Ministry of Forests and Range

FFT Ministry Survey Standard
March 7, 2008

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

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ARTICLE 1: GENERAL STANDARDS

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 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) **"Crop Tree Standards"** means, in the absence of Stocking Standards, regional or district issued or approved guidelines which define acceptable crop tree characteristics.

(e) **"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 could be a Recipient (reviewing Contractor work); Administrator; or MoFR staff (Regional or District)

(f) **"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.

(g) **"Opening"** means an area identified on a vegetation resources inventory map by an opening number.

(h) **"Overstorey Conifer"** means layer 1 and 2 stand structure trees as described in the *2008 Silviculture Survey Procedures Manual.*

(i) **"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 – using a small number of sample plots or measurements and results in a next action recommendation.

(j) **"Stocking Standards"** means the stocking requirements applicable to an Opening that are stated in a Treatment Plan, Work Plan, the "Reference Guide to FDP Stocking Standards" or other document as outlined in FFT Stocking Standards link in Article 3.

(k) **"Stratification Criteria"** means the criteria set out in these standards.

(l) **"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.

(m) **"Survey"** means, as the context requires, a reconnaissance, a stocking, plantability, free-growing, survival or pre-stand tending survey as set out in the *2008 Silviculture Survey Procedures Manual* and includes the collection and analysis of field data, and all forms, maps, reports, photographs and Treatment Prescription required by the Ministry and FFT standards.

(n) **"Survey Map"** means a map produced according to the specifications in Article 3.

(o) **"Treatment Map"** means a map produced according to the specifications in Article 3.

(p) **"Treatment Prescription"** means a logical, biologically-sound, cost-effective recommendation, based on survey results and anticipated stand development, which specifies what if any, future Surveys and silviculture treatments are required for a Stratum, and which also specifies the year and season during which any such Survey or treatment should take place.

(q) **"Understorey conifer"** means layer 3 and 4 stand structure trees as described in the *2008 Silviculture Survey Procedures Manual*

(r) **"Vegetation Resources Inventory Map"** means a Vegetation Resources Inventory Maps maintained by the Ministry of Forests and Range or by a holder of a Tree Farm License or Community Forest Agreement.

(s) **"Walk Through Survey"** means a brief assessment of a survey opening, intended to screen and refine pre-stratification criteria prior to a full plot data survey.

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 within each opening must include at least one Accredited Silviculture Surveyor on the ground per opening and all personnel performing the Work must be familiar with the Treatment Prescription options that are appropriate and generally considered acceptable for the area.

Recipient / Contractor Internal Inspector's Qualifications

2.2 All Work must be internally inspected by a person who is:

(a) the Registered Professional Forester (RPF), or operates under the direction of the RPF, who will sign and professionally seal the treatment prescriptions;

(b) 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 EVERY SURVEY

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

Stocking Standards

3.2 All Surveys will use the stocking standards applicable for each opening by following the standards protocol outlined in the FFT Stocking Standard Policy

General

3.3 All Treatment Prescriptions must be signed and sealed by an RPF, as outlined in Article 2.2 above.

3.4 All contents and sections of this document pertaining to specific FFT Survey Standards, will supersede any similar content and section procedures stated in the *2008 Silviculture Surveys Procedures Manual*. Any survey procedures not specifically referenced in this FFT Survey Standard document, will default to the *2008 Silviculture Survey Procedures Manual* standards, as referenced in the text of this document.

Survey Lines and Plots

3.5 Survey lines and plots must be marked as follows:

(a) point of commencement (P.O.C.) and marked with flagging tape showing the P.O.C. number in waterproof ink;

(b) survey baseline (if established) and all strip lines marked with flagging tape showing the baseline and stripline number in waterproof ink;

(c) flagging tape affixed to the ground at all plot centers; and

(d) flagging tape affixed at a height of approximately 1.3 meters above each plot centre, showing in waterproof ink the plot number, date of survey, surveyors initials (if not included with the plot number) and bearing and distance to next plot.

(e) Handheld GPS units are preferred and can be used to locate plot centers (however flagging tape at plot centre must still be placed). Handheld GPS units can be used in place of flagging strip lines between plots, as long as plot centre UTM Coordinates are provided and physically marked on the ground as per above.

Format of Documentation

3.6 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 forms – specifically the FS 657, 658 and 659 and its respective procedural requirements, once approved by the FFT Regional Staff for the TSA being assessed.

Recommendations

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

(a) the procedures in the *2008 Silviculture Survey Procedures Manual;*

(b) the Ministry of Forests' Backlog Cost Guidelines (only relevant, if the block being surveyed is a backlog opening);

(c) the past Treatment Prescription for the Opening, if one exists.

Survey and Treatment Maps

3.8 Survey and Treatment Maps must:

(a) be submitted in accordance with the British Columbia Mapping Standards for use in RESULTS submissions;

(b) the two maps can be combined into one Survey and Treatment map if directed by the FFT Regional Staff.

Survey Maps - Additional Requirements

3.9 In addition to the requirements of section 3.10, Survey Maps must also show:

(a) points of commencement of the survey;

(b) survey lines and direction traveled;

(c) plot centers numbered at least every fifth plot;

(d) Opening and Strata area;

(e) the type of Survey;

(f) Inventory and Silviculture Label (including WS and FG / ha) per Stratum.

Treatment Maps - Additional Requirements

3.10 In addition to the requirements of Article 3.9, Treatment Maps must also show:

(a) Standard Unit boundaries (treatable areas) and identifiers;

(b) abbreviated Treatment Prescription;

(c) the direction and distance to nearest town; and

(d) gross and net treatment area.

ARTICLE 4 RECONNAISSANCE (RECCE) GROUND SURVEY STANDARDS (MPB AND WILDFIRE AREAS)

General

4.1 An initial reconnaissance (recce) of a stand (opening, stratum etc.) is a form of screening walk-through survey. They 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. A small number of sample plots or measurements should also be taken to further define the characteristics of the stand. The recce will be used to recommend the next course of action on the stand. This survey technique differs from the **pre-survey walkthrough assessment** , for the recce is more in depth assessment covering the majority of the opening and involves collecting detailed plot information which is targeted for a treatment or further assessment decision. The **pre-survey walkthrough assessment** is intended to screen and refine pre-stratification criteria prior to a full plot data survey and is not required for a recce survey as described in this section.

The recce survey approach will be designated by the FFT Regional Staff to be appropriate only for identified survey openings, where a coarse overview is required, prior to a detailed stocking or free growing survey or where large areas of a landscape need to be assessed quickly and efficiently to make treatment option decisions(i.e. for large wildfire areas or large MPB killed areas).

In a MPB assessment application, it should be noted that the recce survey is best utilized where the stand is heavily damaged by MPB. In stands where the beetle damage is sporadic or intermittent, there is a risk that the random recce survey will either over estimate stocking from sampling only stocked areas or over estimate the amount of NSR by just establishing plots in heavily attacked pockets. These complex stands are best surveyed via a statistically valid systematic series of stocking plots, as described in Article 5.

Recommendations / Next Course of Action

4.2 Upon completion of the recce and sample plot establishment, and the compilation or summary of the data collected, there should be a recommended next course of action. The broad categories are:

a) Re-assess - Do another walk-through reconnaissance in the future and recommend a date.

For example in MPB applications, stands which have only a small amount of MPB attack currently, but are susceptible to future attack due to their piece size/dbh class distribution, and the potential for MPB to enter the stand in the future

b) Leave as is - Do nothing.

For example in MPB applications, stands which have little to no MPB attack, and should not be susceptible to future MPB attack due to their piece size/dbh class distribution. Or stands which have an abundance of healthy acceptable understorey conifers which are maintaining the strata stocked (in the case of heavy mortality of the overstorey).

c) Conduct a full survey - Recommend plot intensity.

For example in MPB applications, stands 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.

d) Develop a Treatment Prescription - Includes planting, or a combination of site preparation and planting.

For example in MPB applications, stands which are heavily attacked by MPB, and have little to no understorey conifers, and thus have very low current stocking. Essentially it would be redundant to do a full survey, as walk-through observations and plots have provided enough information. **Note: If this is the recommendation, then additional data may need to be collected during the reconnaissance, so that a more precise treatment prescription can be developed. This would mean a minimum of 5 sample plots should be established (see number of plots section 4.10 below) and data to support the treatment prescription and ROI calculation specifications as outlined in Article 5 will have to be collected. The FFT Regional Staff or Recipient will aid in the selection of this option and make the decision if more plots are required or a full survey is required.**

4.3 The above recommendations/next course of action options will be based on the threshold criteria and levels within the survey decision matrix. Refer to the general decision matrix presented in Article 5.4 below-

Survey Decision and Treatment Prescription Matrix for details on threshold criteria for treatment decisions and next course of action.

Information from Recce

4.4 The recce should be collecting information about the stand that may or may not be represented entirely by the limited number of plots. Therefore the surveyor(s) should be analyzing both their plot data and recce non-plot observations in making the final decision.

4.5 The purpose of the recce is to collect pertinent information or characteristics about the stand. The broad categories of information that will need to be collected during the recce, and at the plots are as follows:

a) Site Index

b) Range of dbh's of overstorey pine

c) Basal area (using a prism sweep)

d) Biogeoclimatic ecosystem classification (site series)

e) MPB attack levels, distribution and age of attack(where applicable)

f) Snag total tally and if Danger Tree Assessment is required (where applicable)

g) Competing (or potentially competing) vegetation and distribution

h) Small mammal (especially hare) population levels, and/or habitat

i) Overstorey stems per hectare (live and dead/dying) and live overstorey stocking (well spaced)

j) Understorey conifers – species, numbers, distribution, stocking (well spaced), age and height

k) Photographs representing the stand/stratum

l) Delineation of stratum boundaries

4.6 For the reconnaissance, specified understorey tree acceptability criteria (crop tree standards) must be used as outlined in Article 3.2.

Recce Traverse Line Procedures

4.7 The method of recce can either be performed via transects or a "wander". While it is not absolutely critical to use transects (i.e. the recce could just be a "wander" through the stand), there are some specific data that needs to be collected that is more easily collected while doing transects, and thus it is recommended that the recce be done on transects with the use of some "wander" where the surveyor thinks it appropriate (the "wander" will be rough mapped or GPS).

4.8 Pre-stratification is recommended prior to performing the recce, in order to identify homogeneous strata for sampling. This can be performed at a coarser scale than for a full silviculture survey scale, and is recommended by utilizing any and all photos, images and maps that would aid in stratification. Stratification criteria should follow the items listed in section 5.3.

4.9 Stratum boundaries are recommended to be delineated during the recce. This stratum boundary needs to be confirmed in at least 2 locations (and possibly more if old maps are found to be incorrect). The use of transects can make the delineation of stratum boundaries easier, though it may be possible to use GPS technology to delineate as well.

Recce Sample Plot Procedure

4.10 Plots should be established so as to be "representative" of what is being observed in the stand. The most important "representative" aspect will be what is occurring in the overstorey, not necessarily in the understorey (i.e. do not choose "representative" plot based solely on the understorey).

4.11 The number of plots required are:

a) 1 plot should be established for every 10 hectare – or portion thereof, with a minimum of 3 plots. In other words a minimum of 3 plots are to be established in any stand 30 hectares or less, with one additional plot for each 10 hectares, or portion thereof after 30 hectares.

b) A minimum of 5 plots should be established in any stratum which is recommended for a treatment prescription, and any stratum where a change to the inventory (and silviculture) labels is being recommended (for example a stratum with heavy mortality in the overstorey but good understorey stocking which will now create the new inventory and silviculture labels).

c) Deviation from the above required number of plots can be used at the surveyor's discretion if the recommendation is going to be to complete a full survey in the future. (a minimum of 3 plots is always required).

4.11 All plot data is recommended to be collected using a Pre-Stand Tending Survey card - FS 748 – (or an equivalent card determined by the FFT Regional Staff) recording the following at each plot:

a) tally the number of overstorey trees (Layer 1 and 2) by species, and dbh classes in a 3.99m plot. Use split box columns to keep track of alive and dead/attacked trees(for MPB surveys).

b) Classes of dbh for overstorey should be as follows: 7.5 to 12.5cm; 12.5 to 15.0cm; greater than 15cm (or any combination of such as defined by the FFT Regional Staff);

c) Select an "average" overstorey live pine (for MPB surveys) and in the sample trees section record it's dbh, height, age and %live crown;

d) As a comment in the sample trees section write down the range of dbh's found (again alive pine trees);

e) Record the number of grey, red, and green attacks (for MPB surveys), and include an estimate of year(s) since attack, for grey attack trees;

f) Tally the number of understorey (Layer 3 and 4) trees by species. Comment on their acceptability and height and age (average and range);

g) Tally the number of well spaced understorey trees;

h) Tally the number of plantable and/or preparable spots;

i) Do a prism sweep of alive overstorey trees (Layer 1 and 2) and record the number and BAF of prism used

j) Estimate the number of snags/ha and if a Danger Tree Assessment is required prior to any treatment.

k) Record the percentage cover, species and height of understorey vegetation (herbaceous and shrubs);

l) Record important vegetation cover by species for hares (where applicable and as directed by FFT Regional Staff) as follows: Pink spireae; 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).

m) Take one photograph per stratum representing the stratum.

n) Estimate Site index via the hierarchy methods and protocol as outlined in Article 5.16 and 5.17.

o) Record the BEC subzone and site series classification.

4.12 All non-plot measurements/observations should be collected during the recce or in-between plots (or observed in-between plots and written down on the plot cards). These would include:

a) Site index estimate, based on measurements at plots and/or changes in site series.

b) BEC subzone and site series classification should be collected by the surveyor in the traverse notes. This classification can include complexes, or completely different ecological units. However, the intention is to obtain an "overview" of what the leading site series is in the stand, and not to make ecological classification a primary reason for the recce.

c) Understorey conifers and brush species should be observed and recorded in the traverse notes in a general sense during the recce, even though this information will also be collected at the plots. For understorey conifers, record comments on the species, the total numbers and distribution, and their acceptability (i.e. could they be considered well spaced if needed?). For understorey vegetation, record comments on the species, distribution and height. This data is important for the potential to compete with under-planted conifers, as well as an indicator of habitat for small mammals (such as hare).

d) Make note of MPB attack levels (where applicable)and their distribution. This could be in the form of comments or as sketching on a map (or both).

ARTICLE 5: STOCKING, PLANTABILITY AND FREE GROWING SURVEYS

General

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

Requirement for a Plantability Assessment

5.2 If a stocking or free growing survey indicates that a Stratum is not satisfactorily restocked, a plantability assessment must also be conducted on the Stratum.

Survey Stratification Criteria

5.3 All areas of an Opening which are significantly different from the surrounding area must be stratified into relatively homogeneous Strata (targeting strata no smaller than 1 hectare in size and ideally 5 hectares and greater in size) based on:

(a) previous Treatment Plan stratification;
(b) standards unit;
(c) stocking status;
(d) inventory components;
(e) previous and recommended treatments;
(f) site series (ecosystem association), where the site series identified have different Stocking Standards;
(g) harvesting and silviculture treatment history;
(h) stand structure (e.g. even-aged vs. Multi-storey);
(i) forest health factors; and
(j) free growing status.

Survey Decision and Treatment Prescription Matrix

5.4 The following matrix will be used to determine if a full silviculture survey (at an appropriate density) is warranted based on the stocking in the opening and the incidence of MPB mortality (where applicable for a MPB survey). The matrix also shows how survey information will be used to make decisions through to developing treatment prescriptions and standard unit traverse and layout. This matrix includes the steps and information reporting needs to be completed for Recce surveys described in Article 4 above.

A Recce Ground Survey

(Article 4 Above)

B Recce Results

1. Opening/polygon/stratum with ≥600 ws sph overstorey or ≥ 700 ws sph understorey

2. MPB attack distribution is uniform (for MPB surveys only)

YES to 1 and 2

(MPB survey)

YES to 1

(Wildfire survey)

C Summarize Data from Recce

1) **RE-ASSESS**: If status of SR is questionable (i.e. further MPB attack possible or stocking is marginal, then schedule a future survey if necessary ,Update RESULTS following FFT Standards and RESULTS INFORMATION SUBMISSION SPECIFICATIONS (link below)

2) **LEAVE AS IS:** If status of SR is definitely stable and no further surveys are required – update only existing silviculture and inventory labels in RESULTS, if they have changed (use existing opening or create a new one). Enter the activity (walkthrough/Recce) in the ATU and denote that a stocking decision has been made for that polygon.

YES to 1, No to 2

(MPB survey)

OR

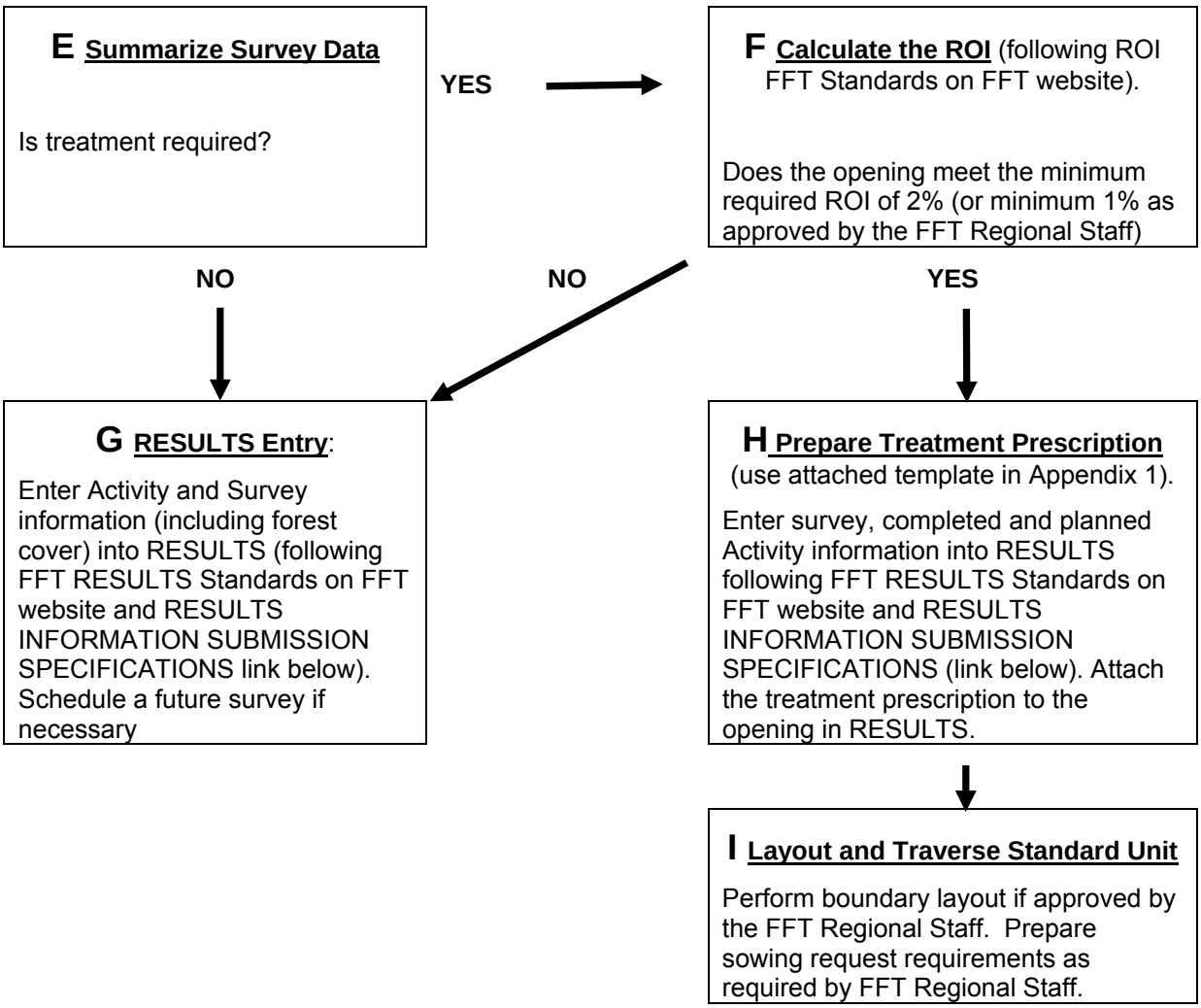
NO to 1 and 2

(MPB & Wildfire survey)

D Pre-Survey Walkthrough Assessment (Article 5.5 below)

Conduct Full Silviculture Survey

Collect data via survey plot establishment methodology as per the standards in Article 5.7 to 5.20, Article 10, Article 11 and *2008 Silviculture Survey Procedures Manual*



Pre-Survey Walkthrough Assessment Stratification

5.5 During the walkthrough, the surveyor is to map the potential strata boundaries as accurately as possible. The surveyor is to make appropriate notes regarding all sections of the FS 657 and specifically noting current access and required access improvements.

No Walkthrough Assessment

5.6 If the surveyor is unable to complete proper stratification of the potential treatment area via a walkthrough, they are to move directly into a Full Silviculture Survey. This applies to many of the wildfire units where visual stratification is inhibited by brush and the size of the regeneration.

Full Silviculture Survey Sampling Intensity

5.7 The sampling design and intensity will be driven by the degree of variability and complexity found in the stratum during the walkthrough. 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.

Tally of Total Trees (TT), Well Spaced (WS) and Free growing (FG) Trees – Relative to Tally by Layers

5.8 For the purposes of FFT Treatment Regimes, the following 3 stand structural scenarios are possible during silviculture survey data collection and applicable for all types of FFT surveys (immature Pl, mature Pl and wildfires):

a) Uneven-aged stand structure and multi-storey survey procedure. These will be stands 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 stands that have a multi-storey 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 re-entries). These stands are to be assessed by tallying TT, WS and FG stems by layer and using nested procedures as outlined in the Multi – Storey Survey procedure in 2008 Silviculture Survey Procedures Manual. Layers are defined by the following criteria for all 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 >=10cm

b) Even-aged stand structure and single or multi-layered survey procedure. These will be stands that fit the FPPR definition of evenaged (FPPR Schedule 1 Sec 6: *"Even-aged means a stand of trees with 1 or 2 age classes"*). These will be stands that are suitable for single entry harvest systems on a longer/conventional rotation ages (for example: 80 years or older). Two types of survey procedures apply in these stand conditions:

b1) Single Layered stands structure: These stands will be surveyed tallying all TT, WS and FG stems as one layer and will follow the standard base survey procedures as outlined in 2008 Silviculture Survey Procedures Manual

b2) Multi-Layered Even-aged stand structure: These stands will be surveyed by tallying TT, WS and FG stems by all 4 layers and will be totaled by adding all layers (with out nesting) to compare estimates of the mean stocking values to the minimum stocking standards. This procedure is outlined as well in the 2008 Silviculture Survey Procedures Manual. Commonly used terminology is to group Layer 1 and 2 into the term "overstorey" and Layer 3 and 4 into the term "understory". These terms are applicable for reference purposes, but the layer designation should be used when entering the inventory and silviculture label data into RESULTS.

Basal Area (BA) Sweeps

5.9 BA sweeps will be completed on all stands (for all trees dead and live and in all FFT surveys - immature Pl, mature Pl 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. using 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).

Tree Acceptability Criteria Total Tree (TT) and Total Conifer (TC) Count

5.10 All trees (conifer and deciduous) will be tallied that are easily visible (i.e. surveyor remains standing and moving brush aside) at the time of survey in the TT count, including germinants. This count can be an estimate, if initial tally exceeds 35 per 3.99 meter plot radius plot. TC count will be tallied for all conifers that are easily visible (as defined above) at the time of survey, including germinants as well.

Tree Acceptability Criteria Well Spaced (WS) and Free Growing (FG) Count:

5.11 All WS and FG crop trees of preferred and acceptable species will be tallied if >10 cm in height and/or 3 years of age.

Brush Assessment

5.12 For each Stratum, brush severity 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

NIL - no brush hazard present

5.13 For all HIGH and MED brush severity, the species, percent cover and height of competing vegetation need to be recorded at every plot.

5.14 For all LOW and NIL brush severity, the species, percent cover and height of competing vegetation need only be recorded at the first and every fourth sample plot thereafter.

Free Growing Assessment

5.15 In a free growing survey, 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.

Site Index Methodology

5.16 Site Index must be collected generally following the procedural hierarchy guidelines outlined in Land Management Handbook 12 - Selecting a Method to Estimate Site Index 2006

5.17 The following is a summary of a combination of the site index hierarchy process presented above and FFT specific guidelines, relative to different FFT objectives and stand conditions:

a) SI for Inventory Labels – RESULTS

a1) Immature and Mature Stands Even-aged / Single layered or Multi-layered

1) First, if possible use the growth intercept method. Surveyors should tally site index for the current dominant species and co-dominant species, a minimum of 3 samples per stratum and target at least 5 samples per stratum for better accuracy. Data should be collected from non-understorey or non-suppressed trees. Data should be collected on a **live** overstorey Pl trees preferably, if these are the suitable site species. Dead Pl stems are acceptable if mortality due to MPB is current (<2 years). Site Tools can be used to accurately calculate all SI from GI measurements. Site tools is available at http://www.for.gov.bc.ca/hre/sitetool/getsware.htm

2) If the growth intercept method can not be used, the second choice is via SIBEC **second** approximation for the appropriate species (usually denoted by a sample size, standard error and decimal site index in the SIBEC table).

3) The third choice would be via SIBEC **first** approximation (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 http://www.for.gov.bc.ca/hre/sibec/

a2) Immature and Mature Stands Uneven-aged / Multi storied

1) The growth intercept method can not be used in these stands due the variable and possibly suppressed growth rates. Therefore the preferred choice is via SIBEC **second** approximation for the appropriate species.

2) The second choice would be via SIBEC **first** approximation. SIBEC tables for all BEC subzones, site series by species by old Forest Service Regions are available at http://www.for.gov.bc.ca/hre/sibec/

b) SI for ROI – Investment Decisions - Immature and Mature Stands Even-aged or Uneven aged

1) If the above methods and hierarchy listed are unable to generate an estimate of the SI of the projected stand forecast for investment analysis (ROI test) **in the stand being assessed**, then use of **the**

adjacent stand of similar BEC and projected leading species is permitted to estimate the SI for ROI purposes only.

Snag/ Dead Tree Count

5.18 Estimates will be made for the total # of stable and total # of unstable snags in the plot >5m in height (suggested to be tallied as a split box in the "COUNT.HEIGHT" column if not used). A recommendation will be made for each Standard Unit which requires treatment, if a Danger Tree Assessment by a qualified assessor is required, prior to treatment.

Required Photography

5.20 One colour photograph must be taken, showing a representative view of each Stratum.

Photographs for an opening must be labeled and attached to the hard copy of the treatment prescription and as well attached into the RESULTS opening file as a PDF file.

ARTICLE 6: REQUIRED PRESCRIPTION, EVALUATIONS (ROI), LAYOUT & REPORTS

General

6.1 The Regional FFT Staff or other MoFR representative may at any time request the Recipient provide him or her with 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 potential standards units (treatment areas) a financial analysis must be carried out to determine if the proposed treatments will meet the minimum required return on investment (ROI) of 2%. The ROI will be calculated using methods provided by the Ministry and all resource tools, procedures and steps are provided on the FFT website under Investment Decision Tools Tab.

Individual FFT Regional Staff 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 The Contractor will prepare treatment prescriptions for all units where activities, other than future surveys, are required and the ROI criteria are met. The links to the format for treatment prescriptions (MPB PI or Wildfire) are provided in Appendix 1 below.

6.4 As a guideline, the minimum treatment unit should be five (**5**) hectares.

6.5 The treatment prescriptions will include all treatments and surveys which will lead to a free growing stand. The prescription must include or address:

a) Use of genetically improved seedlings;
b) Greater species diversity (see FFT Policy on "Management of Tree Species Composition" on the FFT website http://www.for.gov.bc.ca/hfp/fft/ under the FFT Policy Document tab);
c) Reducing the risk to future fire and pest loss;
d) Appropriate stocking standards for the site series;
e) Danger tree assessment recommendation where applicable;
f) Numbers of seedlings to be planted by species, including recommended stock type;
g) Planting year and season;
h) Proposed brush control treatments;
i) Schedule of treatment, options/alternatives, preference rationale, and follow-up surveys,;
j) Treatment map;
k) Total hectares of the prescribed statement unit as determined by a GPS traverse;
l) Access notes including information on accessibility (e.g. 4WD, quad access only).

Traversing and Layout of Standard 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). The Contractor will only layout and traverse those areas approved by the FFT Regional Staff.

6.7 Traversing of standard units, roads and spur roads will be done using Global Positioning System (GPS) technology to the FFT GPS Standard.

6.8 All traverses must be aerial-photo tied and ground-tied to a mappable unit.

6.9 Standard 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. must be able to see two consecutive ribbons in one direction). Preference is to attach ribbon to trees (the higher the better).

Reports and Deliverables

6.10 For each opening, the Recipient (via the survey contractor where applicable) will ensure the provision of the following products to the FFT Regional Staff:

a) One (1) **hardcopy** of an **Overview Map** showing all areas surveyed in the TSA. This map will be color themed to show the areas requiring treatment;
b) One (1) **hardcopy** of the **Survey map** and **Survey Summary**;
c) One (1) **hardcopy** of the **Treatment Prescriptions (Appendix 1 format), ROI Printout where applicable** and **Treatment Maps**;
d) One (1) **CD/DVD** containing all **Treatment Prescriptions (Appendix 1 format), ROI where applicable** and **Treatment maps**, and the overview map in digital format. The map files may be in .PDF format or plot file format.

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 (which ever is applicable).

Data Entry Standards

7.2 All data must be entered into RESULTS in accordance with the FFT established Standards for RESULTS Submissions. These standards can be found on the website under the Guidelines and Standards Tab in Field Data Capture. These standards describe 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”. Extensive training materials exist on the RESULTS Homepage at http://www.for.gov.bc.ca/his/results.

Overlapping Data and Opening Procedure:

7.3 Overlapping Data and Opening Procedures are found in the Overlapping Data Procedures and Encumbrance Checking Document. After April 1, 2008 these procedures will be incorporated into the FFT RESULTS Field Data Capture Standard.

RESULTS Quality Management

7.4 The Recipient or their service provider must submit tabular and spatial data for 5 (five) openings to RESULTS by the specified deadline (identified by the FFT Regional Staff) for quality checking. Following this initial submission, the Recipient will periodically provide, a list of openings that have been successfully submitted into RESULTS. This will allow for quality checking and to resolve any outstanding issues.

ARTICLE 8: ACTIVITY SPECIFIC SURVEY STANDARDS

8.1 In addition to this entire base standard above, there are activity specific survey standards for surveys being conducted in 1) MPB Immature Pl; 2) MPB Mature Pl and 3) Wildfire Areas. These standards will apply to the particular survey being performed as directed by the FFT Regional Staff within the TSA being assessed. These activity specific survey standards are as follows:

MPB – Determining Incidence of MPB in Immature and Mature Surveys

8.2 Clear identification and documentation of the levels of present MPB attack on Pl in the openings being surveyed is a primary data collection aspect of this survey. Therefore collection format and reporting protocol of the data must be consistent and follow this process:

In All Measurement Plots for Pl stems:

a) **TT and TC Count:** Only Live Pl (no MPB infected stems) and all other live species will be included in the count and the inventory label;

b) **WS and FG Count:** Only Live Pl by layer (no MPB infected stem) and all other live preferred and acceptable species will contribute to the stocking status and be included in the silviculture label;

c) **MPB (IBM - forest health code) Infected Pl:** All infected Pl will be tallied separately by layer (in the Forest Health Column of the FS 658) and identified as live (green attack) or dead (red or grey attack);

d) **Basal Area (BA) Sweeps:** BA sweeps will be completed for all trees (including dead and live Pl identified separately) 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. Live trees must be tallied by species (i.e. 2 Pli, 1 Sx).

MPB - Overstorey Pl and Understorey Regen tallied Separately

8.3 A separate tally separating the overstorey (Layer 1 and 2) live Pl out of the total WS and FG count is recommended. The reason being in order for the ROI analysis process to be provided with a **"Worst Case Scenario"**, should the remaining Pl die from further MPB infestation spread through the surveyed stratum and if this possibility would change the treatment planned. Therefore refer to Appendix 1 – Treatment Prescription Format - for the location of this tally.

MPB - Deviation From Potential (DFP) Optional application

8.4 Where stand structures being assessed are un-evenaged as defined in the assessment of layers above, then the DFP method of assessing and judging if a stand is stocked **may** be used in the field as directed by the FFT Regional Staff (solely a stocking decision tool only and not a stocking standard).

Determine the Deviation from Potential (DFP) from the following link: http://www.for.gov.bc.ca/hfp/silviculture/MPBI/index.htm and calculate the mean DFP for each stratum. It is recommended that where there is more than 5m2/ha of basal area in Layer 1, record the residual basal area (m2/ha). As well record the understory (Layers 2, 3, 4) well-spaced tree count – for this is the cohort of trees that will form the next harvestable stand if all (or most) overstorey trees are killed.

Wildfire Surveys

8.5 No specific standards required.

ARTICLE 9: ADDITIONAL AND VARIANCE TSA STANDARDS

9.1 Additional and variance standards to all of the base standards above, may be requested by specific TSA FFT Regional Staff. These may be attached to this document (and must be located on the FFT Website by TSA map for reference).

9.2 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 sound Regional specific rationale for variance to this base standard.

ARTICLE 10: INSPECTION

Quality Inspection - General

10.1 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.

10.2 Unless otherwise Specified by a Ministry representative, the methodology given in this Article shall form the basis for the Approved Surveys Quality Inspection System.

10.3 The Inspector must carry out field and office inspections to an intensity necessary to confirm the items in section 10.9 and must make a written record of the inspection. 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 are correct.

Inspection Method

10.4 An Inspector must use one or more of the following inspection methods which form part of the Approved SQI System and must document the rationale for the choice of methods in the inspection report:

a) an office review;

b) a field reconnaissance;

c) a field check on a portion of the Survey; or

d) an independent Survey of selected Strata.

10.5 If an Inspector conducts an office review, the Inspector must review all forms, reports and maps to ensure they meet the requirements of the FFT Standards.

10.6 If an Inspector conducts a field reconnaissance, the Inspector must conduct a reconnaissance of a portion of each Opening and carry out an overview assessment of the quality of Work.

10.7 Where the Inspector checks the results of plots established by the Survey Crew, he or she must:

a) inspect the lesser of all plots established or 10 plots in a Strata, selected on a systematic, unbiased basis and well-distributed throughout the Opening or Strata; and

b) collect and record the same types of data and information as taken, or should have been taken, in the original Survey.

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

Satisfactory Work Quality Defined

10.9 The Inspector must generally examine each Survey 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 (ecosystem association),

ii) 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) stocking status (e.g., SR vs. NSR);

c) the Survey correctly reports

i) a brush hazard,

ii) any pest, pest damage, disease, disease damage or other physical damage;

d) there are no errors in measurement that exceed allowable errors or, if errors in measurement are found, such errors are not material to the results of the Survey;

e) in a Survival Survey, planted and natural trees are correctly distinguished;

f) 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,

iv) preparable spots, and

v) in a survival survey, the live trees by condition category;

g) 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;

h) 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

i) field cards, reports, maps or summaries are legible, and are completed in accordance with the FFT Standards.

APPENDIX 1: TREATMENT PRESCRIPTION FORMAT

Treatment Assessment & Prescription Format for Immature and Mature Pl and Wildfire Surveys

A template has been posted on the FFT website:

http://forestsfortomorrow.ca/GuidelinesAndStandards/Surveying/Documents/AssessmentTemplateMPB.xls

This is only a template and may be modified to meet specific TSA needs. A specific format may be requested by the FFT Regional Staff.