

Ministry of
Forests, Lands and Natural Resource Operations



Land Base Investment Strategy

Post Incremental Treatment Assessment

FINAL Sept 30, 2013

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

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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 Ministry Designated Representative highlighted in **yellow**

Objective and Purpose of Post Incremental Treatment Assessment (PITA)

Definition

PITA is a scheduled stand level operational assessment, performed a minimum of 10 years after an incremental treatment completion (primarily spacing and spacing& pruning), designed to collect stand attributes and growth and performance data, in order to determine if the treatment prescription has been achieved or is on track to achieving the stated objectives or not.

Objective and Purpose

Stand Attribute Data Collection

- to collect stand attribute data of selected Incremental Treatment Units (ITU's) that will aid in evaluating the achievement of past incremental treatment objectives - in a general and in an objective assessment context (not intended to be published as research findings);

Data Compilation

- to compile and analysis the assessment data to specifically determine if the treatment objectives have been met (i.e. Log values have been improved due to the prescribed treatment of spacing and pruning)

Use of Findings

- to evaluate incremental treatment regimes in the context of whether they are “achieving or not achieving” stated objectives and to communicate these findings as guidance for further incremental prescriptions. (i.e. reducing Fdc stands > SI 35, below 900 sph will dramatically reduce volume production within a 50 year rotation).
- to prescribe further intensive stand treatments where deemed necessary to achieve the prescribed stand management regime objectives and/or to recommend revision of the treatment objectives in order to attain the management regime (i.e. an extension of the rotation age)

Reporting of Outcomes

- to record the treatment results within corporate data bases - RESULTS (including the identification of treated stands from untimely early harvest, within the LRDW – the process of which is to be defined by RPB);
- to communicate the findings, objective assessment learnings and suggested improved practices annually per District;

Definitions

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

- (a) **“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, **Ministry Designated Representative** prior to the commencement of Work.

- (b) **“Commercial Tree Species”** means all tree species that are managed locally for commercial forest products and are usually reflected as preferred species targeted for management in the specific ITU’s prescription.
- (c) **“Control Area”** means an area ideally no less than 1 ha. in size located within or adjacent to the prescribed area treated within the same biogeoclimatic subzone and site series (clearly representing the pretreatment species competition and untreated stand density and conditions).
- (d) **“Crew”** means one person, or a group of persons working together in the same Opening.
- (e) **“Ghost Tree”** means a tree of a specific species that, for a prescribed rationale (i.e. biodiversity reasons), will not be counted towards the well spaced crop leave trees in the Opening and will not be considered a competitor relative to well spaced crop trees.
- (f) **“Inspector”** means any person (identified by the Ministry Designated Representative) who under the defined roles of the Approved Surveys Quality Inspection System, performs an inspection review of a survey or treatment prescription - this includes a Recipient (reviewing Contractor work); an Independent Contractor; or MoFLNRO staff (Regional or District)
- (g) **“Incremental Treatment”** (for the purposes of this PITA standard) means those treatments performed on post free growing stands that include:
 - i) Juvenile Spacing
 - ii) Conifer Release; and
 - iii) Pruning.
- (h) **“Incremental Treatment Unit (ITU)”** means an area identified in RESULTS with a unique opening (polygon) number that also has had the same prescribed incremental treatments applied, as identified in the history record files for the opening, at the time of treatment.
- (i) **“Log Value Sort”** means a specific log value sort category assigned to each crop tree in a plot, that contains and/or portrays the attributes and criteria relative to a specific end product use at rotation – either A) Premium or Peeler logs; B) Sawlogs or Standard use; C) Utility or Lower Grade Gang Sawlogs; OR D) Pulp or lowest value use (The 4 sort options and criteria are listed in Appendix B)
- (j) **“Ministry Designated Representative (MDR)”** means the MoFLNRO staff person(s) or Ministry Designated Administrator/Authority, identified at the project pre-work and documented in Article 9 of this document, who is responsible for the outcomes of the surveys performed under this standard, and will be empowered to give approval and/or direction to specific article content in this standard that references this title.
- (k) **“Opening”** means an area identified in RESULTS by a RESULTS opening ID.
- (l) **“Stocking Standards”** means the stocking requirements per BEC site series (i.e. Minimum and Target WS /ha values of ecologically suitable species, of minimum heights) applicable to an Opening that are found either in an approved prescription or within [the reference guide to FDP Stocking Standards 2010](#).
- (m) **“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.
- (n) **“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.
- (o) **“Survey”** means a full plot PITA survey and includes the collection and analysis of field data, and all forms, maps, reports, and photographs.
- (p) **“Survey Map”** means a map produced according to the specifications in Article 6.10.

- (q) **“Vegetation Resources Inventory Map”** means a Vegetation Resources Inventory Map maintained by the MoFLNRO or by a holder of a Tree Farm Licence or Community Forest Agreement.

Information and Materials Furnished by the MoFLNRO

1.2 At the request of the Contractor, Ministry Designated Representative will provide or facilitate access to :

- any Treatment Prescription or Work Plans applicable to the Openings, when they exist;
- copies of the Vegetation Resources Inventory Maps applicable to the Openings to be surveyed;
- applicable aerial photographs or access to ortho photos, subject to any conditions of use that may be attached; and
- all other available information considered by the Ministry Designated Representative to be pertinent to the Work.

ARTICLE 2: PITA PROCEDURAL OVERVIEW

STEP 1
Identification of the Treatment Opening Population

1. Targeted District Specific Subset ¹ of ITUs
2. Random selection of ITUs within Subset



STEP 2
Review of Past Prescriptions per Opening

1. Generation of a Listing of Prescription Goals; Standards; and Post Treatment Quality Attributes
2. Development of a set of specific Treatment Objective Questions required to be answered from PITA



STEP 3
Set Assessment Design Parameters

1. Pre-stratification
2. Systematic grid plot location within max and min plots range



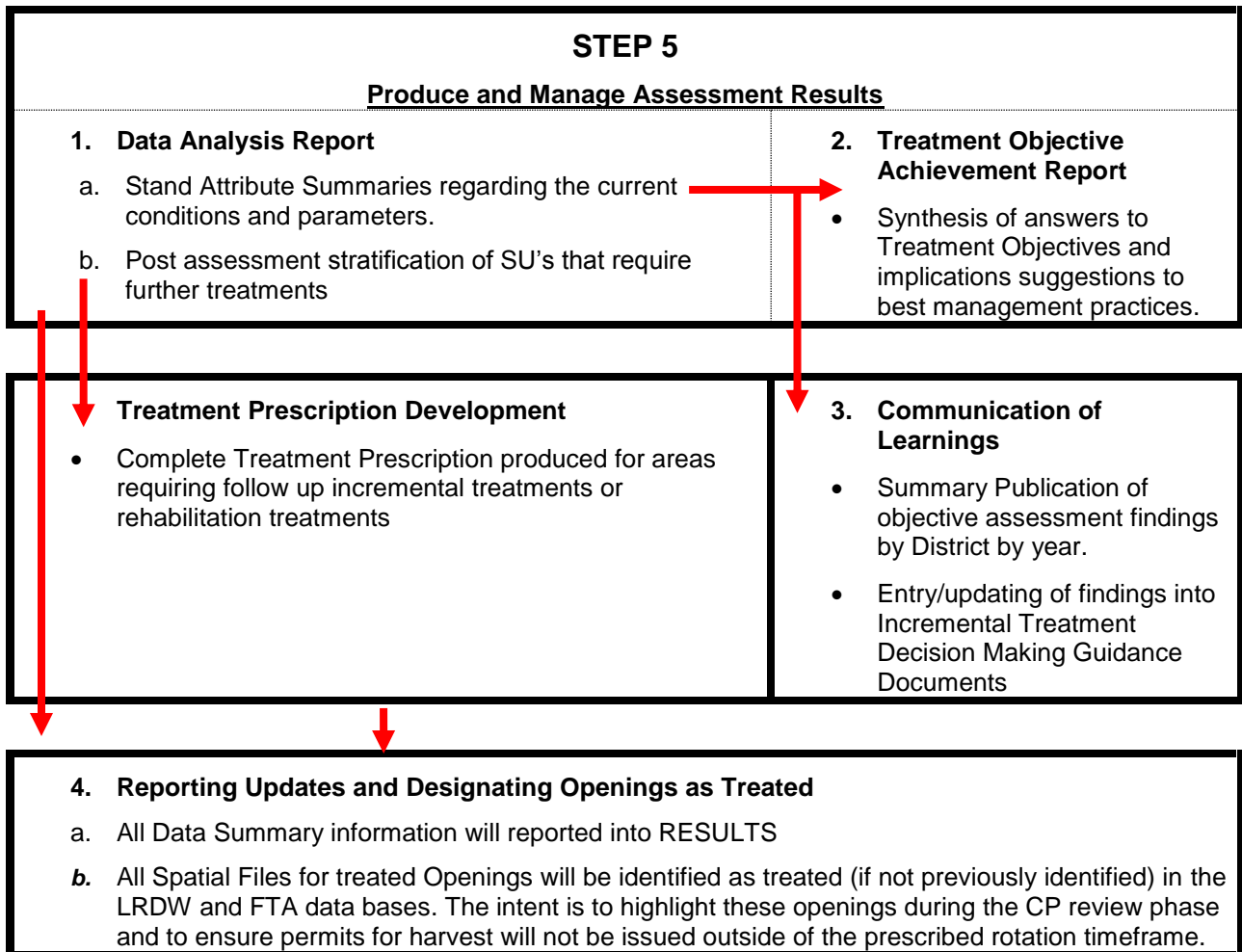
STEP 4
Collection of Data

Sample Plot is variable (prism) and optional fixed radius if dbh's are predominately < 12.5 cm.– repeated within control area if established.

<p>1. Core Common Data</p> <ul style="list-style-type: none">• From Checklist generated from STEP 2.1	<p>2. Treatment Objective Question Data Points</p> <ul style="list-style-type: none">• From prescription review from STEP 2.2
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¹ E.g., All Douglas-fir stands > SI 20 where Douglas fir is the leading species post treatment.



ARTICLE 3: IDENTIFICATION OF THE TREATMENT ITU POPULATION

3.1 General

- To be performed by the Ministry Designated Representative or their delegate.

3.2 Criteria for Population Query – District/TSA target

- Query all incremental treatments performed 10 years ago or greater
- Query RESULTS and GIS location of openings – (Spatial and Attribute Data Reports)
- Areas identified as logged in the history records will be screened from the sample population.

3.3 Resultant Non-Logged Area Query Openings Population

- Targeted Subset: Identify the targeted criteria from the initial query, specific to the District future incremental treatment needs (i.e. target sample of all Fd stands > SI 20).
- Random Selection: Of the ITUs identified from the targeted selection, a specific number (as per District specific annual number of ha. and/or ITUs) will be randomly selected for assessment for the project year. Ensure the history record files are reviewed (if available) in detail for the selected populations opening files. Details regarding actual ITU areas are very important.

ARTICLE 4: REVIEW OF PAST PRESCRIPTIONS PER ITU

4.1 General

- To be performed by the Ministry Designated Representative or their delegate.

4.2 Past Prescription Goal Metric Checklist

- Each selected ITU will have its past prescription reviewed and the targeted stand attributes will be tabled as an assessment checklist/template for the collection of assessment data.
- The following is an initial starting point for the generation of a complete checklist per opening (this is potentially an incomplete list, but will serve as a basis):

Target Metrics:

- Stand structural goals (i.e. species per layer and/or by diameter class);
- Non-timber value objectives and standards for that value requirement (e.g. spotted owl requirement of stems @ diameter/ha.);
- Species distribution - % Spp
- Diameter target/ log grade targets and timeframe (rotation age) to achieve;
- Forest health considerations and actions;
- Targeted volume/ha and/or BA/ha production (i.e. possibly with accompanied TIPSY runs);
- Clear wood requirement (i.e. 10 cm of knot free core for the first sawlog of 6 m.);
- Future treatments required with the prescribed regime (i.e. fertilization, pruning and/or commercial thinning);
- Ghost tree specifications (e.g. Cw and/or Pw) if applicable.

Post Treatment Quality Plot Data

- BEC subzone, variant and site series;
- Inventory and/or Silviculture Label;
- Actual treatment costs;
- Site Index

4.3 Treatment Objective Question List

- Each selected ITU will have its past prescription reviewed (this could be within a Stand Management Prescription [SMP] or other identified prescriptions) and a list of Treatment Outcome Objective Questions produced, that need to be answered after the PITA.
- These questions will be a function of the targeted metric data relative to the treatment objectives. The following is an example of the an objective question:
 - Statement: The achievement of a Fd (80 %) and Hw (20%) stand with a minimum of 600m³/ha by age 50.
 - Question: Is this stand on the trajectory for the volume projection, based on the PITA data at age 35 years?

4.4 No Clear Treatment Objectives

- If there are no clearly stated treatment objectives for the ITU, the Contractor will use the default treatment objective of :
 - “The prescribed and implemented treatment (spacing and/or pruning) was performed to improve the timber product outcome”.
- Therefore the Treatment Outcome Objective Question will be simple and would best be phrased like:
 - “Has the stands timber value improved due to the implemented treatment?”

ARTICLE 5: ASSESSMENT DESIGN PARAMETERS

5.1 General

- To be performed by the Contractor or their equivalent.

5.2 Pre-stratification

- Each selected ITU will be pre-stratified as set out in [Silviculture Survey Procedures Manual](#) - Section 3.2: Preliminary Stratification and Section 3.8.1: Field Stratification.

5.3 Sampling Plot Intensity

- A minimum of 5 plots/Stratum is required for all ITUs. For all ITUs > 10 ha., plot intensity will range from 1 plot/ 2 ha to a maximum of 10 plots per ITU. If a separate ITU (i.e. different treatment regime and therefore a different stratum), is identified while performing the assessment, the minimum number of plots must be established in the new ITU. 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.

5.4 Control Plot Sampling

- If a control area was left untreated and identified within the original treatment (or adjacent), it will be sampled using the same data checklists and core data collection criteria as the treated area. Plot intensity will be a minimum of 3 plots per control area.

5.5 Survey Lines and Plots Locations

- 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 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.

ARTICLE 6: FIELD DATA COLLECTION

6.1 General

- To be performed by the Contractor or their equivalent.

6.2 Sample Plot Design

- Each plot will collect core data within a variable plot radius using a prism to tally all stems ≥ 12.5 cm dbh (layer 1) – the BAF prism size will be determined by the BAF that will capture a target of between 4 to 7 stems per plot as long as the same BAF is used throughout the ITU;
 - If < 12.5 dbh stems occupy the majority of crop trees in the plot – (i.e. a younger stand or juvenile interior stands), it will be at the surveyors' discretion to establish a fixed radius plot of 5.64 m radius and tally all of the stems < 12.5 dbh .
 - One sample tree is measured in detail every plot. The sample tree could be the Site Index Tree as well, but will always be a leading species sample, free from forest health factors and in a dominant or co-dominant crown position (usually a Layer 1 stem).

6.3 Format of Documentation

- Where PITA 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 recommended FS205C - Cruise Tally Sheet - used by the MoFLNRO.

6.4 Plot Data Collection

- The following information will be collected at each plot, relative to the SECTIONS listed below (grouped for specific PITA data) from the FS205C – Cruise Tally Sheet:

SECTION #1) Individual Tree #: Total Height; Species; DBH

- Tally the total number of all commercial trees (layer 1 only) within the prism sweep by tree number and record the following in the tree number row for the corresponding tree:
 - The estimate (to the nearest meter) of the height per tree – relative to the one measured tree height in the plot;
 - The tree species;
 - The measured dbh per tree;
- Tally (only if article 6.2 second bullet above applies) the number of total trees (by layer 2 and/or 3 – layer 4 will not be tallied due to the advanced age of the stands) by species, in a 5.64 m plot;
 - Locate this tally below the Layer 1 stems recorded above and identify their layer class.

SECTION #2) Path Remarks; Damage; Live/Dead

- Record the following in the tree number row for the corresponding tree:
 - Identify forest health factors/damage agents where applicable – using the Stand Development Monitoring (SDM) Damage Criteria, in Appendix D. **Note:** For root rot infected stems in the plot, the next closest crop tree in the plot to that infected tree, will be degraded to log quality sort letter “**D – Pulp**” as the net down procedure and replaces the WS net down as described in the SDM damage criteria;

- Tick the appropriate box per damage and record next to the tick the Forest Health Agent code from the FS747 listing;
- Tick the Live/Dead column in the tree number row if the tree is standing dead or a dead windfall. Determine/estimate the forest health factor responsible and record next to the tick, as per the Forest Health Agent code above.

SECTION #3) Log Grades

- Record the following in the tree number row for each live corresponding layer 1 tree:
 - Assign a log value sort **letter** in the “Log Grades” column space, using the log value assessment criteria in Appendix B to determine the sort **letter**.

SECTION #4) Sample Tree Details

- Selection of the sample tree will be based on starting at a north azimuth and then selecting the first crop tree (post treatment) encountered during the prism sweep to the east from the north azimuth. This could be potentially the Site Index Tree as well, but not necessarily in every plot – for the Site Index tree is the largest tree in a 5.64 m. radius plot and is recorded at every 2nd plot.
- In the Sample Tree Details section record:

At every plot:

- Selected tree number;
- Total height;
- Diameter breast height (dbh);

At every second plot - using the site index method described below collect SI data for a minimum of 5 plots per stratum, to a maximum of 10 samples per stratum

- In the tree no. column enter the tree number if the sample tree is the same as the SI tree or “SI” if the Site Index tree is outside the prism sweep plot;
- Total height;
- Diameter breast height (dbh);
- Breast height age in the “Counted Age “ column, and;
- Note if ring width increase post treatment or not.

SECTION #5) Remarks

- Identify and confirm the BEC subzone, variant and site series;
- Estimate and record the inventory label every 1st and 4th plot, as described below (NOTE: an estimate of crown closure is required);
- Tally or record other factors/observations that may affect treatment operations as per criteria defined by the Ministry Designated Representative, (i.e., numbers of ghost cedar trees and/or western white pine, whips to be cut, and/or brush issues, etc.);
- Record the general presence of unique features observed in the ITU (e.g. estimates of CMT’s, danger trees or other such special features), **only** if the feature would be a critical factor to the implementation of recommended future treatments (e.g. commercial thinning).

6.5 Plot Treatment Objective Question Data

- At each plot, inter-plot and/or at the final plot, objective assessment notes will be recorded to generally consider and initially suggest potential answers (while still in the field) to the treatment objective questions developed in Article 4 above.

6.6 Site Index (SI) Methodology

- 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](#).
- Collect Growth Intercept (GI) site index data – **total Height and BH Age** - for the current dominant/co-dominant species of the **leading species** in the ITU of the **largest diameter**, with a minimum of 5 samples per ITU. This would target taking a GI sample every 2nd plot. For ITUs < 5 ha. in size, a minimum of 3 samples should be taken.
- 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.
- [Site Tools](#) can be used to accurately calculate all SI from growth intercept measurements.

6.7 Forest Cover Inventory Label

- All PITAs must produce a complete updated forest cover inventory label for each Stratum, as specified in the [Silviculture Survey Procedures Manual](#) and the RESULTS Information Submission Specification - Government Submission – included % crown closure (CC).
- NOTE: The % species in the inventory label will be based on basal area and not density, if the leading species in the label are in layer 1 (i.e. ≥ 12.5 cm. dbh).

6.8 (optional) Supportive Photography

- Colour photographs may be taken showing representative views of any Stratum requiring detailed explanations of complex or unique conditions observed by the surveyor.

6.9 Access

- Current access and required access improvement notes shall be collected during and documented/summarized with the Treatment Prescription if applicable.

6.10 Survey Maps

- Survey Maps must:
 - be submitted in accordance with the British Columbia Mapping Standards [BC Mapping Standards](#) for use in RESULTS submissions; and
 - in addition to the requirements above, Survey Maps must also show:
 - the type of Survey;
 - biogeoclimatic (BEC) classification from the subzone to the site series level;
 - Opening and Strata area;
 - inventory;
 - points of commencement of the survey;
 - plot centers numbered at least every fifth plot; and
 - (optional) survey lines and direction travelled.

ARTICLE 7: MANAGEMENT OF ASSESSMENT RESULTS

7.1 General

- To be performed by the Contractor or their equivalent.

7.2 General

- PITA results will be tabled in 2 reports: **Data Analysis Report**; and **Treatment Objective Achievement Report**.
- All Treatment Prescriptions must be signed and sealed by an RPF or RFT.

7.3 Data Analysis Report

- The Contractor will prepare a summary report outlining the stand attributes regarding the current conditions and factors.
- A sample report template is attached in Appendix A.
- For ITUs within the Openings that require further incremental treatments (by meeting the treatment criteria list below and have further treatment prescribed in the original prescription treatment regime), the Contractor will provide a complete Treatment Prescription as outlined below.

7.4 Treatment Objective Achievement Report and Summary

- The Contractor will prepare a report outlining the stated pre treatment objectives/metrics and present the current measured attributes relative to those objectives questions identified in Article 4 for the Opening. They will be presented in a comparison manner on one page, to clearly illustrate common metric achievements and comparisons.
- A sample report template is attached in Appendix A, section 2.

7.5 Deliverables

- For each Opening that a PITA is performed, the Contractor will ensure the provision of the following products to the Ministry Designated Representative and deliverables 2 to 3 in the following table will be included as attachments in the RESULTS submission.

PITA List of Deliverables	# of Original s	Digital Deliverable Format (insertion ~ content)
1. All original field data and summary forms.	1	Not applicable
2. Survey Map, Data Analysis Report, Treatment Objective Answer Report and Communication Learning Summary	1	.pdf
3. (optional) Colour photograph for each Stratum	1	.jpg (incorporated into report)

ARTICLE 8: SUBMISSION INTO RESULTS AND LRDW

8.1 General

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

8.2 Data Entry Standards

- All data must be entered into RESULTS in accordance with the FFT Standards for RESULTS Submissions. (using the code "PITA"). This standard describes the process of creating new Openings 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".

8.3 Designating Openings as Treated

- All Spatial Files for treated Openings will be identified as treated (if not previously identified) in the LRDW and FTA data bases. The intent is to flag and highlight these openings so that the DDM is aware of prescribed rotation timeframes prior to making a decision to issue a CP during the CP review phase.
- This data review check and entry will be performed by the Ministry Designated Representative, (unless specified otherwise in this standard).

8.4 RESULTS Quality Management

- For the purposes of quality management, the Contractor must submit tabular and spatial data for 5 (five) Openings into RESULTS by a deadline specified by the Ministry Designated Representative. Following this initial submission, the Contractor will periodically provide to the FFT Regional Staff, a list of Openings that have been successfully submitted into RESULTS.

ARTICLE 9: ADDITIONAL DISTRICT SPECIFIC STANDARDS

- Additional standards to all of the base standards above (including TSA specific Forest Health factors impacting prescriptions), may be requested by specific **TSA Ministry Designated Representative**. These additional standards must be attached to this document.
- 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 10: INSPECTION

10.1 Quality Inspection - General

- Unless otherwise specified by a Ministry Designated Representative, the methodology given in this Article shall form the basis for the Approved Surveys Quality Inspection System.
- The Approved SQI System will involve potentially two parties: at least the Ministry Designated Representative and potentially a second as the Inspector – if different than the Ministry Designated Representative.

10.2 Method of Inspection

- If the Deliverables are satisfactory, the Ministry Designated Representative / Inspector shall conduct a reconnaissance of the Payment Area to carry out a preliminary assessment of the quality of the Work.
- If, after any reconnaissance, the Ministry Designated Representative/ Inspector decides, in their discretion, to conduct field inspections of the corresponding Payment Area, they shall inspect 10% or more of the Payment Area to determine compliance with the terms and conditions of this Agreement.
- The Ministry Designated Representative will provide the Contractor with a copy of the inspection of the Deliverables and the preliminary assessment, and/or field inspection within (insertion ~ 10) working days of the date of the inspection so that the Contractor is notified in a timely manner as to:
 - whether to proceed to the next activity or phase of Work; and/or
 - any deficiencies or non-compliance with the Agreement.

10.3 Field Inspection

- The Ministry Designated Representative/ Inspector shall conduct field inspections by checking, at their discretion, the results of all plots and lines established by the Contractor on a portion of the Payment Area or by establishing an independent survey of some of the Strata within the Payment Area.
- Where the Ministry Designated Representative/ Inspector checks the results of actual plots established by the Contractor in an Opening, they shall inspect the greater of five (5) plots established or 10% of plots established, and the Province shall assess and compare the data it obtains with that collected by the Contractor for the same plots.

10.4 Provision of Field Maps

- The Ministry Designated Representative may request that the Contractor provide them with copies of Survey cards and field maps for any Stratum surveyed, and the Contractor shall supply the copies within a reasonable time period as agreed to by the Ministry Designated Representative.

10.5 Satisfactory Work Quality Defined

- The Ministry Designated Representative must examine the data to the extent necessary to determine that the Survey has been undertaken and reported in accordance with this Standard, and specifically may determine a Survey to be **satisfactory** when:
 - a. an Opening is correctly stratified according to the Stratification Criteria;
 - b. the Survey correctly identifies for a Stratum:
 - a) the Biogeoclimatic zone, sub-zone, and site series,
 - b) the order of the leading and secondary species in the inventory label, and
 - c) any pest, pest damage, disease, disease damage or other physical damage;
 - c. a field check finds a difference of no more than 10% between the Survey and the Ministry Designated Representative's/ Inspector's tally in any data collected in Article 6;
 - d. field cards, reports, maps or summaries are legible, and are completed in accordance with this Standard, and;
 - e. the Deliverables are complete and contain no errors, omissions or false statements.

10.6 Approval of Payment from Inspection

- The Ministry Designated Representative shall approve payment for any Payment Area where the Contractor has, in the sole opinion of the Ministry Designated Representative, satisfactorily completed and submitted all Deliverables and Silviculture Treatment Recommendations required for the Payment Area to the Standards of this document. The Ministry Designated Representative may approve partial payment for achievement of specified milestones as set out in the Work Progress Plan.
- The Ministry Designated Representative 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 10.5:
 - a. the Ministry Designated Representative 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 Ministry Designated Representative wishes to exercise their option to require the Contractor to rework the unsatisfactory Work; or,
 - ii. specify the fault, indicate that the Ministry Designated Representative 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 Ministry Designated Representative will recommend no payment per Opening basis, for Work pertaining to all Surveys.

APPENDIX A – EXAMPLE OUTLINE OF PITA DATA ANALYSIS & TREATMENT OBJECTIVE ACHIEVEMENT REPORT

1. DATA ANALYSIS

1.1 Stand History Area: Ecology

Treatments Dates

Harvested:
 Planted:
 Fill Planted:
 Juvenile spaced/ Brushing: **Control Established:**
 Pruned:

Table 1: Summary of Pruning

Year	Area	Density Pruned (sph)	Year	Area (ha)	Density pruned (sph)
1 st lift (i.e. 2.8 m)					
2nd lift (i.e. 5.5 m)					

Pre- Treatment Forest Cover Label(s)

Post-Treatment Forest Cover Label(s):

1.2 Post Incremental Treatment Assessment (PITA) Data Summary:

Date Assessed and Crew Members

Table 2: % Crop Tree Basal Area/ Density by projected Log Value Sort Category

	% Total Trees per projected Log Value Sort Category				Totals
	(A) PREMIUM	(B) SAWLOG	(C) UTILITY	(D) PULP	
Total Basal area (m ² per ha)					
Total Trees					
% BA					100%
% density					100 %

Table 3: Residual Diameter Distribution per **BA (m²/ha)** by species and Log Value Sort Category

Species	Log Value Sort Category	Diameter (cm) Distribution – BA (m ² /ha)								total
		15	20	25	30	35	40	45	50	
	A									
	B									
	C									
	D									
	Standing Dead									
	Sub total									
Total Excluding Standing Dead										
Total Basal Area										

Table 4: Residual Diameter Distribution per **Density (stems/ha)** by species and Log Value Sort Category

Species	Log Value Sort Category	Diameter (cm) distribution – Density (sph)								total
		15	20	25	30	35	40	45	50	
	A									
	B									
	C									
	D									
	Standing dead									
	subtotal									
Total density excluding standing dead										
Total density										

Current Inventory Label

(EXAMPLE: Fd92Cw03Hw03Mb01 31 years 27m ht. SI 43 80% CC 40.2 m²)

Table 5: (optional) Understory regeneration (sph)

Species	Layer 2		Layer 3		Total	Total
	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable	Acceptable
As per Advanced Regen Damage Criteria						

Table 6: Forest Health Factors per Species per Layer

FH Factor	Species	Layer 1	Layer 2 (optional)	Layer 3 (optional)	Totals
Totals					

Table 7: Sample tree characteristics

Species	Ht to live crown (m)	Average Height (m)	Average DBH (cm)	Average age at DBH	Average Ht / Diameter ratio	Average crown width (m)	Average ring width since treatment (cm per year)

1.3 Control Area Assessment (PITA) Results or other comparable untreated sites such as Stand Development Monitoring (SDM) sampled sites of similar stand attributes and productivity or Growth Model runs that are capable of accurately simulating a reasonable representation of an untreated stand condition.

Control Details

Area Description (Orientation, source SDM, etc)

Table 8: Control % Crop Tree Basal Area/ Density by projected Log Value Sort Category

	% Total Trees per projected Log Value Sort Category				Totals
	(A) PREMIUM	(B) SAWLOG	(C) UTILITY	(D) PULP	
Total Basal area (m ² per ha)					
Total Trees					
% BA					100%
% density					100 %

Table 9: Control Diameter Distribution per BA (m²/ha) by species and Log Value Sort Category

Species	Log Value Sort Category	Diameter (cm) Distribution – BA (m ² /ha)								total
		15	20	25	30	35	40	45	50	

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	A									
	B									
	C									
	D									
	Standing Dead									
	Sub total									
Total Excluding Standing Dead										
Total Basal Area										

Table 10: Control Diameter Distribution per **Density (stems/ha)** by species and Log Value Sort Category

Species	Log Value Sort Category	Diameter (cm) distribution – Density (sph)								total
		15	20	25	30	35	40	45	50	
	A									
	B									
	C									
	D									
	Standing dead									
	subtotal									
Total density excluding standing dead										
Total density										

Control Inventory Label

(EXAMPLE: Fd92Cw03Hw03Mb01 31 years 27m ht. SI 43 80% CC 40.2 m²)

Table 11: (optional) Control Understory regeneration (sph)

Species	Layer 2		Layer 3		Total	Total
	Unacceptable	Acceptable	Unacceptable	Acceptable	Unacceptable	Acceptable
As per Advanced Regen Damage Criteria						

Table 12: Control Forest Health Factors per Species per Layer

FH Factor	Species	Layer 1	<u>Layer 2 (optional)</u>	<u>Layer 3 (optional)</u>	Totals
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Totals					

Table 13: Sample tree characteristics

Species	Ht to live crown (m)	Average Height (m)	Average DBH (cm)	Average age at DBH	Average Ht / Diameter ratio	Average crown width (m)	Average ring width since treatment (cm per year)

2. TREATMENT OBJECTIVE ACHIEVEMENT REPORT AND SUMMARY

2.1 Treatment Outcome Objectives (Formed from the original Prescriptions)

EXAMPLE

- To reduce established density to 600 sph and increase log value.*

2.2 Treatment Outcome Questions

EXAMPLE

- SPACING IMPACT:** *Has the spacing treatment of 600 sph influenced log value?*

2.3 Treatment Objective Achievement Discussion (Address the questions identified above)

EXAMPLE LIST (INCOMPLETE) OF QUESTIONS OF HOW TO ADDRESS THE TREATMENT QUESTIONS

1. SPACING IMPACT:

- Why were the objectives met? What was achieved? OR Why were the objectives **not** met?*
- Possibly use models (TASS or TYPsy) to show if spacing will produce a higher log value sort earlier than the control.*
- What would have been a better treatment and how would that have been implemented? What were the critical factors (operational or physical) that influenced the treatment success – (like was the BEC Site Series appropriate for the treatment)?*

2.4 Summary of Learnings (Within one or two bullets or lines, list the key learnings, using a continual improvement lenses for the text)

EXAMPLE

- *Density reduction spacing of Fdc leading stands with SI > 35 m. is not recommended to be below 1000 sph.*

APPENDIX B – ASSESSMENT FIELD CRITERIA AND REFERENCE TABLE FOR ESTIMATING LOG VALUE SORT CATEGORY PER TREE

Visual Assessment of Log Value Sort Assumptions and Parameters:

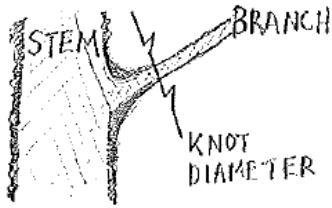
- The assessment criteria below reflect the best visual attributes at this PITA mid-rotation stand stage, that best forecast the final (rotation) log value , reflected by the category sorts presented;
- The 4 sort categories represent a relative difference in current \$ value per m³ and are best placed into context by using the following differences in current market values:
 - A) Premium - \$90/m³
 - B) Sawlog - \$80/m³
 - C) Utility - \$40/m³
 - D) Pulp - \$10/m³
- All live layer 1 commercial trees in each plot will be assessed;
- Only the first 13 meters of the tree (the first “log”) will be assessed for Log Value Sort;

CONIFER LOG VALUE (*)

Tree Attribute	Log Value Sort Category – per first 13 m. of ht.			
	(A) PREMIUM	(B) SAWLOG	(C) UTILITY	(D) PULP
1) Knot Size	< 4 cm.	Few ≥ 4 cm.	Few ≥ 4 cm.	Abundant ≥ 4 cm
2) Inter-whorl Distance	Majority > 50 cm.	N/A	N/A	Possibly minimum distance
3) Stem Form	100% Straight;	75% Straight (3.25 m crooked)	50 – 75% Straight (3.26 – 6.5 m crooked)	< 50% Straight (> 6.5 m crooked)
	No crook, sweep or wobble; minimum taper;	Little crook, sweep and/or wobble;	Moderate crook, sweep and/or wobble;	Pronounced crook, sweep and/or wobble;
	No spiral grain	No spiral grain	No spiral grain	Possibly spiral grain
4) Canopy Position	N/A	Dominant or co-dominate	Intermediate (unable to grow into Sawlog within rotation)	N/A
5) Species	All but Hw	N/A	N/A	N/A
6) Other			Low Site Index (< 18 SI); < 20% Live Crown	Possibly 100% Live Crown with excessive branching

(*) NOTE: The above Conifer Log Value table was designed for solely Coastal BC use. If the intent of the use of this standard is targeted for Interior BC stand assessments, the Ministry Designated Representative may want to develop a new Interior version of this table or modify this table to suit their needs.

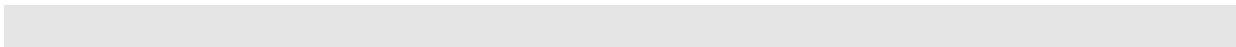
1) Knot Size: **Knot diameter** will be estimated at the location just outside the branch collar on the branches (live or dead), as shown below:



3) Stem Form: **Wobble** is defined as when the trees stem has multiple curves in the main stem bole away from the pith centre-line.

DECIDUOUS LOG VALUE

Tree Attribute	Log Value Sort Category – per first 13 m. of ht.	
	(B) SAWLOG	(D) PULP
1) Stem Form	75% Straight (3.25 m crooked)	< 50% Straight (> 6.5 m crooked)
	Little crook, sweep, forks and/or wobble;	Pronounced crook, sweep, many forks and/or wobble;
2) Other		Possibly 100% Live Crown



APPENDIX D – STAND DEVELOPMENT MONITORING (SDM) DAMAGE CRITERIA

SDM DAMAGE CRITERIA FOR EVEN-AGED (AGE CLASS 2 & 3) CONIFEROUS TREES (Revision 5).

PLEASE READ the preceding introduction before using the following table and figures.

LOCATION OF DAMAGE	TYPE OF DAMAGE	TREE BEING ASSESSED IS UNACCEPTABLE IF:	HOST SPECIES	LIKELY DAMAGE AGENTS & DAMAGE AGENT CODES	COMMENTS
STEM	Wound (including sunscald and girdling)	<ul style="list-style-type: none"> • the tree has a girdling wound which is greater than 33% of the stem circumference, or • the tree has a wound which is equal to or greater than 1m in length. 	All	Biotic causes: bear AB, cattle AC, hare AH, moose AM, porcupine AP, squirrel AS, beaver AZ, atropellis canker DSA Abiotic causes: sunscald NZ, logging TL, mechanical TM, fire NB, windthrow NW	A wound is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable.
STEM	Insect mining at root collar	<ul style="list-style-type: none"> • the tree is currently attacked by a bark-mining insect such as a weevil or a beetle and exhibits symptoms such as foliage discoloration, thinning and/or reduced height growth increments 	Pi, Sx	root collar weevil IWW, red turpentine beetle, IBT, lodgepole pine beetle IBL	Only trees that are symptomatic should be checked for insect infestation or mining damage. Non-symptomatic trees are presumed to be unaffected by insect mining.
STEM	Deformation (including crook, fork, browse, and dead or broken top)	<ul style="list-style-type: none"> • the pith is horizontally displaced more than 30 cm from the point of defect and originates above 30 cm from the point of germination, or 	All	Biotic causes: Bear AB, cattle AC, deer AD, elk AE, moose AM, defoliators ID, spruce leader weevil IWS, lodgepole pine terminal weevil IWP, sequoia pitch moth ISQ, Abiotic causes: frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TM, Deep planting TP	For horizontal displacement see Figure 1.
		<ul style="list-style-type: none"> • the tree has a fork in the lower 2/3 of the stem and the smaller of the stems is $> \frac{1}{4}$ the diameter of the main stem, note forks below 1.3 m are considered as two trees, or 	All		For forking, see Figure 2. If unable to determine cause of fork record as damage code K, if cause of fork is clear record under appropriate damage code. Note: forks below 1.3 m are considered as two trees, both stems should be measured for dbh.
		<ul style="list-style-type: none"> • the tree has a dead or broken top at a point that is > 5 cm in diameter. 	All		
STEM	Lean and sweep	<ul style="list-style-type: none"> • the tree leans $> 30^\circ$ from the vertical with or without growth correction (sweep) 	All	flooding NF, snow NY, slides NS, wind NW, mechanical TM	
STEM	Suppressed	<ul style="list-style-type: none"> • the tree has a height to diameter ratio > 100 • or, tree has $< 20\%$ Live Crown 	Pi, Py, Pw, Fd, Sx, Lw	Suppressed light environment, leading to high potential for competition induced mortality VT	Note: Only trees that are clearly not expected to reach rotation should be deemed unacceptable
STEM	Infection (including cankers and galls)	<ul style="list-style-type: none"> • any infection occurs on the stem, except DSG • DSG stem gall affects $> 25\%$ of stem circumference 	All Pi, Py	comandra blister rust DSC, stalactiform blister rust DSS, white pine blister rust DSB, western gall rust DSG,	Note: Wounds caused by rodent feeding around rust cankers should have stem rust recorded as the causal agent.

POST INCREMENTAL TREATMENT ASSESSMENT

LOCATION OF DAMAGE	TYPE OF DAMAGE	TREE BEING ASSESSED IS UNACCEPTABLE IF:	HOST SPECIES	LIKELY DAMAGE AGENTS & DAMAGE AGENT CODES	COMMENTS
STEM	Bark mining	<ul style="list-style-type: none"> Any of the following signs are visible: pitch tubes, boring dust, exit holes on bark surface, galleries under the bark 	PI, Sx, Fd	Douglas-fir beetle IBD, mountain pine beetle IBM, spruce bark beetle IBS, Ips pini IBI, <i>Pityogenes</i> & <i>Pityophthorus</i> IBP	<p>Note: pitch tubes can be associated with trees that have successfully repelled bark beetles, bark must be removed above pitch tube to confirm successful attack (successful galleries will be filled with frass and not pitch, contain adult beetles and/or larval galleries).</p> <p>Stressed trees are susceptible to secondary bark and twig beetles.</p>
BRANCH	Infection (cankers)	<ul style="list-style-type: none"> an infection occurs on a live branch less than 20 cm from the stem. 	Pw, PI, Py	white pine blister rust DSB, comandra blister rust DSC, stalactiform blister rust DSS	
BRANCH	Gouting	<ul style="list-style-type: none"> any adelgid gouting occurs on a branch. 	Ba, Bg, BI	balsam woolly adelgid IAB.	Gouting is defined as excessive swelling of a branch or shoot caused by balsam woolly adelgid, and is often accompanied by misshapen needles and buds. It is most common on branch tips and at nodes near the ends of branches. Consult a recent distribution map to identify the geographic extent of this pest.
FOLIAGE	Dothistroma	<ul style="list-style-type: none"> > 50% of tree foliage has been removed by Dothistroma in ICH, CWH, and SBS biogeoclimatic zones. 	All P	Dothistroma needle blight, DFS	See Figure 3
FOLIAGE	Douglas-fir tussock moth and hemlock looper	<ul style="list-style-type: none"> >60% of tree foliage has been removed due to hemlock looper or Douglas-fir tussock moth. 	Fd, Hw	Douglas-fir tussock moth (IDT), hemlock looper (IDL)	
FOLIAGE	Other defoliating insects and disease	<ul style="list-style-type: none"> >80% of tree foliage has been removed due to foliage disease. 	All other conifers Note: Lw	foliage diseases DF, defoliating insects ID	Note: Lw is a deciduous tree so defoliation has less impact. Repeated defoliation attacks will result in dead branches, apply the >80% rule to obviously dead branches, not just defoliated branches as with other conifer species. See Figure 3
FOLIAGE	Elytroderma needle cast systemic infection	<ul style="list-style-type: none"> The top 2/3's of the tree is affected and the growth is clearly stunted. 	PI, Py	Elytroderma needle cast DFE	Note: To confirm infection the surveyor must observe signs of the pathogen as small dark streaks on dead foliage
STEM OR BRANCH	Dwarf mistletoe infection	<ul style="list-style-type: none"> Any layer 1 and 2 tree with a Hawksworth rating >3 (Figure 4). any infection occurs on the stem or a live branch of layer 3 trees. a susceptible tree is located within 2 times the height of the infection on an overtopping tree, which is infected with dwarf mistletoe. 	Hw, PI, Lw, Fd	Douglas-fir dwarf mistletoe DMF, hemlock dwarf mistletoe DMH, larch dwarf mistletoe DML, lodgepole pine dwarf mistletoe DMP,	<p>Note: To confirm infection, the surveyor must observe mistletoe aerial shoots or basal cups on regeneration or on live or dead fallen brooms.</p> <p>Overtopping tree is a tree that is in an overtopping layer.</p>

POST INCREMENTAL TREATMENT ASSESSMENT

LOCATION OF DAMAGE	TYPE OF DAMAGE	TREE BEING ASSESSED IS UNACCEPTABLE IF:	HOST SPECIES	LIKELY DAMAGE AGENTS & DAMAGE AGENT CODES	COMMENTS
ROOTS	Root disease	<ul style="list-style-type: none"> sign(s) or a definitive combination of symptoms of root disease are observed. 	All	armillaria root disease DRA, blackstain root disease DRB laminated root rot DRL, annosus root disease DRN tomentosus root rot DRT,	<p>Signs are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. Symptoms include foliar chlorosis or thinning, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. An individual symptom is not sufficient to identify a root disease.</p>
		<ul style="list-style-type: none"> infected tree found in plot. See comments for well-spaced tree net down calculation. The multiplier for all root disease infected trees is 1. The well-spaced tree that is netted down is the susceptible species that is closest to the infected tree. Note that the WS tree that is netted down may vary depending on the species acceptability rules being followed, those currently used or those used at the time of declaration. 	All Fd Bg,Hw,Sx, Se,Lw Fd, PI, Pw, Sx Se, Sx, Fd, PI Ba, Hw, Ss, Fd	armillaria root disease DRA, laminated root rot DRL. black stain root disease DRB. tomentosus root rot DRT. annosus root rot DRN	<p>Note: All conifer species are considered susceptible. All broadleaf species are considered not susceptible for survey purposes only.</p> <p>Note: Cw, PI, Pw, Py, and all broadleaf species are considered not susceptible for survey purposes only.</p> <p>Note: All other conifers and broadleaf species are considered not susceptible for survey purposes only.</p> <p>Note: Bg, Bl, Cw, Cy, Pw, Py, and all broadleaf species are considered not susceptible for survey purposes only.</p> <p>Note: Cw, Cy, Pw, PI, Py, and all broadleaf species are considered not susceptible for survey purposes only.</p> <p>Example: How to apply net down for all root diseases. If root disease-infected trees are found in the plot: 1. In the first sweep, determine the total number of healthy, well-spaced trees using the prescribed minimum inter-tree distance (MITD) (e.g., 12 trees); 2. In a second independent sweep, determine the number of well-spaced infected trees using MITD (e.g., 1 infected tree); 3. From the number of susceptible healthy well-spaced trees found in step 1, subtract the number of well spaced infected trees. The result (e.g., 11 trees) is the adjusted number of healthy, well-spaced trees tallied for the plot.</p>

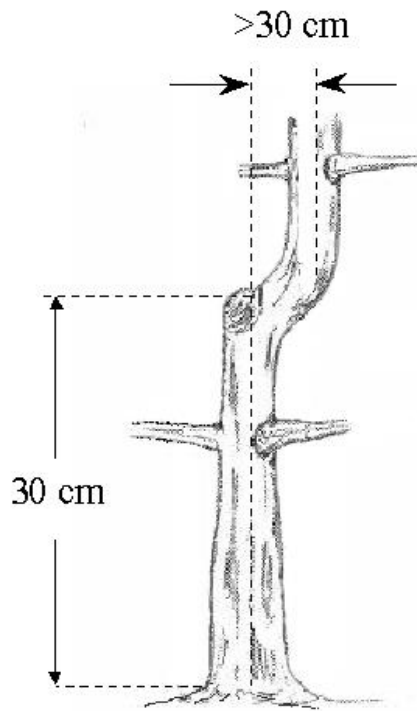


Figure 1. Determining horizontal displacement when assessing stem deformation. This is only done when the tree has five seasons' growth after damage occurs.

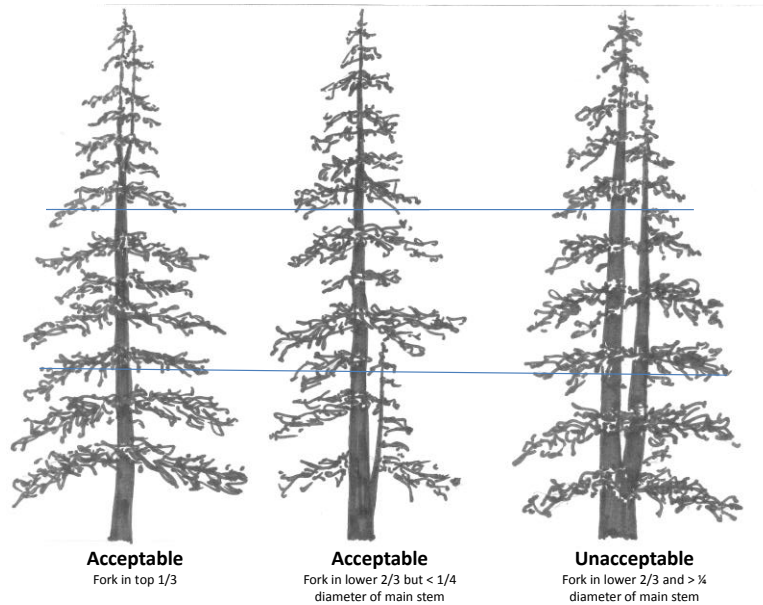


Figure 2. Acceptable and unacceptable forking in age class 2 & 3 conifers

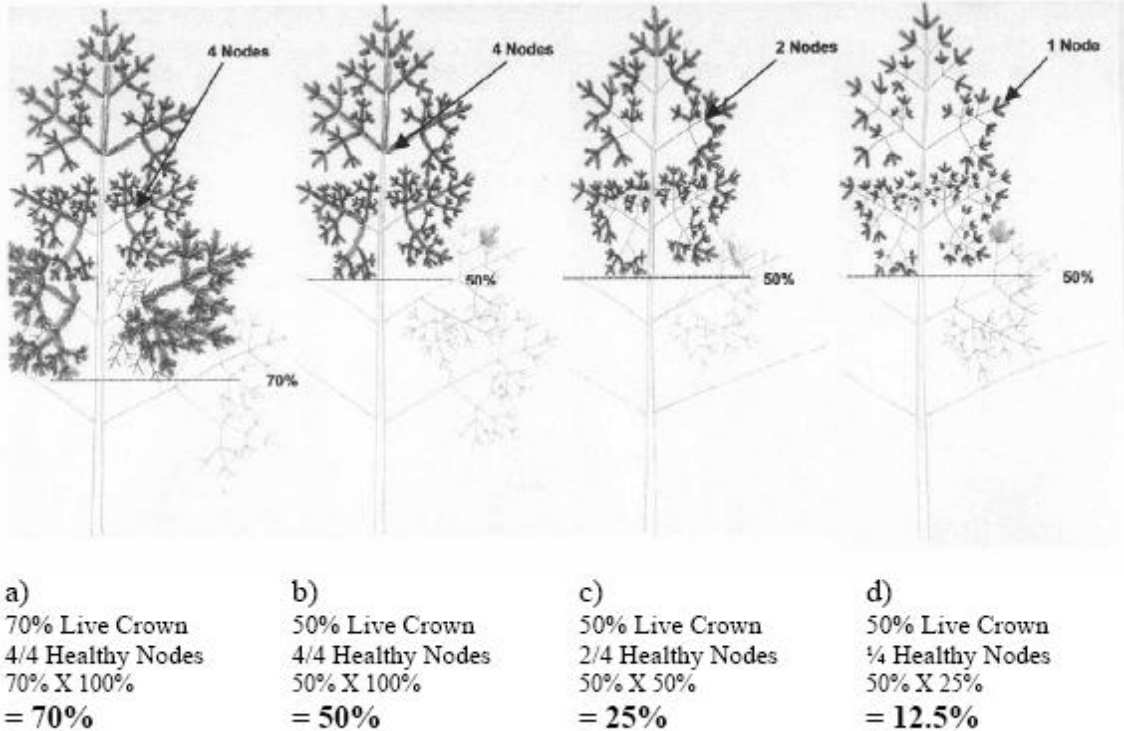


Figure 3. Calculating defoliation for Dothistroma-afflicted conifers.

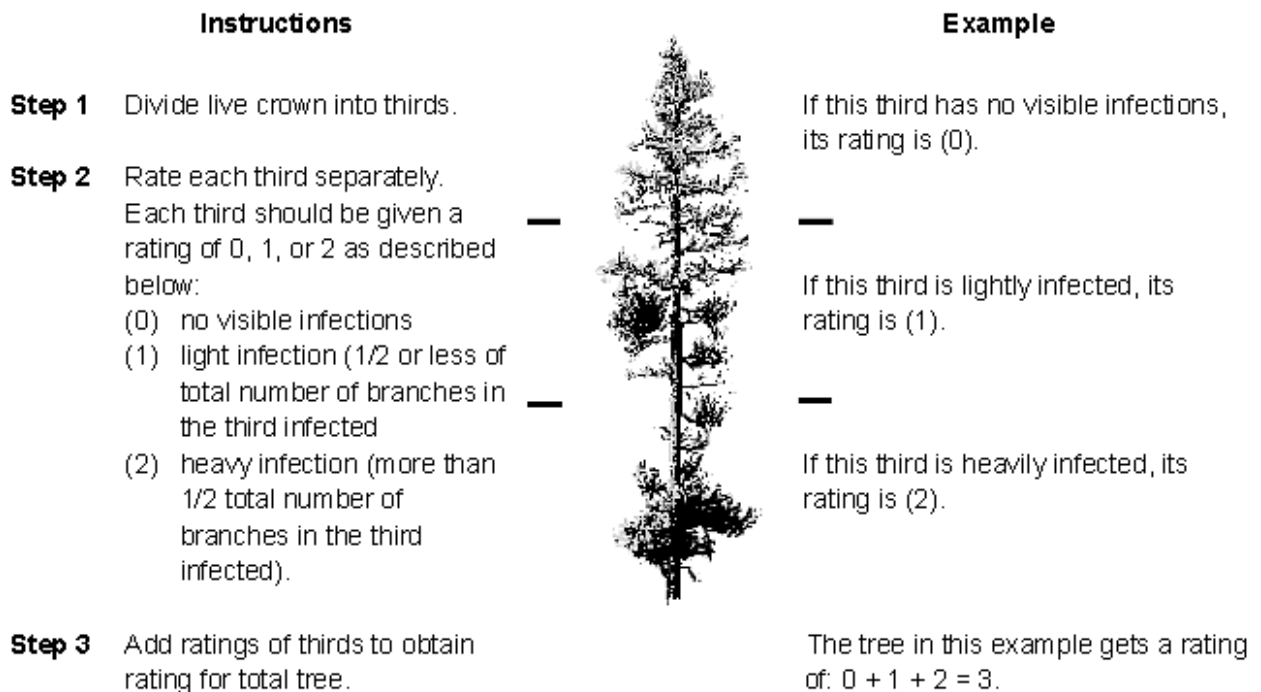


Figure 4. The Hawksworth six-class dwarf mistletoe rating system.

Definitions

basal resinosis (pitching): copious exudation of pitch at the base of the stem at or below the root collar. This symptom often is associated with armillaria root disease or attack by Warren's root collar weevil.

decay: the disintegration of plant tissue. The process by which sound wood is decomposed by the action of wood-destroying fungi and other microorganisms.

fork: two or more leaders have originated from the loss of a leader or apical shoot. At free-growing age, a fork is considered persistent if it has not differentiated in height between competing leaders by more than 5 cm after five years of growth since the leader damage occurred. Forks may provide entry points for decay fungi, are points of weakness during felling, and may create waste in the highest value first log.

gall: nodule or lump of malformed bark or woody material caused by a variety of damaging agents, such as western gall rust and some insects.

gouting: excessive swelling of a branch or shoot, often accompanied by misshapen needles and buds. Most common at nodes on branches and frequently caused by balsam woolly adelgid on true firs (*Abies* spp).

Height to diameter ratio: height in meters divided by dbh in meters.

infection: characterized by a lesion or canker on stem or branches or by swelling around the entrance point of a pathogen.

injury: damage to a tree by a biological, physical or chemical agent.

scar: a wound completely healed-over by callus tissue

wound: an injury where cambium is dead (e.g., sunscald) or completely removed. Wounds often serve as entry points for decay fungi