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# Vegetation Resources Inventory

## Field Calibration Procedures for Photo Interpretation

Prepared by  
Ministry of Forests, Lands and Natural Resource Operations  
Forest Analysis and Inventory Branch

April, 2011

Version 1.1

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Published by the  
Resources Information Standards Committee

## **Library and Archives of Canada Cataloguing in Publication Data**

**Digital Copies are available on the Internet at:**

<http://www.ilmb.gov.bc.ca/risc>

## Acknowledgments

The Government of British Columbia provides funding of the Resources Information Standards Committee work, including the preparation of this document. The Resources Information Standards Committee supports the effective, timely and integrated use of land and resource information for planning and decision making by developing and delivering focused, cost-effective, common provincial standards and procedures for information collection, management and analysis. Representatives to the Committee and its Task Forces are drawn from the ministries and agencies of the Canadian and the British Columbia governments, including academic, industry and First Nations involvement.

The Resources Information Standards Committee evolved from the Resources Inventory Committee which received funding from the Canada-British Columbia Partnership Agreement of Forest Resource Development (FRDA II), the Corporate Resource Inventory Initiative (CRII) and by Forest Renewal BC (FRBC), and addressed concerns of the 1991 Forest Resources Commission.

For further information about the Resources Information Standards Committee, please access the RISC website at:  
<http://ilmbwww.gov.bc.ca/risc/index.html>

# Field Calibration Procedures for Photo Interpretation

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# 1.0 Introduction

Vegetation Resources Inventory (VRI) field calibration consists of ground and air assessments conducted by photo interpreters on vegetated polygons. They are intended to provide calibration information for subsequent photo interpretation by the individuals conducting the field visitations and to provide the photo interpreter an iterative educational process to further increase their knowledge of the different vegetation types and site conditions in the project. Comprehensive land cover information is obtained through a detailed data-gathering routine. The data provide a useful link of vegetation attributes on the ground to how it is observed on mid-scale aerial photography or digital imagery, and thus aid in providing accurate and consistent attribute estimation.

Proper location and establishment of VRI calibration points is imperative to providing useful data sources for the current inventory and any subsequent inventories.

The following principles apply to the placement of VRI calibration points.

1. The collection of field calibration data must be distributed to cover the full range of anticipated land cover types to be observed, as well as areas identified as issues and of concern to the photo interpreter. Priorities for data collection may be identified on a project-by-project basis as per the project pre-work or VPIP.
2. Calibration points are conducted to provide data to strengthen the final photo interpreted estimates.

The following are general requirements for calibration points establishment

1. All photo interpreters involved in the attribution stage of the project must participate in collecting air call and ground call data to enhance their knowledge of the different stand types and conditions within the project area.
2. Collection of calibration data is to be conducted by a certified VRI photo interpreter, or under the direct supervision of a certified VRI photo interpreter.
3. Before field visitation, the photo interpreter should observe the calibration point polygon through stereoscopic vision and make preliminary estimates for all attributes. Following the data collection, the interpreter should review the initial estimates in comparison with the data obtained.

## 2.0 Calibration Points

There are three types of calibration points:

1. Observation
2. Ground call
3. Air call

Observations are not subject to the third-party quality assurance process. Ground calls and air calls are subject to the third-party quality assurance process.

## 2.1 Observation

Ground and air observations are an integral and highly useful data source for the photo interpreter. Efforts should be made to collect and record data while traveling between ground call and air call locations. All ground and air observation information can be collected on existing photos or orthoimages.

The location of observations is determined during the calibration process and is dictated primarily by the photo interpreter's need for additional calibration data in difficult forest types and can be as simple as a notation of species composition or height estimate in a polygon.

## 2.2 Ground Call

There are three ground call types that are considered acceptable for the collection of ground data for calibration purposes; three point ground calls, one point ground calls and observation ground calls. The types and amount of ground calls established will vary by project and will be specified in the VPIP or project contract. It is expected that projects will use a combination of the three types of calls.

The proportion of each type of ground call is determined at the project planning stage. The lead proponent / licensee should consider the following factors when deciding on the proportions of each type of call: complexity of stands (uneven aged, multi species, variable heights, and variable density), age and distribution of previous data sources, and field work budget.

The photo interpreter must review the plot results before leaving the ground call (particularly in multi-species stand) and comment whether the plot data reasonably reflects the observed stand attributes. Based on an ocular observation of the representative portion of the stand, the interpreter should comment if a species composition adjustment is necessary to the species composition derived from the plot data. A comment regarding species composition adjustment is entered in the comment section of the final ground call digital summary.

### *Three Point Ground Call (XGV)*

The three point ground call consists of three plots with a minimum distance of 50 m between each plot. A reduction in the minimum distance is permitted in very small polygons. This type of ground call is typically used in complex stand with significant variation in stand attributes. For example, these include stands with multiple species, patchy tree distribution; uneven-aged or all-aged stands; multiple layers such as interior Douglas-fir stands; and a wide range of ages and/or heights such as mature spruce-balsam complexes. The three point ground call will provide more representative information on species composition, basal area, density, age, and height in these types of stands than a single point ground call.

### *One Point Ground Call (XGV)*

The one point ground call consists of one plot established in a representative portion of the polygon. This type of ground call would typically be used in very homogenous polygons with little variation in attributes. Fire origin stands of lodgepole pine or stands of coppice aspen are good examples of where a one point ground call should be used. A brief walk and informal sweeps should be completed in the representative portion of the polygon before establishment of the plot centre to ensure the most representative plot location of the polygon. Informal sweeps are not subject to quality assurance and are not to be used in the calculation of derived attributes.

### ***Observation Ground Call (XGO)***

Ground observations with measurements are calibration points where ocular species composition estimate, age and height of the leading and second species, and additional comments to help the photo interpreter in the estimation phase are collected in the field. The photo interpreter should view the photograph stereoscopically before entering the polygon to estimate the basic stand attributes and then, take a short walk through the stand to confirm the species composition. Although sweeps are not required, it is recommended that a few informal sweeps be completed to improve species composition and basal area. The age and height of a suitable sample tree representative of the stand for the first and second leading species must be measured and recorded.

#### **2.2.1 General Requirements for Ground Call Establishment**

- All photo interpreters involved in the attribution stage of the project must participate in the ground calibration to enhance their knowledge of the different stand types and conditions within the project area.
- Ground call data collection is to be conducted by a certified VRI photo interpreter, or by someone under the direct supervision of a certified VRI photo interpreter.
- Ground calls must be located in representative areas of the polygon.
- All plots must be a minimum of 50 meters from any distinct polygon boundary to reduce the possibility of edge effect. These polygon boundaries include, but are not limited to, road rights-of-way, cut blocks, well sites, swamps and water features. A reduction in the minimum distance from a defined polygon boundary may be permitted in small polygons where the 50 m distance requirement cannot be met for a 1 point ground call or ground observation with measurements or the 100 m distance requirement for a 3 point ground call cannot be met.
- Tree measurement and recording of data should be systematic in nature (clockwise from north); at a minimum, the first tree measured in each plot should be numbered and all trees tallied 'in' should be marked with a paint dot or number at or near dbh.
- To assist with identification of plot trees and measurement of borderline trees, plot centers should consist of stakes firmly embedded in the ground with a ribbon around it and the plot number on the ribbon and, if it is a 3 point call, the point number.
- Ribbon must be used to indicate the tie point and the direction of travel to the plot centre and in between plots.
- Before leaving the ground call, the photo interpreter must complete all measurements, calculations and data summaries. The photo interpreter should carefully consider the data summary as it relates to the ecology and vegetation of the site before leaving the polygon.
- Tree count will be based on a diameter breast height (dbh) limit set by the field crew on the walk into the plot. The dbh limit should be chosen based on the goal of sampling the dominant, co-dominant and high intermediate trees in the polygon, and must remain constant for all plots in the ground call. The dbh limit is based on 5cm diameter classes. The dbh limits are as follows: 4.0, 7.5, 12.5, 17.5, 22.5, 27.5, etc. For stands with the majority of stems less than 10.0 cm, it is recommended a fixed radius plot be used. The dbh limit must be indicated on the field card.

- For multi-layer stands, complete information is to be collected and recorded for each layer visible on both the ground and aerial photograph. The field crew should stereoscopically view the polygon prior to collecting any data to determine whether multiple tree layers exist within the polygon. If there is more than one layer, the crews must write down in the column next to the tree number column on the field card which layer each tree belongs to.
- An ocular species composition must be estimated for each ground call and the interpreter must comment if a species composition adjustment is necessary to the species composition derived from the plot data. A comment regarding species composition adjustment is entered in the final ground call digital summary.

### **2.2.3 Plot Types**

#### **Variable Radius Plot**

- It is suggested that a variable radius plot be used in stands where the average DBH is above 10cm.
- The desired tree count is 6 to 8 live trees per variable radius plot on average. Once a BAF is selected it will be maintained throughout all of the plots in that polygon.
- Borderline trees will have the diameter and horizontal distance measured to determine whether they are 'in' or 'out'. This data should be recorded on the field cards.

#### **Fixed Area Plot**

- Fixed area plots should only be used in stands where the average stand diameter is less than 10cm DBH.
- The optimum plot radius used should result in an average of 12 to 18 live trees per plot using one of the following plot radius: 3.99m, 2.52m or 1.78m.
- The plot size shall be maintained consistently for all fixed area plots within the polygon.
- All trees within a circular plot must be tallied and used in all tree calculations and measurements. Splitting of plots or using only a portion of a circular plot to make attribute measurements is not permitted.

### **2.2.3 Sample Tree Selection**

- Sample trees must be representative of the main stand canopy for each layer.
- At least one sample tree, for age and height measurements, must be selected for both the leading species and second species. If using a three point ground call, three leading species trees and one second species tree must be selected over the three plots.
- The same sample trees must be used for both age and height. Where sound sample trees are not available, trees with rot defect may be used and noted as an estimated age in the comments.
- All sample trees are to have an 'S' painted on them facing the direction that the height was taken.
- If there are no representative 'in' trees available, trees from outside the plot may be used as a sample tree. Trees should be numbered starting with 99 for the first

sample tree and then 98 for the next sample tree and this sequence of numbering should be continued until all sample trees have been identified. A comment should be noted on the field card indicating the approximate bearing and distance from the plot centre to the sample tree to assist the QA personnel in locating the sample tree(s).

### 2.2.4 Data Collection

The following information is to be recorded for each ground call:

- Crew Names; Company Name;
- Date;
- DBH Limit: Minimum DBH limit used to select plot trees;
- BAF: BAF size used to determine plot trees;
- Species: All tallied trees are to have genus and species recorded;
- DBH: All tallied trees must have a recorded DBH. The DBH can be measured, or estimated into 5cm classes. All sample trees must have a measured DBH;
- Age: All sample trees must have an age. It is highly recommended that all field counted ages are office verified using a hand lens or microscope. Sample trees with prorated ages are not subject to the quality assurance standards;
- Height: All sample trees must have a height;
- Ocular Species Composition: Must be estimated in the representative area of the stand for every ground call and recorded in the comments section;
- Ecological Information: The crew is encouraged to correlate the presence of all vegetation species (trees, shrubs, and herbs) with soil types and their moisture and nutrient regimes. Data on shrubs and herbs should only be collected if it will be visible from the image;
- GPS Coordinates: If the crew is unable to capture a field GPS coordinate of the location of the ground call, then an intended coordinate is recorded and labeled as “Intended”. Field captured GPS coordinates are labeled as “Field” coordinates.

### 2.2.5 Data Summary

A summary for each ground call must be made and include the following data, at a minimum:

- BCGS Map Sheet Number;
- Ground Call Number;
- Layer information: if more than one layer;
- Species composition: Species composition is determined on the basis of basal area. For variable radius plots species composition is based on tree count. For fixed-radius plots, compute the individual tree basal areas and use them in determining percent composition;

- Ocular Species Composition - the ocular estimate must be recorded in the comment section in the final digital data summary for one point and three point ground calls;
- Age: The average age of the leading and second species based on the sample tree measurements. Ages estimated from rotten cores are not subject to QA standards;
- Height: The average height of the leading and second species based on the sample tree measurements;
- Basal area: Total basal area for the plot. If the interpreter feels that the tallied trees do not reflect the actual basal area of the stand, an estimate of the basal area should be made in the comments section;
- Density: Stems /hectare for all tallied trees;
- Snag Frequency: Snags/ha;
- UTM coordinates: All ground call locations are to be referenced to a Geographic Positioning System (GPS) location in UTM NAD 83 format. For a 3 point call, the center point should be used as the reference.
- **Comments:** Add comments that help describe the stand (calibration data point) either under or in the canopy that will assist the photo interpreter during the photo estimation phase.

### 2.3 Air Call

Preliminary planning includes the creation, submission and approval of a field air calibration plan including a tally of air call targeted stand types. In this respect, initial polygon delineation for a project should be completed prior to the determination of field calibration locations.

All information collected will be recorded on the VRI Air Call Form or digital equivalent. The hardcopy forms or digital must be submitted to the Ministry upon completion of the field calibration. Summarized digital air call data must be submitted to the Ministry in an excel format.

#### 2.3.1 General Requirements for Air Call Establishment

- A minimum of one British Columbia VRI Certified photo interpreter must be in the air craft during the collection of the data; although it is preferable to have two certified interpreters.
- Air calls must be located in representative areas of the polygon.
- All air call mid-point locations are to be referenced to a Geographic Positioning System (GPS) location so that they can be subsequently revisited for any quality assurance and accurately placed in the provincial field calibration tile.
- Data collected in air calls should be for the visible portion of the polygon (trees that are visible on the aerial photographs used for the project, shrubs and herbs not otherwise obscured by taller vegetation, etc.) This would normally include trees in the dominant, co-dominant and high intermediate canopy positions.
- Decisions about multi-layer stands should be made using the stereo image before going to the air call location. For multi-layer stands, complete information is to be collected and recorded for each layer visible.

- All of the data collected are to be estimates. It is important that the crews calibrate themselves with ground measurements to ensure the estimates are reasonable. The air call crew must set down to collect ground data approximately every 20 calls (and indicate in the records where this has occurred) to enable them to calibrate their estimations.

### 2.3.2 Data Collection and Summary

The following is required information is to be recorded for each air call:

- Crew Names; Company Name;
- Date;
- BCGS Map Sheet Number;
- Air call identification: Air call numbering should be formatted as follows: “Flight plan number – Air call number – Year”. Assign each air call a unique air call number. Air calls should be numbered systematically for ease of reference;
- UTM coordinates: All air call locations are to be referenced to a Geographic Positioning System (GPS) location in UTM NAD 83 format;
- Layer information: if more than one layer;
- Species composition: The tree species composition is determined on the basis of basal area and can include a maximum of six tree species. Each species indicated must have a corresponding percentage included;
- Age: Leading and second species age for the dominant and co-dominant and high intermediate crown position to the nearest 10 years;
- Height: Leading and second species height for the dominant and co-dominant and high intermediate crown position to the nearest metre;
- Basal area: For the dominant and co-dominant and high intermediate crown position;
- Density: For the dominant and co-dominant and high intermediate crown position;
- Snag frequency;
- Comments: Add any comments that may assist the photo interpreter during the photo estimation phase;
- Photo Number (optional) where hard copy photos are used.

The following is supplemental information that should be recorded for each air call:

- Shrub Height;
- Herb Cover Type;
- Non-Vegetated Cover Type.

*Additional information can be collected at the interpreter’s discretion.*



### 3.0 Documentation of Calibration Points

For all ground calls and air calls, the minimum documentation on the face of the aerial photograph or orthoimage must include the location, the extent and identification of each call.

#### Ground Call

Upon completion of the ground call, the appropriate aerial photograph or orthoimage should be pin-pricked to mark the location of the ground call. The corresponding ground call documentation details should be noted near the location mark. A capture of the field GPS coordinate for the plot centre should be carried out and recorded on the field card.

For example, documentation for a three-point ground call (reference #3), established in 2008 is as follows:

**GV 3(08)**  
**I-----X-----I**

Documentation for a single point ground call (reference #4), established in 2008 is as follows:

*X GV 4(08)*

Documentation for an observation ground call (reference #5), established in 2008 is as follows:

*X GO 5(08)*

#### Air Call

Upon completion of the air call, the appropriate aerial photograph or orthoimage should accurately mark the location of the call. The corresponding air call documentation details should be noted near the location mark. A capture of the field GPS coordinate for the midpoint of the air call and ground call extent is necessary.

For example, documentation for an air call (call 21, flight plan 3), established in 2008 is as follows:

**3-21(08)**  
**|----- X ----->**

Any variation from the above requirements should be agreed to and documented during the project pre-work meeting. The photos or orthoimages and newly acquired ground call GPS coordinates must be made available to the quality assurance personnel.



## 4.0 Final Deliverables

The final deliverables submitted to MFR must include:

- Ground call and air call tally cards or digital equivalent;
- Summary of all ground calls and air calls data in a digital format provided by the Ministry of Forests and Range;
- A field calibration plan shape (.shp) file with the final location of established ground calls and air calls, and
- Photos (hard copies) or orthoimages with the location of all established ground calls and air calls.



## Appendix A – Ground Call Standards

Representative Location:	Ground calls must be located within a representative portion of the polygon.
Establishment Location:	Field location of each ground call must be within $\pm 30$ m of the provided photo or orthoimage marked location.
Species Identification:	One error allowed in species identification for a three-point ground call. No species identification error allowed for one-point ground call.
Age:	The counted ages for trees less than 300 years must be within $\pm 10\%$ or 5 years, whichever is greater and for trees equal or greater than 300 years within $\pm 15\%$ or 20 years, whichever is greater.
Height:	The measured heights must be within $\pm 5\%$ or 0.5 m, whichever is greater.
Diameter Breast Height:	Measured dbh for sample trees must be within $\pm 3\%$ Estimated dbh for non-sample trees must be within $\pm 15\%$ or 5 cm, whichever is greater.
Tree Count:	One point ground call must be within $\pm 1$ tree; Three point ground call must be within $\pm 2$ trees; Note - missed or added trees are cumulative (i.e. 1 missed tree and 1 added tree in a plot is a difference in tree count of 2).
Basal Area and Density:	Must be correctly calculated, based on the contractor's recorded dbh classes and the number of trees tallied.
Ocular Species Composition:	At least 80% of species composition must be correctly identified at every ground call.
Suitable Sample Tree:	Must be of the correct species and represent the crown position of the main canopy and free of major defect. Point deduction is made for a missed sample tree or tree that has a defect.



## Appendix B – Air Call Standards

Location:	Air calls must be located within a representative portion of the polygon and the GPS location of each air call must be within the correct polygon.
Species Composition:	80% of species composition must be correctly identified.
Leading Species:	Leading species must be correctly identified. If the first and second species are within 10% by composition, then either species is acceptable as the leading species.
Age:	The age estimated must be within +/- 20% or 15 years, whichever is greater. Discretion should be applied with stands over 300 years of age.
Height:	The estimated heights must be within $\pm 15\%$ or 3 m, whichever is greater
Basal Area:	Basal area must be within +/- 10m <sup>2</sup> per hectare or 20%, whichever is greater.
Density:	Estimated stems/ha must be within 100 stems or 20%, whichever is greater.
Snags:	Estimated snags/ha must be within +/- 20%



## **Appendix C – Quality Assurance Procedures**

This Appendix contains the Quality Assurance Procedures for ground call and air call establishment based on the VRI Field Calibration Procedures for Photo Interpretation. This document is intended to be used by individuals responsible for the quality assurance of the field calibration stage of a VRI photo interpretation projects

Quality Assurance (QA) is an external process, whereby the work is evaluated by independent third-party quality assurance personnel using approved standards established for calibration point location and measurements. A rating system with pass/fail criteria has been developed to evaluate the audited calibration points and to determine if the calibration points were established to the current VRI standards.

The quality assurance results provide the contract administrator with information about the quality of the work being completed and the contract administrator will use the pass/fail criteria as the basis for payment of work.

The ratings outlined in Section 4 and section 5 of this appendix are used for evaluation of the three ground call types and air call as described in this document.

### **1. Objectives of Quality Assurance**

The objectives of conducting quality assurance of calibration points encompass the determination of both the effectiveness of the calibration points and accuracy of measurements.

Generally, the objectives can be stated as follows:

1. To provide feedback for improving the effectiveness of field calibration and the quality of field data;
2. To assess the performance of the individual interpreters;
3. To ensure adherence to the specified Ministry of Forests and Range (MFR) ground call and air call establishment standards; and
4. To provide supporting information for contract administration; i.e., to facilitate payment and to document the quality for future use of the data.

### **2. Quality Assurance Process Requirements**

The following requirements must be adhered to during the QA process:

1. The QA is performed by a Certified VRI Photo Interpreter with significant experience who is independent of the primary contractor and sub-contractors that are undertaking the inventory project.
2. The QA person is an experienced individual capable of conducting quality measurements and assessments to ensure field procedures have been conducted within standards.

3. The QA person must also be the person completing the quality assurance on all other phases of the project including the delineation, air calls and attribution phases.
4. The project coordinator notifies the QA person well in advance of the planned field start-up date. The initial quality assurance must commence in the early stage of field calibration work for each crew. The interpreters will benefit from and are encouraged to accompany the QA person in the field, especially on the initial inspections. A second quality assurance visit must be completed once all the field work has been completed to ensure the QA sample includes the entire population of ground calls.
5. Send all third-party quality assurance reports to the Ministry representative.
6. Every ground call and air call established in the project, as well as every interpreter's work must have a chance to be selected to undergo the quality assurance process.

### **3. Procedures**

The following are the general steps of the Quality Assurance process:

1. Ministry awards a Quality Assurance contracts and designates the Quality Assurance personnel at the commencement of the project.
2. Contractor and QA personnel develop schedule for submission of field work and scheduling of quality assurance visits.
3. Contractor completes field work and provides cards with supporting material to field locate the calibration points to the QA personnel.
4. QA personnel reviews calibration data and supporting materials in office and select calibration points for quality assurance.
5. QA personnel prepare QA report and submit it to the Ministry representative..
6. Ministry representative provides report to contractor.
7. If required, a meeting is coordinated with the contractor, Ministry representative and QA personnel to review report.

### **4. Data and Material Required**

The contractor must provide the QA person with calibration data, air photos or orthoimages and any other supporting material that was used to locate the calibration points by the contractor's crews. This information will assist the QA person in locating the samples. A list of the final GPS coordinates of each calibration point must be provided. In addition, it is mandatory that all calibration points locations are marked on the photos or orthoimages to enable points to be located without the assistance of GPS coordinates.

### **5. Office Check**

An office evaluation of ground call and air call data in the batch must be completed before the QA person can proceed with the field inspection. If any of the data is missing, incomplete or errors are noted, the ground calls are returned for correction.

The QA personnel assesses the distribution of established ground calls and air calls and provides comments in the QA report on the distribution of the established calibration points versus the proposed distribution of calibration points in the approved Field Calibration Plan.

### **6. Calibration Point Sample Selection**

Unless otherwise stated in the Vegetation Project Implementation Plan (VPIP), a minimum random sample of five ground calls and air call or 5% of all ground calls and air calls established (whichever is greater) by interpreter, must be checked.

### **Ground Call**

Batches of ground calls must be established in proportion to the type of ground calls and number of interpreters in the project. The criteria for defining a batch will be determined at the pre-work conference.

Inspected ground calls must be chosen randomly within each batch. Where safety or access restriction does not allow a ground call to be inspected, another ground call is randomly selected, and the reason for replacement is documented on the tally card.

### **Air Call**

Batches of air calls must be established by flight plan and interpreter involved in the air call data collection. The criteria for defining a batch will be determined at the pre-work conference.

## **7. Field Data Check**

It is recommended that the original field crew accompany the QA person in the early phase of the project. The following is a suggested process to follow during calibration point inspection:

### **Ground Call**

1. Verify that the ground call location is:
  - a. within the representative portion of the polygon;
  - b. accurately marked on the photo or orthoimage; and
  - c. within acceptable limits of the GPS coordinates.
2. Confirm that:
  - a. adequate field markings of the tie point and tie line exist; and
  - b. BAF size or plot radius was correctly selected.
3. Check accuracy of:
  - a. plot tree count;
  - b. tree measurements; and
  - c. sample tree selection and measurements.
4. Provide comments:
  - a. mandatory ocular species composition.

Where a ground call cannot be found in the field, the QA crew collects a GPS coordinate, and proceeds with checking the next available ground call in the area. Ground calls that cannot be located by the QA personnel score zero points on the ground call rating form and are removed from the calibration data.

### **Air Call**

5. Verify that the air call location is:

- a. within the representative portion of the polygon
  - b. accurately marked on the photo or orthoimage
  - c. within acceptable limits of the GPS coordinates.
6. Check accuracy of:
- a. air call estimates

Where an air call cannot be found in the field, the QA crew collects a GPS coordinate, and proceeds with checking the next available air call in the area. Air calls that cannot be located by the QA personnel score zero points on the air call rating form and are removed from the calibration data.

## **8. On-site Reporting of QA Findings**

The preliminary QA results must be presented to the Ministry representative as soon as practical following the field inspection.

In cases where the QA is carried out while the contractor is still at the project site, the contractor must be advised whether the completed work met the standards and is acceptable prior to the QA person's departure from the project site.

Where the QA person identifies substandard work, remedial actions must be provided to the project coordinator prior to the contractor leaving the project site.

## **9. Dispute Resolution Process**

Where a dispute arises between the photo interpreter and the quality assurance personnel, the Ministry representative is responsible for developing a mechanism to resolve the disagreements.

## **10. Quality Assurance Report**

Feedback from the QA person is important for the continual improvement of the calibration process and ground call establishment. The report should document any problems identified during the field review in order for the interpreter to be aware of areas of weakness to consider during the estimation phase and for improving ground data collection in the future.

Each Quality Assurance report must include the following:

1. Completed rating table (Table 1 and/or Table 2) for each batch (interpreter) of ground calls and air calls;
2. Any observations and considerations data users should be aware of regarding the data collected;
3. If required, a description of the recommended remedial action and a report on compliance with that direction; and
4. The QA person's signature and recommendation of acceptance or not acceptance of the work.

As well as providing immediate feedback to the contractors and Ministry, the results of the Quality Assurance process are included as part of the Project Completion Report deliverable.

## 11. Remedial Action Procedures

Where the outcome of the quality assurance identifies a need for re-work, all ground calls in the affected submission must be revisited to correct errors identified. Once the rework has been completed, a second QA on the resubmitted ground calls will be required to ensure the work meets MFR standards.

## 12. Ground Call Ratings

The ground call evaluation process is based on the assumption that all field cards are properly filled out and ground call locations are documented on photos or orthoimages, as outlined in the ground call data collection procedures. If the tally cards are found incomplete and/or ground call locations are not documented to the set standard, the batch submission will be returned to the field crew for completion.

Location representative of polygon	2
Established within $\pm 30$ m of the provided photo or orthoimage marked location	2
Tree count (based on all points within the ground call)	5
Measured dbh (0.5 points deducted for each error to a maximum of 1)	1
Estimated dbh (0.5 points deducted for each error to a maximum of 1)	1
Suitable sample trees selected (1 point assigned for each sample tree)	1-4
(1 point deducted for each unsuitable tree)	
(4 points deducted from the total points obtained for a missed sample tree)	
Species identification (based on all points within the ground call)	5
Age (2 points assigned for each sample tree, 2 points deducted for each error)	2-8
Height (2 points assigned for each sample tree, 2 points deducted for each error)	2-8
Basal Area	1
Density	1
Ocular Species Composition*	3 $\geq 80\%$ correct
	1 $> 70\%$ correct
	0 $< 70\%$ correct

*\*Species Composition Examples:*

<u>Quality Assurance</u>	<u>Contractor</u>	
S <sub>40</sub> Pl <sub>30</sub> Bl <sub>30</sub>	Bl <sub>40</sub> S <sub>30</sub> Pl <sub>30</sub>	Species composition correct=90%;
Fd <sub>50</sub> S <sub>40</sub> Pl <sub>10</sub>	S <sub>50</sub> Fd <sub>40</sub> Pl <sub>10</sub>	Species composition correct=90%;

## Field Calibration Procedures for Photo Interpretation

Pl<sub>60</sub>Fd<sub>30</sub>LW<sub>10</sub>

Fd<sub>55</sub>LW<sub>25</sub>Pl<sub>20</sub>

Species composition correct=60%;

### **Ground Call Accept/Reject Criteria**

The following are the MFR accept/reject standards for each QA batch:

1. The minimum acceptable rating on any individual ground call is 75%. Any ground call not meeting this minimum percentage will be rejected.
2. Each category must have an overall rating of 75%, except for age and height which must be 85% to be considered acceptable.
3. The standard for minimum acceptable average score for all categories for all ground calls audited is 85%.

If criteria 2 and 3 above meet the minimum standard then the work is considered acceptable.

### 13. Air Call Ratings

The air call evaluation process is based on the assumption that all air call data sheets are filled out and air call locations are documented on photos or orthoimages, as outlined in the air call data collection procedures. If the data sheets are found incomplete and/or locations are not documented to the set standard, the batch submission will be returned to the field crew for completion.

Location representative of polygon	2
GPS Location within the correct polygon	2
Species Composition points	7 $\geq$ 80% correct 4 $\geq$ 70% correct 0<70% correct
Correct Leading Species	6
Leading Species Age	2
Leading Species Height	5
Second Species Age	1
Second Species Height	3
Basal Area	1
Density	1
Snags/ha	1

*\*Species Composition Examples:*

<u>Quality Assurance</u>	<u>Contractor</u>	
S <sub>40</sub> Pl <sub>30</sub> Bl <sub>30</sub>	Bl <sub>40</sub> S <sub>30</sub> Pl <sub>30</sub>	Species composition correct=90%;
Fd <sub>50</sub> S <sub>40</sub> Pl <sub>10</sub>	S <sub>50</sub> Fd <sub>40</sub> Pl <sub>10</sub>	Species composition correct=90%;
Pl <sub>60</sub> Fd <sub>30</sub> LW <sub>10</sub>	Fd <sub>55</sub> LW <sub>25</sub> Pl <sub>20</sub>	Species composition correct=60%;

#### **Air Call Accept/Reject Criteria**

The following are the Ministry accept/reject standards for QA batch:

1. The minimum acceptable rating on any individual air call is 75%. Any individual air call not meeting this minimum percentage will be rejected.
2. Each category must achieve an overall rating of 80% to be considered acceptable. Any category that does not achieve this minimum standard will be rejected for that category.
3. The minimal acceptable standard for all air calls in the batch is 80%.

If criteria 2 and 3 above meet the minimum standard then the work is considered acceptable.

# Appendix D: Field Calibration Plan Guidelines

## Objectives

Field Calibration Plans (FCP) are required to ensure consistency between the proposed field calibration points and the requirements for additional information in the project area.

- a) Data source analysis from previous inventories. This is carried out to indicate where data sources may be considered less reliable or non-existent.
- b) Consultation with proponents regarding management concerns.

The FCP will include calibration points that will assist the photo interpreter to correlate the vegetation attributes on the ground with those on the air photos (e.g., complex multi-layered stands).

## Approval process and plan content

Prior to the commencement of any field data collection, the recipient must submit to their respective Ministry project representative the FCP for approval. After successful review, written approval will be provided to the recipient. The plan should include:

- a) An Excel spreadsheet showing the distribution of calls by age class, leading species and any calibration points pertaining to items identified in the VSIP. An example of field calibration table summary is shown in attached Table 3.
- b) The number and type (1 point and/or 3 point clusters) of calibration points proposed. Often more points than required to meet the target may be pre-selected to allow for operational issues such as limited access.
- c) Designated staff who will be carrying out the field work including both air and ground calls.

## Mapping Requirements

- a) A submission format of a single shape file (.shp) for each call type.
- b) All map sheet boundaries and map sheet ID.
- c) Include the following map features:
  - Proposed Air Calls with call #
  - Proposed Ground Calls





**Table 3 – Field Calibration Table Summary**

<b>Ground Calls</b>				<b>Age Class 1 1-20</b>				<b>Age Class 2 21-40</b>				<b>Age Class 3 41-60</b>				<b>Continue Age Classes</b>		<b>Non Forest</b>	
Existing Species	Total XG	%	Area	%	Total XG	%	Area	%	Total XG	%	Area	%		Total XG	%	Area			
SUM																			
<b>Air Calls</b>				<b>Age Class 1 1-20</b>				<b>Age Class 2 21-40</b>				<b>Age Class 3 41-60</b>				<b>Non Forest</b>			
Existing Species	Total XV	%	Area	%	Total XV	%	Area	%	Total XV	%	Area	%		Total XV	%	Area			
SUM																			
<b>Existing Profile By Area</b>				<b>Ground</b>				<b>Air</b>				<b>Total Calls</b>							
Species	Hectares	%	% no NF	# of Calls	# of Calls	# of Calls	%	# of Calls	# of Calls	# of Calls	%	# of Calls	%						
Estimated Site Index > 0 but no Species 1																			
Non Forest																			
SUM																			
Sum Excluding Non Forest																			

## Field Calibration Procedures for Photo Interpretation

	List all leading species in the project as per the existing inventory. Species that are a very small portion of the profile may be grouped.
	Show the number of calls to be established by each species in each age class.sp
	Calls in each species as a percent of the total in THIS Age Class (not of the entire project)
	Area in hectares in each species by age class
	Area in each species as a percent of the total in THIS age Class (not of the entire project)
	This summary is based on the existing forest cover so calls may be desired in areas where new delineation would determine treed label
	Expressed as a percent of the TOTAL calls or area for the entire project
	Normally we would not establish calls in non forest, so this column excludes the non forest hectares. This may make a better comparison between the overall air and ground call totals by species.