



Ministry
of Forests



FIA SURVEY STANDARDS

Effective April 1, 2002

These standards apply, in addition to the General FIA Standards (FS 1001), to all silviculture survey activities funded under the Forest Investment Account (FIA).

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ARTICLE 1: GENERAL CONDITIONS

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 District Manager 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) **“Forest Cover Map”** means a forest cover map maintained by a District Manager or by a holder of a Tree Farm Licence or Community Forest Agreement.
- (f) **“Minimum Stocking Standard”** means the minimum number of well-spaced trees per hectare, of preferred and acceptable species, that must be present for a stratum to be considered satisfactorily restocked or free growing.
- (g) **“Multi-Storey Stand”** means a stand with a mature or pole layer present in combination with a sapling and/or regeneration layer.
- (h) **“Opening”** means an area identified on a Forest Cover Map by an opening number.
- (i) **“Project Map”** means a map produced according to the specifications in Article 3.
- (j) **“Silviculture Treatment Recommendation”** 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.
- (k) **“Specified”** means, as the context so requires, specified in an Approved Plan or Work Plan, in a FIA Standard, or by a District Manager.
- (l) **“Stratification Criteria”** means the criteria set out in the FIA Standards, the *Silviculture Surveys Guidebook*, or as may be specified by a District Manager.
- (m) **“Stocking Standards”** means the site specific stocking requirements that are stated in an Approved Plan.
- (n) **“Stratum”** or **“Strata”** means, respectively, a Survey area or areas for which the boundaries are determined by the Stratification Criteria specified in the FIA Standards for the type of Survey referenced.
- (o) **“Survey”** means, as the context requires, a stocking, plantability, free-growing, survival or pre-stand tending survey as set out in the *Silviculture Surveys Guidebook* and includes the collection and analysis of field data, and includes all forms, maps, reports, photographs and Silviculture Treatment Recommendations required by the FIA Standards.
- (p) **“Treatment Map”** means a map produced according to the specifications in Article 3.

1.2 Any reference in this document to a guidebook, means a guidebook issued as a component of the Forest Practices Code.

Information and Materials Furnished by the District Manager

- 1.3 At the request of the Recipient, the District Manager will provide:
- (a) where they exist, the Approved Plans applicable to the Openings;
 - (b) where Approved Plans do not exist, the Stocking Standards and Crop Tree Standards to be applied to the Openings;
 - (c) copies of its Forest Cover Maps having the Openings to be surveyed;
 - (d) applicable aerial photographs, subject to any conditions of use that may be attached; and
 - (e) all other available information considered by the District Manager to be pertinent to the Work.

ARTICLE 2: PERSONNEL

Crew Qualifications

- 2.1 Each Survey Crew must include at least one Accredited Silviculture Surveyor and all personnel performing the Work must be familiar with the silviculture treatment options that are appropriate and generally considered acceptable for the area.

Inspector's Qualifications

- 2.2 All Work must be inspected by a person (the "Inspector") who is:
- (a) the Registered Professional Forester (RPF), or operates under the direction of the RPF, who will sign and professionally seal reports for the Work;
 - (b) experienced and competent in conducting Surveys;
 - (c) familiar with the Approved Plans for the Openings;
 - (d) familiar with appropriate silviculture treatment options; and
 - (e) 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.

General

- 3.2 All Surveys must be in accordance with the FIA Standards, including any standards or specifications stated or implied in the Approved SQI System which forms part of the FIA Standards, and with any applicable guidebook.

Plot Size and Location

- 3.3 Plot size and locations must be in accordance with the specifications for the type of Survey contained in the *Silviculture Surveys Guidebook*.

Marking Lines and Plots

- 3.4 Survey lines and plots must be marked as follows:
- (a) point of commencement (P.O.C.) and point of termination (P.O.T) marked with flagging tape showing the P.O.C. or P.O.T. 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 centres; and
 - (d) flagging tape affixed at a height of approximately 1.3 meters above each plot centre, showing in waterproof ink the plot number, strip line number, surveyors initials, date of survey, bearing, and distance to next plot.

Allowable Errors in Measurement

- 3.5 Surveys must be within the following allowable errors:

<u>Item</u>	<u>Allowable Error</u>
(a) P.O.C. and P.O.T.	± 10 metres
(b) All bearings	± 2 degrees
(c) All plot centres and tie points	± 2% of horizontal distance (HD)
(d) Plot radius	± 1% of HD
(e) Closed traverse	± 1% error of closure

- (f) Estimated tree heights:
 - i) under 2 metres $\pm$ 10 centimetres
 - ii) 2 metres to 10 metres $\pm$ 10%
 - iii) greater than 10 metres $\pm$ 20%
- (g) Measured tree heights $\pm$ 5%
- (h) Estimated tree diameters $\pm$ 20% (rounded to the nearest whole cm)
- (i) Estimated stand age $\pm$ 20%
- (j) Site index $\pm$ 3 metres (for Growth Intercept Method)
- (k) Stratum area in hectares $\pm$ 10%

Estimated Total Tree Count

- 3.6 If the total tree count within a sample plot reaches 35 before an entire plot has been tallied, the total number of trees in the plot may be estimated.

Damage and Condition Assessment

- 3.7 Each Stratum must be examined for any pest, pest damage, disease, disease damage or other physical damage which may be present, and the following information recorded:
- (a) the type of pest, disease or damage present within a survey plot (or on a staked tree, if using the staked-line method of survival survey);
 - (b) the type of pest, disease, or damage, the severity of damage and the percent of total trees, percentage of total conifers and percent of the host trees affected or the percentage of the area of the Stratum affected;
 - (c) the type of pest, disease or damage present by means of the standard pest identification codes specified on the damage agent and condition code reference form (FS 747);
 - (d) the pest, disease or damage information in the appropriate column of the field data forms; and
 - (e) a summary of the pest, disease and damage information in the Silviculture Treatment Recommendations and summary section of the appropriate form.

Required Recommendations & Format of Documentation

- 3.8 Subject to the outcome of a Survey, Silviculture Treatment Recommendations must be developed in accordance with:
- (a) the Forest Practices Code;
 - (b) the procedures in the *Silviculture Surveys Guidebook*;
 - (c) the Approved Plan for the Opening, if one exists; and
 - (d) if an Approved Plan does not exist, the Stocking Standards and Crop Tree Standards appropriate for the area and applicable tree species.
- 3.9 If an Approved Plan held by the District Manager appears to require an amendment, the Recipient must make the recommendation to the District Manager.
- 3.10 Where the District Manager provides a sample Survey representing the standards for conducting, recording and reporting a Survey, the sample will be the minimum acceptable standard for a Survey. Where a sample Survey is provided it becomes part of the FIA Standards.
- 3.11 Where Survey data or results are summarized or represented using computerized (or other electronic data) means, the display, content and format of the information shall substantially duplicate the corresponding Ministry of Forests form and its respective procedural requirements.

Project and Treatment Maps

- 3.12 Project Maps and Treatment Maps must be prepared to the specifications below for each survey type in each Opening.
- 3.13 Project and Treatment Maps must:
- (a) be draughted in accordance with Ministry of Forests' standards;
 - (b) unless otherwise Specified, be at a scale of 1:10,000;
 - (c) be draughted in ink or produced by computer assisted draughting software; and
 - (d) show the
 - i) date of survey,
 - ii) Opening boundary and number,
 - iii) scale,
 - iv) roads and landings in and near the Opening,
 - v) creeks and streams in and near the Opening and their direction of flow,
 - vi) standards unit boundaries and labels (if applicable),
 - vii) boundaries and letter labels of all Strata one hectare or greater in size,
 - viii) aerial photo tie points,
 - ix) forest cover types outside the opening boundary,
 - x) north arrow, and
 - xi) draught person's name.

Project Maps - Additional Requirements

- 3.14 In addition to the requirements of section 3.13, Project Maps must also show:
- (a) points of commencement and termination of the survey;
 - (b) survey lines with numbers and direction traveled;
 - (c) plot centres numbered at least every fifth plot;
 - (d) the boundaries and name of each ecosystem site series;
 - (e) Opening and Strata area;
 - (f) the locations from which each photo was taken and an arrow indicating the direction of the photo image from that location; and
 - (g) the type of Survey.

Treatment Maps - Additional Requirements

- 3.15 In addition to the requirements of section 3.13, Treatment Maps shall also show:
- (a) treatment unit boundaries and identifiers;
 - (b) Silviculture Treatment Recommendations;
 - (c) the direction and distance to nearest town; and
 - (d) gross and net treatment area.

Forest Cover Maps

- 3.16 Where a copy of the Forest Cover Map is required as part of a Survey, it must accurately detail all boundary, road, and forest cover label changes for any Opening and must be attached to the corresponding forest cover attribute form (FS 810A).

ARTICLE 4: STOCKING, PLANTABILITY AND FREE GROWING SURVEYS

- 4.1 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 Survey

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

Stratification Criteria

- 4.3 All one (1) hectare or larger areas of an Opening which are significantly different from the surrounding area must be stratified into relatively homogeneous Strata based on:
- (a) previous Approved 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.

Required Number of Plots

- 4.4 The number of plots per Stratum must be in accordance with the “Decision rules for determining number of plots required” in the appendices of the *Silviculture Surveys Guidebook*, except Surveys in Multi-Storey Stands and plantability surveys must have a minimum of one plot per hectare.

Brush Hazard Assessment

- 4.5 For each Stratum, brush hazard must be assessed in the following manner.
- (a) During the initial walk-through, record
 - i) the estimated percentage of brush cover,
 - ii) average brush height in centimetres,
 - iii) current brush severity 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,

- iv) current brush distribution using the following codes -
 - CONTINUOUS - brush covers the entire stratum,
 - PATCHY - small or large non- continuous areas of brush,
 - SCATTERED - randomly distributed clumps or individual plants.
- (b) At the first and every fourth sample plot thereafter, record the species, percent cover and height of competing vegetation.

Required Forms

- 4.6 The following forms must be completed.
- (a) Survey plot information must be recorded on the appropriate silviculture survey and silviculture survey plot forms (FS 657 and FS 658).
 - (b) A silviculture survey summary form (FS 659) must be completed for each Stratum, summarizing all information recorded on the field survey forms (FS 657 and FS 658), and specifying Silviculture Treatment Recommendations for the Stratum.
 - (c) A forest cover attribute form (FS 810A) must be completed for each Opening.

Required Maps

- 4.7 The following maps must be prepared for each Opening surveyed:
- (a) a Project Map;
 - (b) a Treatment Map, if future stand treatments are recommended as a result of the Survey; and
 - (c) an updated copy of the Forest Cover Map.

Required Photography

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

ARTICLE 5: SURVIVAL SURVEYS

- 5.1 The standards contained in this Article apply to survival surveys in addition to the standards specified in Article 3.

Stratification Criteria

- 5.2 All one (1) hectare or larger areas of an Opening which are significantly different from the surrounding area must be stratified into relatively homogeneous Strata based on:
- (a) ecosystem site series;
 - (b) tree species;
 - (c) seedling stock type;
 - (d) seedlot;
 - (e) nursery at which stock was grown; and
 - (f) method of site preparation.

Sampling Specifications for New Surveys

- 5.3 Survival surveys using the staked plot method must use circular sample plots having a radius of 3.99 metres (0.005 hectares).
- 5.4 Survival surveys using the staked line method of Survey, must have a minimum of four lines of 25 trees within each Stratum.

- 5.5 Staked trees (in lines or plots) must be evenly distributed throughout each Stratum in order to obtain Survey data which is representative of the Stratum.
- 5.6 A minimum of 100 trees in each Stratum must be staked and assessed.

Required Forms

- 5.7 Survey information must be recorded and summarized as follows:
 - (a) staked plot Survey information recorded on the survival staked plots form (FS 707);
 - (b) staked line Survey information recorded on the survival staked lines form (FS 844); anda survival surveys summary form (FS 716) must be prepared for each Opening, summarizing information recorded on the field data forms and specifying Silviculture Treatment Recommendations.
- 5.8 A forest cover attribute form (FS 810A) is not required.

Required Maps

- 5.9 A Project Map must be prepared for each Opening.

ARTICLE 6: PRE-STAND TENDING SURVEYS

- 6.1 The standards contained in this Article apply to pre-stand tending surveys, in addition to the standards specified in Article 3 .

Stratification Criteria

- 6.2 All one (1) hectare or larger areas of an Opening which are significantly different from the surrounding area must be stratified into relatively homogeneous Strata based on:
 - (a) density and coverage of dominant tree species;
 - (b) recommended silviculture treatment;
 - (c) forest inventory component;
 - (d) forest health factors;
 - (e) ecosystem site series; and
 - (f) forest stand structure.

Required Forms

- 6.3 Survey information must be recorded and evaluated as follows:
 - (a) Survey information recorded on the pre-stand tending survey form (FS 748);
 - (b) a pre-stand tending site description prescription form completed (FS 770) for each Stratum; and
 - (c) a forest cover attribute form (FS 810A) completed for each Opening.

Required Maps

- 6.4 The following maps must be prepared for each Opening:
 - (a) a Project Map;
 - (b) a Treatment Map, where further treatments are recommended; and
 - (c) an updated copy of the Forest Cover Map.

ARTICLE 7: INSPECTION

Quality Inspection - General

- 7.1 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 FIA Standards.
- 7.2 Unless otherwise Specified by a District Manager, the methodology given in this Article shall form the basis for the Approved Surveys Quality Inspection System.
- 7.3 The Inspector must carry out field and office inspections to an intensity necessary to confirm the items in section 7.10 and must make a written record of the inspection. The primary focus of an inspection is to verify that the findings, silviculture and inventory labels, forest cover map changes, Silviculture Treatment Recommendations and Treatment Maps resulting from a Survey are correct.
- 7.4 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) for any Survey, including a Staked Line Survival Survey,
 - i) an office review, or
 - ii) a field reconnaissance; or
 - (b) for any Survey, excluding a Staked Line Survival Survey,
 - i) a field check on a portion of an Opening of plots established by a Survey Crew, or
 - ii) an independent Survey of selected Strata; or
 - (c) for a Staked Line Survival Survey, a field check of a line or a portion of a line established by a Survey Crew.

Office Review

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

Field Reconnaissance

- 7.6 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.

Inspection of Plots

- 7.7 Where the Inspector checks the results of plots established by the Survey Crew in an Opening, he or she must:
- (a) inspect the lesser of all plots established or 10 plots, selected on a systematic, unbiased basis and well-distributed throughout the Opening or Strata;
 - (b) record, as appropriate to the type of Survey:
 - i) well-spaced trees by species;
 - ii) free-growing trees;
 - iii) plantable spots;
 - iv) preparable spots;
 - v) identification of planted and natural trees in Survival Surveys;
 - vi) surviving trees;
 - vii) total trees;
 - viii) brush hazard;

- ix) forest health factors; and
- (c) compare the totals with those collected by the Survey Crew for the same plots.

Independent Survey

- 7.8 Where the Inspector conducts an independent survey, the Inspector must:
- (a) survey 10% or more of the Strata within the Work Area; and
 - (b) for each Stratum sampled, compare (at the 95% confidence level) the results of the independent survey with the Survey estimates of the number of well-spaced trees and free-growing trees.

Inspection of Staked Line Survival Surveys

- 7.9 Where the Inspector conducts a field check of a staked line survey, the Inspector must field inspect the lesser of one line or 25 trees within an Opening, and must compare his or her assessment of the total number of surviving trees with the Survey assessment for the same line or trees.

Satisfactory Work Quality Defined

- 7.10 The Inspector must generally examine each Survey to the extent necessary to determine that the Survey has been undertaken and reported in accordance with FIA 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
 - i) the biogeoclimatic zone, sub-zone, site series (ecosystem association) for a Stratum,
 - ii) preferred or acceptable tree species as permitted under the stocking standards for the Stratum,
 - iii) the order of the leading and secondary species in the inventory label for a Stratum, and
 - iv) stocking status for a Stratum (e.g., SR vs. NSR);
 - (c) the Survey correctly reports
 - i) a brush hazard that will prevent the stand from attaining a free growing condition within the time specified in the standards,
 - ii) any pest, pest damage, disease, disease damage or other physical damage which is present in an Opening;
 - (d) there are no errors in measurement that exceed the allowable errors specified in the FIA standards 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) surviving trees;
 - (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.

ARTICLE 8: REQUIRED REPORTS & RECORDS**General**

- 8.1 The District Manager 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.

TFL's, CFA's

- 8.2 Where the Recipient holds a tree farm licence (TFL) or community forest agreement (CFA) and conducts Surveys on Crown land that is part of its TFL or CFA, the Recipient shall, as appropriate to the results, recommendations or Treatment Prescriptions arising from the Surveys:
- (a) update forest cover maps and silviculture and forest inventory information systems for the TFL or CFA; and
 - (b) keep on its own files for as long as necessary to maintain the silviculture history of an Opening but at a minimum for not less than two years, the original paper or digital copies of all inspection reports, forms, maps, photographs and other material and records which are required by this document to be prepared or completed.

FL's & Others

- 8.3 Where the Recipient is not the holder of a TFL and conducts Work on Crown land that is part of a timber supply area (TSA), the Recipient must, within 60 days of completion of the Work, submit to the District Manager copies of all inspection reports, forms, maps, reports, photographs and other material and records which are required under this document to be prepared or completed.