable errors specified in Article 9.10;
 - b) select inspection plots on a systematic and unbiased basis which are well-distributed throughout the Opening or Stratum being sampled; and
 - c) verify that the surveyor correctly collected the survey data to this schedule's FFT standards.

- 9.9 Where the Inspector conducts an independent survey, the Inspector must survey the selected Strata in accordance with the FFT standards.

Satisfactory Work Quality Defined

- 9.10 The Inspector must generally examine the data to the extent necessary to determine that the Survey has been undertaken and reported in accordance with FFT Standards, and specifically may determine a Survey to be **satisfactory** when, as appropriate to the Survey type and the chosen inspection method:
- a. an Opening is correctly stratified according to the Stratification Criteria;
 - b. the Survey correctly identifies for a Stratum:
 - i. the Biogeoclimatic zone, sub-zone, and site series,
 - ii. the preferred or acceptable tree species as permitted under the Stocking Standards,
 - iii. the order of the leading and secondary species in the inventory label, and
 - iv. the stocking status (e.g., satisfactorily restocked [SR] vs. not satisfactorily restocked [NSR]);
 - c. the Survey correctly reports:
 - i. a brush hazard, and
 - ii. any pest, pest damage, disease, disease damage or other physical damage;
 - d. there are no errors in measurement that exceed allowable errors (Article 9.10 e, f, and g) or, if errors in measurement are found, such errors are not material to the results of the Survey;
 - e. a field check finds a difference of no more than 10% between the Survey and the Inspector's tally in any one of the following total counts of:
 - i. well-spaced trees by species,
 - ii. free-growing trees,
 - iii. plantable spots, and
 - iv. preparable spots;
 - f. there is a difference of no more than 20% between the Survey and the Inspector's assessment in the total trees from the results of actual plots established in a Stratum;
 - g. an independent Survey within a Stratum shows that, at the 95% confidence level, the estimates of the number of well-spaced or free-growing trees are drawn from the same population; and
 - h. field cards, reports, maps or summaries are legible, and are completed in accordance with the FFT Standards.

Approval of Payment from Inspection

- 9.11 The Inspector will recommend payment per Opening basis, for Work pertaining to all Surveys that have met the FFT Survey Standards and that are satisfactorily surveyed to the criteria identified in Article 9.10.
- 9.12 The Inspector will recommend the following action on a per Opening basis, for Work pertaining to all Surveys that are determined unsatisfactory due to non-compliance of the criteria identified in Article 9.10:
- a. the Inspector shall promptly notify the Contractor, and
 - b. the notice shall:
 - i. specify the fault, give the Contractor a deadline for compliance, and specify if the Inspector wishes to exercise its option to require the Contractor to rework the unsatisfactory Work; or,
 - ii. specify the fault, indicate that the Inspector will exercise the option to correct the unsatisfactory Work, and deduct from payment all direct and indirect costs incurred for correcting the unsatisfactory Work.

If the Contractor fails to comply by the specified deadline for compliance, or if any inspection of further Work indicates that Work is again unsatisfactory, the Inspector will recommend no payment per Opening basis, for Work pertaining to all Surveys.