

# 2005/06 Forest and Range Evaluation Program Quality Assurance and Quality Control Annual Report

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## INTRODUCTION

This annual report summarizes all quality-related resources and activities for the Forest and Range Evaluation Program (FREP) for the fiscal year 2005 ending March 31, 2006. The report also outlines the future direction of the FREP Quality Assurance Framework, which is progressive in nature and based on the principle of continuous improvement.

## QUALITY ASSURANCE AND QUALITY CONTROL RESOURCES

The resources allocated to FREP quality assurance (QA) and quality control (QC) for 2005/06 are presented in the following tables. Projected resources for 2006/07 are estimated based on the current QA/QC work plan.

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BRITISH  
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Ministry of Forests and Range  
Ministry of Environment  
Ministry of Agriculture and Lands

### **Quality Assurance...**

*...is the consciousness and the discipline to meet the highest standard through systematic processes and continuous improvement.*

### **The FREP Mission:**

*To ensure British Columbia is a world leader in sustainable forest management by providing the high quality, science-based information we need for decision-making and continuous improvement of our forest practices, policies and legislation.*

<http://www.for.gov.bc.ca/hfp/frep/index.htm>

| <b>Personnel</b>   | <b>Person years</b>   |                          |
|--|-----------------------|--------------------------|
|  | <b>Actual 2005/06</b> | <b>Projected 2006/07</b> |
| QA and QC coordinator  | 1                     | 1                        |
| QA Working Group (QA/QC work plan and QC protocols) – advisory body <sup>1</sup> | 0.1                   | 0.3                      |
| QA site visit  | 0.1                   | 0.3                      |
| Stand-level biodiversity data cleaning – checklist level                         | 0.2                   | 0.3                      |
| Riparian/fish data cleaning – checklist level                                    | 0.1                   | 0.3                      |
| Data cleaning – analysis level   | 0.1                   | 0.2                      |
| Question and Answer summary  | 0.1                   | 0.1                      |
| <b>Total</b>   | <b>1.7</b>            | <b>2.5</b>               |

| <b>Financial</b>  | <b>\$</b>             |                          |
|---|-----------------------|--------------------------|
|   | <b>Actual 2005/06</b> | <b>Projected 2006/07</b> |
| Training and Quality Management courses                         | \$3000                | \$3000                   |
| Travel for training   | \$2000                | \$2000                   |
| Books, manuals, and standards                                   | \$1000                | \$1000                   |
| QA site visits  | \$10,000              | \$20,000                 |
| Data entry  | \$5,000               | \$10,000                 |
| Data cleaning   | \$14,000              | \$25,000                 |
| Data analysis   | \$15,000              | \$20,000                 |
| Question and Answer summary                                     | \$1500                | \$1500                   |
| Software – MS Visio, Access 2002                                | \$0                   | \$0                      |
| Hardware – scanner  | \$500                 | \$0                      |
| Data quality solution for FREP IMS (methodology and technology) |                       | \$50,000                 |
| <b>Total</b>  | <b>\$52,000</b>       | <b>\$132,500</b>         |

| <b>QA and QC Courses and Training</b>                         | <b>Number of participants</b> |                          |
|---|-------------------------------|--------------------------|
|   | <b>Actual 2005/06</b>         | <b>Projected 2006/07</b> |
| Quest for Quality (module 1) – National Quality Institute*    | 1                             |                          |
| Quest for Quality (module 2 & 3) – National Quality Institute | 1                             |                          |
| Framework for Excellence (online plus two-day workshop)       |                               | 12                       |
| Process Mapping   |                               | 5                        |
| Quality Function Deployment – American Society for Quality    | 1                             |                          |
| MS Access level 2   | 1                             |                          |
| MS Access level 3   | 1                             |                          |
| Project Management  | 4                             | 4                        |
| MS Excel level 3  | 1                             | 1                        |
| Dreamweaver MX and 8 (web development)                        | 2                             |                          |
| Introduction to Information Management                        | 3                             |                          |
| <b>Total number of participants</b>                           | <b>15</b>                     | <b>22</b>                |

\* Modules 1, 2, and 3 of Quest for Quality certify a Level 1 Excellence Professional from the National Quality Institute (<http://www.nqi.com>).

1 The QA Working Group was formed as an advisory and decision-making body; therefore, the group was only involved in the review of publications and feedback on QA and QC activities. QA site visits, data cleaning, and question and answer summaries were completed by contractors in 2005.

# QUALITY ASSURANCE AT THE PROGRAM LEVEL

In the *Background Paper for the FREP Quality Assurance Framework*, several prominent quality management systems were researched and evaluated for their potential application to FREP. Based on that analysis, we recognized the need to pursue certification under a quality management certifying body. Many of the systems investigated stressed the importance of quality control, but lacked a strategic focus. Some of the case studies reviewed by the background paper revealed versions of modified or adapted quality management systems that have been used in natural resource management or environmental monitoring. These modified systems suggest that quality control and assurance techniques can be applied within the FREP context.

Quality assurance, quality control, or quality management in an environmental monitoring and evaluation context is a challenging undertaking and, as a result, has often been overlooked. FREP initiated a Quality Assurance Framework in 2004 based on the US Environmental Protection Agency (EPA) guidelines for quality assurance. The experience gained from the 2004 and 2005 stand-level biodiversity and riparian/fish monitoring further validated the need for a comprehensive FREP quality management strategy in order to anticipate, prevent and solve quality issues in resource value checklist design, training, data collection, analysis, reporting, and overall program management.

The QA Working Group has identified six key areas for quality assurance on the program level of FREP. These areas include the general FREP framework and structure, FREP teams and working groups, communications and publications, budgets, stakeholder involvement, and the FREP Information Management System.

There are several reasons/justifications for seeking quality management certification. Organizations are continually looking for public recognition and external validation, ways to increase competitiveness, evidence of information credibility, ways to recognize staff, and mechanisms for building their image. For FREP's results and recommendations to be taken seriously by peers and stakeholders (provincial, national and international), we need recognition of our commitment to consistent and excellent quality data and information.

There are several options for quality management certification. Different implementation strategies and types of certification have varying associated costs and benefits. There are certifying bodies that focus on the process and others that evaluate end results as indicative of correctly implemented quality management tools and techniques.

Certification and quality systems, such as Six Sigma, Kaizen, and Quality Function Deployment, provide useful tools and techniques; however, limited implementation, high costs, and low adaptability to public sector organizations make them undesirable for use in FREP.

The National Quality Institute (NQI) is the Canadian leader in quality management certification. NQI developed the public sector criteria for the Management Accountability Framework with the Treasury Board Secretariat of Canada. NQI has been recommended by the Service Excellence Branch in CITS (formerly Management Services) as a suitable quality management system and certification for FREP. NQI has a Progressive Excellence Program (PEP), and the public sector criteria have been adopted by the federal government, the provincial governments of Alberta and Ontario, and numerous municipal governments.

## Interim quality assurance strategy

Many key FREP components are still in development. The FREP Information Management System, for example, has just completed the user requirements gathering phase. In addition, some resource value checklists are not operational at this stage. Therefore, quality management for FREP is not fully implemented at this time, nor does it follow a particular management system. FREP quality assurance will adapt and grow with the program.

The FREP quality assurance framework currently focuses more on quality training, quality control of data and analysis, and continuous improvement. In quality training, program personnel will be exposed to various degrees of quality-related training and concepts. This is the beginning of a management-led quality policy and an organization-wide quality culture. Quality control and improvement is all about standardization of efforts to increase quality to meet program objectives.

The foundation for quality assurance can be created using a set of metrics. In FREP, the set of metrics is called "quality indicators." The quality indicators are designed to be user-friendly scores and benchmarks that illustrate the level of quality of the six major program areas identified earlier. Quality indicators for the program are created based on the FREP quality criteria of: timeliness, accessibility, interpretability, value for money, fairness and equity. Quality control protocol 5<sup>2</sup> explains the development of quality indicators, and also identifies the sources where data are collected for quality indicators.

FREP and its quality assurance framework are based on the principles of continuous improvement. The effort for improvement is never-ending, and lessons are always learned and incorporated by program staff.

<sup>2</sup> <http://www.for.gov.bc.ca/hfp/frep/qmgmt/control.htm>

## QUALITY CONTROL AT THE PROJECT LEVEL

Quality assurance relates to the FREP program as a whole. Quality control relates to individual FREP projects. Quality control focuses on the entire process of resource value checklists and data collection, beginning with checklist design and ending with reporting of results.<sup>3</sup> For the 2005/06 field season, four quality control protocols<sup>4</sup> were developed to guide the following:

1. Quality assurance site visits
2. Data validation and cleaning
3. Data summary and analysis
4. Data reporting and publication.

These quality control protocols are similar to standard operating procedures, and will be updated as appropriate in a continuous improvement process.

### Interim quality control strategy

Quality control techniques are deployed to ensure data quality and integrity by providing guidelines for systematic processes and process mapping. The process of quality improvement seeks to uncover systematic or critical errors. When activities or processes exhibit a pattern of defects, it is not difficult to analyze them and find the root cause. Correcting the root cause of the problem and preventing future occurrence is the essence of quality improvement.

Similar to quality assurance at the program level, quality control (QC) at the project level also employs a set of quality indicators to assist with quality improvement. The primary quality criteria for QC are Accuracy and Consistency; however, since QC at the project level manages checklists and data collection, a set of more refined criteria is required for ensuring data quality. The interim FREP data quality criteria are accuracy, precision, completeness, representativeness, and comparability, as adapted from the criteria used by the U.S. Environmental Protection Agency (EPA). These are core criteria for data quality, as the numbers of criteria can range from five to 25 depending on the level of sophistication required for data quality.

The FREP Quality Control Protocol 5 describes the quality indicators at the project level for data quality. The FREP Information Management System (FREP IMS) Working

3 See "FREP Quality Assurance and Quality Control Integrated Implementation Strategy and Work Plan for 2005/06" ([http://www.for.gov.bc.ca/hfp/frep/site\\_files/qmgmt/QM\\_QA\\_Implementation\\_Strategy\\_2005-06.pdf](http://www.for.gov.bc.ca/hfp/frep/site_files/qmgmt/QM_QA_Implementation_Strategy_2005-06.pdf)).  
4 <http://www.for.gov.bc.ca/hfp/frep/qmgmt/control.htm>

Group<sup>5</sup> currently manages the data collected, and the quality indicators will be in place until FREP develops its Data Quality Framework (see section on Data Quality).

## QUALITY CONTROL ACCOMPLISHMENTS

During the 2005/06 field season, two resource value checklists were implemented: a total of 189 stand-level biodiversity checklists and 259 riparian/fish checklists were completed.

The following were the quality control accomplishments for 2005/06.

### Checklists

The stand-level biodiversity and riparian/fish checklists went through the stages of design, test, redesign, and validation. For the stand-level biodiversity checklist, the Resource Value Team Leader (RVTL) designed a built-in self assessment to remind field staff to completely fill-in the checklist before leaving the site.

In a small pilot, the stand-level biodiversity and riparian/fish checklists were programmed on handheld devices (HP IPAQ 2750) for data collection. Handheld devices provide the ability to capture GPS coordinates and transfer collected data to a central database. However, after several rounds of testing and evaluation, the handheld devices used in the pilot proved to be insufficient in processing power and not reliable in the field. The preliminary conclusion from the pilot suggested that a more powerful mobile computing device may be required.

### 5 Members of FREP IMS Working Group

| Name               | Email                       | Role                            |
|--------------------|-----------------------------|---------------------------------|
| Barber, Frank      | Frank.Barber@gov.bc.ca      | Project Manager                 |
| Gallimore, John    | John.Gallimore@gov.bc.ca    | Information Management Group    |
| Yee, Ricky         | Ricky.Yee@gov.bc.ca         | Information Management Group    |
| Chen, Thomas       | Thomas.Chen@gov.bc.ca       | Quality Assurance               |
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| Elo, Susan         | Susan.Elo@gov.bc.ca         | Consultant                      |
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| Pelchat, Mike      | Michael.Pelchat@gov.bc.ca   | Quesnel Forest District         |
| Mardell, Christina | Christina.Mardell@gov.bc.ca | Northern Interior Forest Region |
| Bernard, Agathe    | Agathe.Bernard@gov.bc.ca    | Nadina Forest District          |
| Smith, Alanya      | Alanya.C.Smith@gov.bc.ca    | Communications – Victoria       |

## Training

Field manuals and data collection protocols were produced for the stand-level biodiversity and riparian/fish checklists. The field protocols are used as a checklist manual for training and as a reference during data collection. At the end of the training sessions, participants completed a feedback survey that looked at the quality of teaching, course materials, planning and scheduling, and asked for suggestions for continuous improvement. The key findings<sup>6</sup> from the feedback were:

1. The trainers were excellent.
2. More in-classroom time is needed to review the checklists and protocols.
3. The riparian/fish checklist requires more training days.
4. Staff would like to see the results of implementing the checklists and how the results may change practices, policies or legislation.

The key findings from 2005/06 will be incorporated into next year's training as part of the FREP continuous improvement effort.

## Data collection

The QA Site Visit (Quality Control Protocol 1, <http://www.for.gov.bc.ca/hfp/frep/qmgmt/control.htm>) guides an experienced course instructor in re-visiting cutblocks that have been assessed by field staff. The purpose of a QA Site Visit is to verify the quality of the data collected and

develop ways of improving data quality. Data collected during a QA Site Visit is stored in a separate database.

Combined with the QA Site Visit is mentoring and refresher training. Mentoring/refresher training helps district field staff establish a leadership role in resource stewardship monitoring and effectiveness evaluations. The Stewardship Officer is usually the primary beneficiary of the mentoring/refresher training, and can reinforce the data collection procedures and answer questions that field staff may raise. Field staff also benefit from the refresher training, which is designed to fill the time gap between training delivery and data collection activities. Mentoring/refresher training is generally one to three days and is offered by request, or where a need has been identified.

## Data entry

Data entry commences when the first set of checklists are received from the field. In 2005, the majority of data entry was completed in November and December. Prior to data entry, every checklist is screened by the RVTL and/or one of the training instructors. For 2005/06, Nancy Densmore and Dean McGeough screened all the stand-level biodiversity and riparian/fish checklists prior to data entry, often communicating with field staff for clarification. The Data Clerk also performed simple error detection during data entry. The average time to enter a completed stand-level biodiversity checklist was 35 minutes, and the average time to enter a completed riparian/fish checklist was 20 minutes. The breakdown of the total time and expenditures for data entry is provided in the table below.

### *Breakdown of time and expenditures for data entry*

|                            | Stand-level Biodiversity checklists | Riparian/Fish checklists | Row total           |
|----------------------------|-------------------------------------|--------------------------|---------------------|
| Total number of checklists | 189                                 | 259                      | 448                 |
| Average time per checklist | 35 min                              | 20 min                   | 55 min              |
| Total data entry time      | 6615 min (110 hrs)                  | 5180 min (86 hrs)        | 11795 min (196 hrs) |
| \$ per hour for data entry | \$15                                | \$15                     | \$15                |
| Data entry \$              | \$1700                              | \$1300                   | \$3000              |
| Communication time         | 40 hrs                              | 25 hrs                   | 65 hrs              |
| Communication \$           | \$600                               | \$400                    | \$1000              |
| Data cleaning time         | 60 hrs                              | 30 hrs                   | 90 hrs              |
| Data cleaning \$           | \$900                               | \$450                    | \$1350              |
| Checklist filing time      | 4 hrs                               | 4 hrs                    | 8 hrs               |
| Checklist filing \$        | \$100                               | \$100                    | \$200               |
| <b>Total time</b>          | <b>214 hrs</b>                      | <b>145 hrs</b>           | <b>359 hrs</b>      |
| <b>Total \$</b>            | <b>\$3300</b>                       | <b>\$2300</b>            | <b>\$5600</b>       |

6 To view the 2006 training evaluation and summary report, see <http://www.for.gov.bc.ca/hfp/frep/rsm/training.htm>

## Data cleaning

The activity of data cleaning is guided by Quality Control Protocol 2.<sup>7</sup> The protocol guides data cleaning by checklist field format (the specific format the data are to be recorded in), logical relationships (the relationship between one data field to another), and general business rules. All data are validated and corrected based on evidence (e.g., maps, photos, etc.), communication with district staff, and consultation with the RVTLs. If the data are corrected, it is often enhanced, matched, and/or expanded:

- Enhanced – using expert knowledge and communication with field staff.
- Matched – using the master cutblock list, RESULTS data, maps, and SP information.
- Expanded – based on qualitative comments and field data on the checklist.

### Data cleaning breakdown

|                               | Stand-level Biodiversity checklists | Riparian/Fish checklists | Row total                   |
|-------------------------------|-------------------------------------|--------------------------|-----------------------------|
| Total number of checklists    | 189 (50 <sup>8</sup> )              | 259                      | 448                         |
| Average time per checklist    | 45 min                              | 30 min                   | 75 min (1.25 hr)            |
| Total data cleaning time      | 189: 8505 min<br>(142 hrs)          | 7770 min<br>(130 hrs)    | <b>Total:</b><br>272 hrs    |
|                               | 50: 2250 min<br>(38 hrs)            |                          | <b>Contract:</b><br>168 hrs |
| \$ per hour for data cleaning | \$64.28                             | \$64.28                  | N/A                         |
| Data cleaning \$              | 189: \$9,200                        | \$8400                   | <b>Total: \$17,600</b>      |
|                               | 50: \$2500                          |                          | <b>Contract: \$10,900</b>   |
| Communication time            | 189: 3780 min<br>(63 hrs)           | 1295 min<br>(20 hrs)     | <b>Total:</b><br>83 hrs     |
|                               | 50: 1000 min<br>(17 hrs)            |                          | <b>Contract:</b><br>37 hrs  |
| Communication \$              | 189: \$4100                         | \$1400                   | <b>Total: \$5500</b>        |
|                               | 50: \$1100                          |                          | <b>Contract: \$2500</b>     |
| <b>Total time</b>             | <b>189: 205 hrs</b>                 | <b>152 hrs</b>           | <b>Total: 357 hrs</b>       |
|                               | <b>50: 55 hrs</b>                   |                          | <b>Contract: 207 hrs</b>    |
| <b>Total \$</b>               | <b>189: \$14,000</b>                | <b>\$9800</b>            | <b>Total: \$23,800</b>      |
|                               | <b>50: \$3500</b>                   |                          | <b>Contract: \$13,300</b>   |

Data cleaning resources for the 2005/06 field season are broken down in the table below.

## Data analysis

Data analysis is guided by Quality Control Protocol 3.<sup>9</sup> The analysis, summary process, and display of results are standardized. The analysis and summary results are organized in ways that answer the indicator and evaluation questions for each resource value.

## Reporting

After data are analyzed and summarized, the RVTLs interpret the results and report them in presentations and FREP reports. In some cases, the RVTL will perform more or in-depth analysis to satisfy specific research needs. All reports and publications follow Quality Control Protocol 4,<sup>10</sup> which includes standards for peer reviews and management approval.

7 <http://www.for.gov.bc.ca/hfp/frep/qmgmt/control.htm>

8 A contactor performed data cleaning on 50 stand-level biodiversity checklists and 259 riparian/fish checklists. The stand-level biodiversity RVTL, Nancy Densmore, performed data cleaning on 139 stand-level biodiversity checklists.

9 <http://www.for.gov.bc.ca/hfp/frep/qmgmt/control.htm>

10 <http://www.for.gov.bc.ca/hfp/frep/qmgmt/control.htm>

# DATA QUALITY

Excellence in data quality is very important for answering priority evaluation questions. From the 2005/06 QA and QC work plan, the following data quality criteria and objectives were identified.

## Data quality criteria and objectives

| Data Quality       | Stand-level Biodiversity |                                     |                          |  |                           | Riparian/Fish                               |                     |                               |
|--------------------|--------------------------|-------------------------------------|--------------------------|--|---------------------------|---|---------------------|-------------------------------|
| Objectives         | No missing pages         | Less than 1% blank or missing value | Score on self-assessment | Consistency among three cards – block, reserve, and plot | Qualitative data recorded | Zero errors on number of Yes and No answers | Recorded field data | Qualitative comments recorded |
| Criteria           |                          |                                     |                          |  |                           |   |                     |                               |
| Precision          |                          |                                     | 100%                     |  |                           |   |                     |                               |
| Accuracy           |                          |                                     | 100%                     |  |                           | 100%  |                     |                               |
| Completeness       | 100%                     | 99%                                 | 100%                     |  | ✓                         | 100%  | ✓                   | ✓                             |
| Representativeness |                          |                                     |                          | 100%   |                           |   | ✓                   |                               |
| Comparability      |                          |                                     |                          | 100%   |                           | 100%  |                     |                               |

### Stand-level biodiversity – Data Quality Objectives (DQOs)

1. Number of missing page(s) on all three levels of the checklist - block, reserve and plot.
2. Achieve 99% blank-free rate in all fields.
3. Built-in self-assessment questions on the checklist and the mail-in check sheet should be completed and achieve 100% answer rate.
4. Block identifying information is consistent among the block, reserve, and plots cards, specifically the fields of Opening number, Opening ID, Licence number, CP number, Block, Reserve ID, and Reserve type.
5. Qualitative fields are answered and captured in the database.

### Riparian/Fish – DQOs

1. The total number of “Yes,” “No,” and “N/A” from the sub-questions add up correctly to the conclusion of “Yes,” “No,” or “N/A” for questions 1 to 15. Based on the number of “Nos,” the correct final conclusion is arrived at.
2. Field data are recorded on pages 12 to 14 of the checklist, and they support questions 1 to 15.
3. Qualitative fields are answered and captured in the database.

In 2006/07, data quality will use the same criteria with much more stringent objectives. Furthermore, FREP IMS is hoping to adopt the ministry data quality framework developed by the Information Management Group (IMG), which provides both technological solutions and a solid methodology for data quality.

## QUESTIONS AND ANSWERS

As part of the continuous improvement effort, we have summarized all the communication, feedback, suggestions, questions and answers, and QA Site Visit reports into a Q&A forum on the FREP website. The Q&A forum provides a user-friendly environment for program staff to find answers to their questions, and post new questions. The forum is managed and monitored for accuracy, consistency and easy access.

## CONTINUOUS IMPROVEMENT AND RECOMMENDATIONS FOR 2006

1. The FREP QA Working Group should be renamed the FREP Quality Management Team (QMT) in order to reflect activities of quality assurance, quality control, and data quality under the comprehensive term “quality management.”
2. The FREP QMT should review and select a quality management/quality assurance/quality control certification system for FREP to gain public recognition and support from program staff. Most important of all, we want to ensure that we provide credible and scientific information for decision-making.
3. All members of the FREP QMT should receive training in quality management in order to implement and sustain positive change.
4. The FREP QMT should assess the feasibility of adopting the ministry’s data quality framework in the FREP Information Management System so that data is of excellent quality for use internally and externally.

5. The FREP QMT should develop a quality control protocol for data entry and reconciliation so that the process is standardized and clearly communicated.
6. FREP should implement the suggestions and comments received from training evaluations.
7. FREP should investigate data collection using handheld devices. This will help to solve some of the data quality issues and eliminate the need for data entry.
8. FREP should continue with the Continuous Improvement workshop sessions. The year end workshops and debriefing proves to be very beneficial and effective.
9. FREP should hold regular or monthly conference calls during the training and field season, so that questions can be answered and issues can be dealt with and resolved as they arise. The discussions should be documented and posted on FREP website.
10. FREP should redesign or enhance the website to ensure effective communication. Some other channel of communication should also be utilized. (i.e. newsletters, online feedback).

## MORE INFORMATION

For additional information on RSM or FREP in general, please refer to our website at:  
<http://www.for.gov.bc.ca/hfp/frep>.

Thank you to all the staff who work so hard and continue to contribute so much to FREP. You are the reason for the success of the program!

*The FREP Newsletter is a regular publication of the Forest and Range Evaluation Program designed to inform stakeholders on program development and implementation, and report on the results of evaluation projects.*