Vegetation Resources Inventory

Ground Call Quality Assurance Procedures and Standards

Prepared by
Ministry of Forests and Range
Forest Analysis and Inventory Branch
for the Terrestrial Ecosystems Vegetation Task Force
Resources Information Standards Committee

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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:
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1.0 Introduction

1.1 Background

This document contains the Quality Assurance Procedures and Standards for ground call establishment based on the British Columbia Vegetation Resources Inventory (VRI) Ground Call Data Collection Procedures. This document is intended to be used by individuals responsible for the quality assurance of the field calibration stage of a VRI photo interpretation project.

Quality Assurance (QA) is an external process, whereby the work is evaluated by independent third-party quality assurance personnel using approved standards established for ground call location and measurements. A rating system with pass/fail criteria has been developed to evaluate the audited ground calls and to determine if the ground calls 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 standards and ratings outlined in Section 4 of this document are used for evaluation of the three ground call types as described in the (VRI) Ground Call Data Collection Procedures.

1.2 Objectives of Ground Call Quality Assurance

The objectives of conducting quality assurance of ground calls encompass the determination of both the effectiveness of the calibration plots 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 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.
2.0 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. In order for the MFR to verify that the data meets current standards, copies of all third-party quality assurance reports must be sent by the QA person to both the MFR region and the recipient at the same time upon completion.
6. Every ground 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.
Ground Call Quality Assurance Procedures and Standards
3.0 Procedures

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

1. Project coordinator hires 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 ground calls to the QA personnel.
4. QA personnel reviews ground call data and supporting materials in office and selects ground calls for auditing.
5. QA personnel prepare QA report and submit it to the project coordinator and MFR region with follow up communication for acceptance of the report by both parties.
6. Project coordinator provides report to contractor.
7. If required, project coordinator schedules meeting with contractor, MFR region and QA personnel to review report.

3.1 Data and Material Required

The contractor must provide the QA person with ground call data, air photos or orthoimages and any other supporting material that was used to locate the ground calls 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 ground call must be provided. In addition, it is mandatory that all ground call locations are marked on the photos or orthoimages to enable ground calls to be located without the assistance of GPS coordinates.

3.2 Ground Call Sample Selection

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

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.

3.3 Office Check

An office evaluation of ground 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 provides comments in the QA report on the distribution of the established ground calls versus the proposed distribution of ground calls in the approved Field Calibration Plan.
3.4 Field Measurement 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 ground call inspection:

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.

3.5 On-site Reporting of QA Findings

The preliminary QA results must be presented to the contractor, MFR region and project coordinator 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.

3.6 Dispute Resolution Process

Where a dispute arises between the photo interpreter and the quality assurance personnel, the recipient is responsible for developing a mechanism to resolve the disagreements. This process must be agreed to in writing and submitted to the MFR for approval.

3.7 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 form (Appendix C) for each batch (interpreter) of ground 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, MFR and project coordinator, the results of the Quality Assurance process are included as part of the Project Completion Report deliverable.

### 3.8 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.
4.0 Standards and Ratings

The standards are based on the assumption that all field cards are properly filled out and ground call locations are documented on photos or orthophotos, 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.

**Standards:**

**Location:**
Ground calls must be located within a representative portion of the polygon and the location of each ground call must be within ±30m of the provided GPS coordinate.

**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 ±10% or 5 years, whichever is greater and for trees equal or greater than 300 years within ±15% or 20 years, whichever is greater. Ages estimated from rotten cores are not subject to QA standards.

**Height:**
The measured heights must be within ±5% or 0.5 m, whichever is greater.

**Diameter Breast Height:**
Measured dbh for sample trees must be within ±3%.
Estimated dbh for non-sample trees must be within ±15% or 5 cm, whichever is greater.

**Tree Count:**
One point ground call must be within ±1 tree;
Three point ground call must be within ±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.
**Rating:**

Location representative of polygon 2*
Location established within \( \pm 30\)m of the provided GPS coordinate 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:*

<table>
<thead>
<tr>
<th>Quality Assurance</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>S_{40}P_{30}B_{30}</td>
<td>B_{40}S_{30}P_{30}</td>
</tr>
<tr>
<td>Fd_{50}S_{40}P_{10}</td>
<td>S_{50}Fd_{40}P_{10}</td>
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<tr>
<td>P_{60}Fd_{30}Lw_{10}</td>
<td>Fd_{55}Lw_{25}P_{20}</td>
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</tbody>
</table>
Accept/Reject Criteria

The following are the MFR accept/reject standards:

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 standard 2 (overall rating for each category) and 3 (the average score of all the audited ground calls), as determined from the summary form, meet the acceptable standard, then the work is considered acceptable.
## Vegetation Resources Inventory

### Ground Call Rating Form

<table>
<thead>
<tr>
<th>Ground Call Number</th>
<th>Photo Number</th>
<th>Rep. Location (2*)</th>
<th>Location (2*)</th>
<th>Tree Count (5)</th>
<th>Meas. Dbh (1)</th>
<th>Est. Dbh (1)</th>
<th>Suitable Sample Tree (1-4*)</th>
<th>Sp. ID (5)</th>
<th>Age (2 to 8*)</th>
<th>Height (2 to 8*)</th>
<th>Basal Area (1)</th>
<th>Density (1)</th>
<th>Ocular Species Comp. (3*)</th>
<th>Points Possible</th>
<th>Points Obtained</th>
<th>Percent</th>
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<tbody>
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*Only categories scored for ground observation with measurements (XGO)*

\[
\frac{\text{(Total Points Obtained)}}{\text{(Total Points Possible)}} \times 100 = \text{Overall Rating} \quad \%
\]

**Comments:**

Interpreter:______________                   QA personnel:______________

Date:______________                   Accept: _____________

(Yes/No)