



FOREST PRACTICES BRANCH

RESULTS QUALITY ASSURANCE FRAMEWORK



BRITISH
COLUMBIA

The Best Place on Earth

Ministry of Forests and Range



July 2007

Executive Summary

The Ministry relies on RESULTS data to monitor legal reforestation obligations and to perform other actions (e.g., determine annual allowable cut control, reporting to the public) with respect to its stewardship role under the *Ministry of Forests and Range Act*. The range of users is increasing through the ministry's streamlining initiatives and electronic transfer processes. Internal ministry uses include compliance and enforcement monitoring, effectiveness evaluations, performance measures reports, *State of the Forests* reports, court proceedings, among others. External uses include Vegetation Resource Information Management System, Integrated Land and Resource Registry, National Forestry Database Program, and Forest Practices Board.

A RESULTS Quality Assurance Framework includes several data quality dimensions, including (among others): accuracy, precision, completeness, accessibility, interpretability, definition conformance, relevancy, consistency, and reliability.

Some data quality issues include:

- While data capture and formatting standards exist for RESULTS, minimal data accuracy standards and measurement mechanisms are in place.
- Legislation governing accuracy standards for RESULTS submissions is non-existent, and the legislation pertaining to form and manner of submissions is ambiguous as to whether or not standards are part of this. While data formatting standards may be directed by form and manner of submissions, it is not clear whether data accuracy standards may fall under this direction.
- Legislation, business and technical documentation, and online data validation checks should be reviewed to confirm that critical business rules are reflected in the system in a manner consistent with business expectations, and are compatible with ministry business applications that share RESULTS data.

An action plan has been developed to address data quality issues, components of which include: correct critical historical data discrepancies; revise validation rules and procedures guides; confirm that RESULTS serves current business requirements; develop a program to confirm data accuracy; increase access security; amend FRPA s.169 to add a Chief Forester standard for data required to be reported to the ministry; develop RESULTS performance indicators for the Ministry Service Plan; provide increased user help desk and support services, revise user training modules; and, audit user activity.

The current staffing and financial resources levels allocated to RESULTS is insufficient to minimize the ministry's current risks. Until a fully resourced quality assurance mechanism is in place for RESULTS, the ministry assumes the following risks associated with unreliable data:

1. Decisions and functions of the ministry associated with responsibilities under the *Ministry of Forests and Range Act* (e.g., timber supply analysis and cut control) are based on unreliable data.
2. Data used to support reporting and commitments under the Ministry Service Plan are not reliable.
3. Licensee, BCTS and government reforestation obligations under the *Forest Practices Code of BC act* and *Forest and Range Practices Act* cannot be adequately monitored.
4. Linkages with other agency databases become contaminated with erroneous data.
5. The ministry is not able to adequately track silviculture liability.
6. Unreliable data can compromise the ministry's defense mechanisms in court proceedings.
7. The ministry is subject to scrutiny by external agencies (e.g., Forest Practices Board) that use the ministry's RESULTS data for public audits and public inquiries.

Acknowledgements

This document is based on:

1. The *Ministry of Forests and Range Data Quality Framework: A Guide for Business Data Quality, March 2006*, prepared by Tom Fulton, Jeremy Janzen, Richard Paar, and Marla Weston.¹
2. A preliminary report to the Forest Practices Branch prepared by Mei-Ching Tsoi, entitled: *RESULTS Quality Assurance Framework, Draft 3, October 2006*.

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¹ Available at: http://www.for.gov.bc.ca/his/datadmin/MoFR_DQFramework_Final.pdf

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1. Background

1.1. Role

The BC Ministry of Forests and Range (hereafter referred to as "ministry") oversees the stewardship of 47 million hectares of provincial forest land and fire protection services for 84 million hectares. This role is supported by the ministry's web-based electronic information management tool, RESULTS (Reporting Silviculture Updates and Land status Tracking System), which tracks provincial reforestation information submitted by forest tenure holders as required by the *Forest and Range Practices Act* (FRPA) and associated legislation.

1.2. Scope

RESULTS serves as the provincial government tracking system of current and past license holder obligations. Reforestation activities are classified into four main groups:

- post-1987 harvested areas with reforestation obligations;
- post-1987 harvested areas that have been relieved of reforestation obligations or declared free growing;
- areas denuded by fire and pest; and,
- pre-1987 harvested areas that had historical silviculture treatments.

Licensees and BC Timber Sales (BCTS) Managers are legally required to meet reforestation obligations for post-1987 harvested areas and must annually report to the ministry on silviculture accomplishments and planting activities. Licensees submit information, in accordance with the *Forest Planning and Practices Regulation* (FPPR) s.86 for FRPA obligations or the *Timber Harvesting and Silviculture Practices Regulation* (THSPR) s.46 for *Forest Practices Code of British Columbia Act* (FPCBCA) obligations, at harvest completion, at regeneration achieved, and at free growing achieved, along with forest cover information and maps. The form and manner of information submission is described in the *Silviculture Information Submission Guide*² (SISG) and other procedural documents published on the RESULTS web site³.

RESULTS also tracks areas subject to government funded silviculture treatments, including areas denuded by fire and pest, backlog areas or areas declared free growing and retained for historical reference or for stand improvement treatment opportunities as funding opportunities are available (e.g., *Forest Investment Account* [FIA] projects, *Forests For Tomorrow* [FFT] projects). Reporting requirements for government funded treatments are described in *RESULTS Information Submission Specifications – Government Funded Silviculture Activities*⁴ (RISS-gf).

² <http://www.for.gov.bc.ca/hfp/publications/00026/pdf/fs708-guide.pdf>

³ <http://www.for.gov.bc.ca/his/results/>

⁴ <http://www.for.gov.bc.ca/hfp/publications/00220/resultsSubmission.pdf>

RESULTS – Quality Assurance Framework

The RESULTS database stores reforestation and forest cover information for all forest tenures and government-funded operations. The scope of RESULTS is:

Total number of Openings:	201,000
Provincial Land Coverage:	8.5 million ha
Annual number of new openings:	7,800
Annual area of new openings:	220,000 ha

RESULTS receives electronic information, through the Electronic Submission Framework (ESF), on approximately 13,000 standards units (SUs; i.e., bounded areas within an opening subject to the same reforestation standards) annually; including information pertaining to SUs, harvesting, silviculture activities, forest cover and maps, and declarations. After June 1, 2005 all RESULTS submissions were required through ESF submission. Licensee compliance rate was 90% on the May 31, 2006 reporting deadline.

1.3. Corporate importance

The *Ministry of Forests and Range Act* (MFRA) s. 4, lists five purposes of the ministry⁵. RESULTS data is used to validate decisions related to carrying out functions to support those purposes. The ministry's roles as defined in the MFRA are deemed to be trustworthy when the information upon which the ministry bases its decisions is reliable.

The minister has stated, in the ministry service plan, that he is accountable for the basis on which the service plan has been prepared, and for achieving the specific objectives in the plan. Both of these accountabilities are compromised if RESULTS is not adequately resourced with staff to address ongoing quality control issues that arise with a large scale provincial information tracking system. Ministry service plan core business areas affected by RESULTS data are: Forest Stewardship; Compliance and Enforcement; Forest Investment; and, BC Timber Sales.

⁵ Five purposes of the ministry as listed in *The Ministry of Forests and Range Act*, s.4:

Purposes and functions of ministry

- 4** The purposes and functions of the ministry are, under the direction of the minister, to do the following:
- (a) encourage maximum productivity of the forest and range resources in British Columbia;
 - (b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;
 - (c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;
 - (d) encourage a vigorous, efficient and world competitive
 - (i) timber processing industry, and
 - (ii) ranching sectorin British Columbia;
 - (e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

1.3.1. Corporate use of RESULTS data

RESULTS data is used by the ministry to:

1. support the derivation of the provincial annual allowable cut allocations;
2. analyse the provincial timber supply;
3. report on Key Performance Indicators in the ministry's *Annual Service Plan Report*;
4. report forestry statistics in “*The State of BC’s Forests*” report;
5. report forest compliance and forest cover statistics;
6. assess licensees for compliance with legal requirements;
7. procure funding for government funded programs;
8. support monitoring and effectiveness evaluations through the *Forest and Range Evaluation Program* (FREP) or other Regional stewardship monitoring initiatives;
9. update provincial forest cover data through the *Vegetation Resource Inventory Management System* (VRIMS);
10. track planned activities for associated with government obligations, FFT or FIA activities; and,
11. support court proceedings.

Several government programs rely on RESULTS data for government business:

1. The ministry publishes Key Performance Indicators (as measures on the ministry's stewardship commitments) for the *Ministry of Forests and Range Service Plan* and the *Annual Service Plan Report*. Two out of the twelve indicators are based on RESULTS data (net area reforested ratio, area loss to permanent access structures). RESULTS data can also be used to support other indicators.
2. VRIMS uses RESULTS data. The forest cover data from disturbance (harvesting and natural disturbance depletions) and free growing RESULTS submissions is used to update the provincial forest cover. RESULTS information affects timber supply projection and the Annual Allowable Cut (AAC) determination.
3. RESULTS information is published in the *Land and Resource Data Warehouse* (LRDW). Openings records can be viewed through the *Integrated Land and Resource Registry* (ILRR) to determine legal encumbrances. The profile for RESULTS data use is increasing with increased public access and use of the LRDW.
4. The FFT program uses RESULTS to track natural disturbance openings and associated silviculture treatments and forest cover. The forest cover information is used by VRIMS to update provincial forest inventory coverage, track stocking, or for future volume or value gain projections from silviculture activities.
5. The Forest Practices Board uses RESULTS data for special investigations on reforestation practices such as reforestation on mountain pine beetle affected areas, and achievement of free growing stands.

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6. The Canadian Council of Forest Ministers use RESULTS data for the *National Forestry Database Program* which compiles annual forestry statistics for all provinces and territories.
7. The FREP program may use RESULTS data to support stewardship monitoring and effectiveness evaluations.
8. RESULTS data is used by organizations such as the Forest Practices Board and others who perform public reviews on, and audit, the ministry's obligations with respect to its forest stewardship commitments under the *Ministry of Forests and Range Act* (MFRA) and the ministry's Service Plan.

RESULTS data may also be used to address criticisms in reports published by non-government agencies⁶, and for international trade issues.

1.4. Evolution

RESULTS evolved from predecessor systems, each system replaced by another (Table 1), concurrent with legislated changes to reforestation obligations and associated reporting requirements (Table 2).

Table 1 Evolution of the ministry's silviculture information systems

Data management system	Approximate timeframe
Paper-based system	prior to 1979
History records <i>First paper-based electronic database – forms were stored in opening files after data was manually input into the system</i>	1979 – 1994
Major Licensee Silviculture Information System (MLSIS) <i>Tracked licensee obligations for harvested areas logged after Oct 1, 1987. Licensees submitted forms to the ministry, and ministry staff input the data into MLSIS. MLSIS data were merged into Integrated Silviculture Information System (ISIS) in 1998</i>	1987 - 1998
Integrated Silviculture Information System (ISIS) <i>Replaced History Records from 1994 to 2003, and was used for timber supply analysis for the Small Business Forest Enterprise Program, and for backlog and incremental programs</i>	1994 - 2003
RESULTS <i>Includes ISIS & MLSIS records</i>	November 2003

⁶ West Coast Environmental Law:

- a) Cutting up the safety net (February 2005)
- b) Timber rules: Forest regulations lower standards, tie government hands and reduce accountability (March 2004)

RESULTS – Quality Assurance Framework

Table 2 Evolution of legislative framework for silviculture obligations and reporting requirements

Legislation	Approximate timeframe
<i>Silviculture Regulation</i> (under the <i>Forest Act</i>) start of licensee basic silviculture obligations	October 1, 1987, January 1, 1988
<i>Silviculture Practices Regulation</i> (under the <i>Forest Act</i>)	April 01, 1994 – June 15, 1995
<i>Silviculture Practices Regulation</i> (under <i>Forest Practices Code Act of British Columbia</i>) requirements for Silviculture Prescriptions replaced by Site Plans	June 15, 1995 December 15, 1998
Bill 70 Transition period between <i>Forest Practices Code</i> and <i>Forest and Range Practices Act</i> (<i>Timber Harvesting and Silviculture Practices Regulation</i>)	December 17, 2002
<i>Forest Planning and Practices Regulation</i> (under <i>Forest and Range Practices Act</i>)	January 31, 2004

RESULTS carries forward previous data standards for any given opening to the end of the silviculture obligation lifecycle, spanning up to 20 years. The data management system, together with its associated processes – data entry, maintenance, and standards – endures a substantive timeline over changing legislative and business requirements.

The repository of older records, no longer under any current licensee obligation, provides a historical context and helps the ministry plan for treatment opportunities to improve forest productivity as funding becomes available.

All current submissions, regardless whether they pertain to licensee obligation reporting or government-funded treatment planning and reporting, use the web-based ESF tool, thereby creating a complexity of programming rules based on different data standards and requirements.

1.4.1. Transition from paper to electronic reporting

RESULTS became operational in November 2003. The ministry provided a phase-in period for mandatory silviculture reporting to allow licensees adequate time to adapt to new submission requirements. Mandatory electronic submissions for amendment requests became effective late in 2004, while mandatory ESF silviculture reporting became effective on June 1, 2005.

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Some distinctions are apparent between paper-based versus ESF submission methods:

1. The paper-based method required third-party human-oversight to check for data completeness and format, and to detect obvious errors. This data entry method created a risk for third party data entry errors.
2. In an ESF submission, licensees submit data directly to the ministry based on a published schema (data format). The data is electronically checked before it is uploaded into RESULTS. This process is automated; but does not eliminate the possibility of data-entry errors, because someone must enter the data. Any errors not captured by the RESULTS program are carried into the system and can contribute to interpretive and forest management errors during the opening's lifecycle. A licensee must exercise vigilance to ensure data is correct before submitting it to RESULTS, because the licensee fully "owns" and is accountable for any submission errors not detected by the RESULTS program.

RESULTS began with many data validation rules, but some of these rules were relaxed to accommodate a large volume of paper forms, stockpiled in some districts for 3 years, that did not conform to the desired workflow and caused processing delays in data entry.

While RESULTS has many data validation checks, it is not possible to translate all business nuances into data validation rules. Professional reliance is expected of forestry professionals to ensure that the business rules are understood, followed, and that submissions are accurate and complete.

1.4.2. Forestry personnel

The **learning curve effect** and related **experience curve effect** express the relationship between experience and efficiency. Learning curve theory is based on the idea that the time (or cost) required to perform a task decreases, and output increases, as a worker gains experience. Experience curve effect encompasses more than labour time. The more often a task is performed, the lower the cost of doing it.

Periodic changes benefit all organizations and can lead to long term productivity gains. Every change causes some temporary productivity decline. Too much, or too rapid, change causes steeper productivity declines (Figure 1). Training programs and user materials require increased time to develop when associated with steep changes, and this increases the period during which productivity declines.

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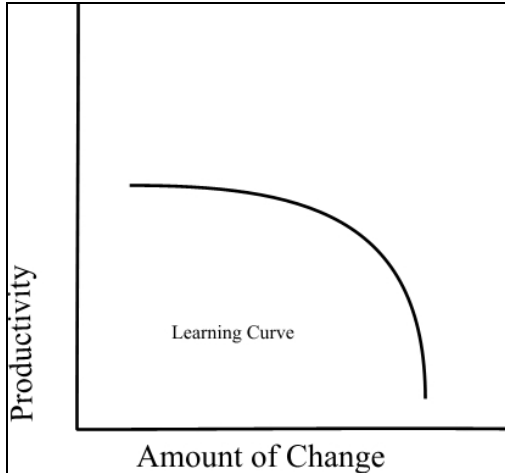


Figure 1 Productivity declines with change

See: F. Heylighen⁷. Graph: C. McClarnon.

For example, the changes between the *Silviculture Regulation* under the 1988 *Forest Act*, and *Silviculture Practices Regulation* under the *Forest Practices Code of British Columbia Act* (FPCBCA), were not as steep as the changes between the *Silviculture Practices Regulation* and the *Forest Planning and Practices Regulation* under FRPA (Figure 2), resulting in different levels of productivity declines when comparing the two transition periods.

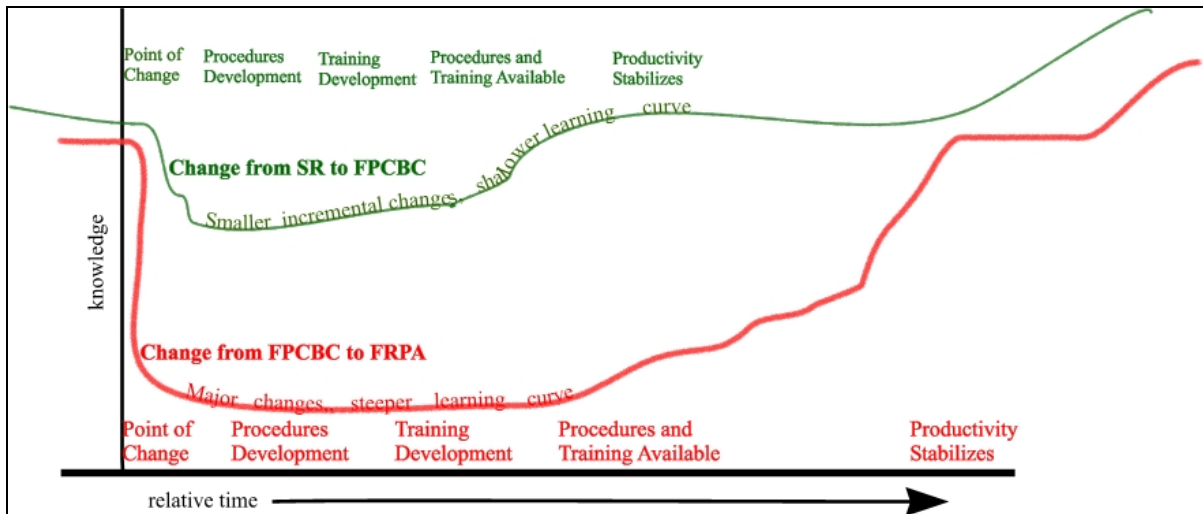


Figure 2 Relative learning curves associated with BC forestry legislation

Change from *Silviculture Regulation* to *Silviculture Practices Regulation* (under FPCBCA) was an extension of an existing business path. Change from FPCBCA to FRPA was a change to a different business path – therefore steeper learning curve. Graph: C. McClarnon.

⁷ Heylighen, F. 1999. Change and information overload: negative effects. *Principia Cybernetica Web*. Brussels: Principia Cybernetica, 1999. Retrieved on March 13, 2007 from <http://pespmc1.vub.ac.be/CHINNEG.html>

All BC forest professionals have experienced two learning curves within the last four years:

1. Changes in Legislation (FRPA)
2. New technology (RESULTS)⁸

Some have experienced another curve:

3. Organizational restructuring (learn new job)

Steep learning curves (always associated with major changes to business) take several years to stabilize, provided the change rate slackens during the period of learning. Submissions to RESULTS are being affected by the learning curves of government and private sector forestry professionals.

1.4.3. Information overload

Cognitive overload, where workers are overloaded with an overabundance of information, causes productivity declines as workers sift through unnecessary information to access needed information.

"Information anxiety' is produced by the gap between what we understand and what we think we should understand, the 'black hole' between data and knowledge, and it happens when information does not tell us what we want or need to know."⁹

RESULTS requires ongoing rationalisation of information requirements so that only required information (e.g., for TSA analysis, compliance, service plan reporting) is collected; information fields not used for business are eliminated from RESULTS, and that user materials on the web site provide uncluttered access to business requirements.

1.4.4. RESULTS support staff

Since 1994, the ministry has reduced staffing (Figure 3). With FPCBCA, ministry staffing increased and then dropped part-way through implementation. With FRPA, staffing dropped during implementation. Both staffing drops occurred during *learning curve periods* associated with implementation of new and complex legislation, resulting in reduced government support to forestry professionals. Significant reductions in staff coincided with the introduction of RESULTS in 2004, during a period when remaining staff were experiencing learning curves as a result of legal changes and province-wide organizational restructuring initiatives both in government and the private sector.

⁸ Other affected ministry technologies:

1. Hardware: Shared Services common platform (Workstation Refresh)
2. Software: Legacy applications discontinued (MAPS 3-D, ISIS/MLSIS)

⁹ Source: Kirsh, D. (2000). A few thoughts on cognitive overload. *Intellectica* 1(30):19-51. Retrieved on March 13, 2007 from <http://interactivity.ucsd.edu/articles/Overload/published.html>

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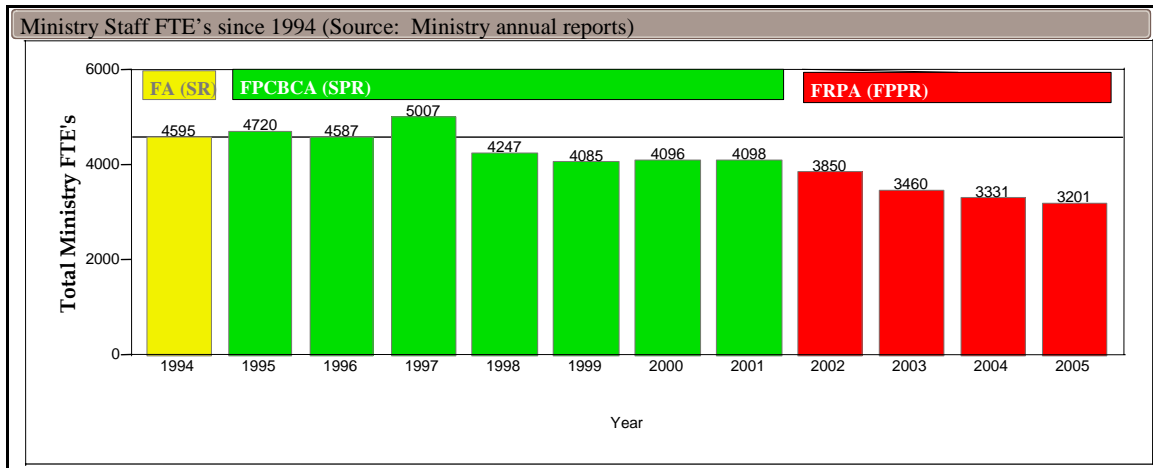


Figure 3 Ministry staff levels since 1994

Graph: C. McClarnon

With reduced staffing, it is no longer possible to process paper form submissions. The electronic submission capability of RESULTS now automates submissions. Nevertheless, the significant changes to business requirements between FPCBCA and FRPA created steep learning curves among all government and private sector forestry professionals.

The government downsizing initiative over the last eight years has also reduced the ministry's capability to manage data quality in RESULTS and has contributed to data entry errors and omissions in RESULTS, during the period between changing business rules and delivery of training products. Data quality impacts on the ministry's forest stewardship role have been recognized in some audits and reports conducted by internal and external government agencies¹⁰.

¹⁰ List of audits and reports conducted by internal and external government agencies that rely on, and/or have identified problems with, RESULTS data:

1. Ministry of Finance (Internal Audit and Advisory Services): Audit Report on the Review of Ministry Silviculture Obligations - October 2002 - Ministry of Forests
2. Ministry of Finance (Internal Audit and Advisory Services): Major Licence Silviculture Data Integrity Review 2002 Report
3. Forest Practices Board Special Investigation – Species composition and regeneration in cutblocks in mountain pine beetle areas, October 2006
4. Forest Practices Board Special Report – A review of the early forest stewardship plans under FRPA, May 2006
5. Forest Practices Board Special Report – Achievement of free-growing forests – 2004 provincial update

2. Quality Assurance Framework for RESULTS

“A quality system is the means by which an organization implements quality management in a systematic, organized manner. A quality system encompasses a variety of technical and administrative elements, including policy and objectives, organizational authority, responsibilities, accountability, and procedures and practices.

A quality system is the “blueprint” or framework by which an organization applies sufficient quality control (QC) and quality assurance (QA) practices to ensure that the results of its’ environmental programs meet or exceed expectations.”¹¹

Table 3 provides an overview of some quality assurance elements as they relate to RESULTS.

Table 3 Elements of a quality assurance framework for RESULTS

Element	Relationship to RESULTS
Technical and Administrative	RESULTS systems design – validation edits. <i>Described in technical documentation: http://www.for.gov.bc.ca/his/results/techDocs.htm.</i>
Policy, objectives, procedures, practices	THSPR s.45-48 (FPCBCA) and FPPR s.86 (FRPA) reporting requirements: <i>Form and manner of submissions described in SISG: http://www.for.gov.bc.ca/hfp/publications/00026/pdf/fs708-guide.pdf and other business and policy documentation on the RESULTS web site http://www.for.gov.bc.ca/his/results/business.htm.</i> Training programs. <i>Accessed by a link on the RESULTS web site: http://www.for.gov.bc.ca/his/results/.</i>
Organization authority	MFRA s.4 (purposes and functions of Ministry): <i>“manage, protect and conserve the forest and ranges of the government...”, “plan the use of the forest and range resources of the government”.</i>
Accountability	Ministry Policy Manual. Vol. 2 – Management Services. Chapter 7 – Information Management. <i>Policy 7.3 – Corporate Information Custodianship: http://www.for.gov.bc.ca/tasb/manuals/policy/mngmstrv/ms7-3.htm. Management Guide to Custodianship (S35): http://www.for.gov.bc.ca/his/datadmin/s35.htm. Statements of responsibility for data custodians: http://www.for.gov.bc.ca/his/datadmin/dc_lang.htm.</i>
Responsibilities	Ministry Headquarters (Forest Practices Branch) <i>Oversight of forest resources on Crown Land, determine reforestation information requirements.</i> Licensee <i>Report to ministry in accordance with legislation. Report FIA funded activities, plan for FIA funded activities. Professional Forester: Responsible for accuracy and completeness of data.</i> Ministry Operational staff <i>Assess compliance with reforestation obligation. Complete planning for FFT activities. Report FFT funded activities completed and activities where government holds an obligation (NFRL/ SNRFL).</i>

¹¹ Source: American National Standard – Quality systems for environmental data and technology programs – Requirement with guidance for use American Society for Quality – ANSI/ASQ E4-2004

2.1. Components of Quality Assurance

The RESULTS business model is based on external sources (licensees and contractors) supplying information to the ministry. The ministry identifies issues, develops procedures, and oversees processes for making corrections to data errors and updating systems configuration.

Table 4 lists twenty-five dimensions of data quality noted in the *Ministry of Forests and Range Data Quality Framework* report (March 2006), hereafter referred to as the “DQF report”, which are of relevance to RESULTS. The DQF report (page10) focuses mainly on eleven primary dimensions (preceded by * in Table 4). While the DQF report provides an overall data quality assurance framework for the ministry, this document addresses additional questions, specific to RESULTS. Although RESULTS has data completeness checks programmed within the software, software solutions proposed in the DQF report to monitor data completeness may complement RESULTS tools; in particular the DQI analysis and reporting tools.

Table 4 Ministry of Forests and Range dimensions of data quality

Dimension	Definition
*Accessibility	Degree of ease of access to information, as well as the breadth of access (whether all the information can be accessed).
*Accuracy	How closely the data value agrees with the correct or “true” value. May also refer to non-quantitative data, such as client names, addresses, segment categorizations, classifications and descriptions. Also includes a measure of the degree to which data agrees with data contained in an original source of data, such as a form, document, field cards, or unaltered electronic records within the control of the originating organization.
*Appropriateness	Categorizes how well the format, presentation, amount, and nature of the data matches the users’ needs.
*Availability	Data is only useful if it is available when needed. This is especially true for managers relying on decision support systems. Often, systems are down and the data is not accessible during maintenance periods or system failures.
*Believability / Reliability	Degree of credibility or trustworthiness of the information.
Business Rule Conformance (Validity)	Degree of conformance of data values to its domain and business rules.
*Completeness	The expectation that certain attributes are expected to have assigned values in a data set. Also pertains to retention requirements for historical data and to the expectation that required associated records will be present.
Concurrency of redundant or distributed data	The information float or lag time between when data are knowable (created or changed) in one database and are also knowable in a redundant or distributed database.

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Dimension	Definition
*Consistency	The common definition, understanding, interpretation and calculation of a data element. Consistency constraints can be encapsulated as a set of rules that specify consistency relationships between values of attributes, either across a record or message, or along all values of a single attribute. These consistency rules can be applied to one or more dimensions of a table, or even across tables.
*Consistent Representation	Whether instances of data are represented in a format that is consistent with the domains of values as well as consistent with other similar attribute values.
Contextual clarity	The relative degree to which data presentation enables the knowledge worker to understand the meaning of the data and avoid misinterpretation.
Correct Interpretation	A good presentation provides the user with everything required for the correct interpretation of information.
*Currency / Timeliness	The degree to which information is current with the world that it models.
Definition conformance	The consistency of meaning of the actual data values with its data definition.
Interpretability	The information is easy to interpret. The codes are clear. The measurement units are clear.
*Metadata	Presence of an enterprise-wide metadata framework and support policies.
Objectivity	The information was objectively collected and is based on facts.
Ownership	Who is the responsible custodian of the information.
*Precision	The ability of a measurement or analytical results to be consistently reproduced, or the number of significant digits to which a value has been measured or calculated.
Privacy	Privacy is an issue of selective display of information based on internally managed permissions.
Redundancy	The acquisition and storage of multiple copies of equivalent data values.
Relevancy	The information is useful, relevant, appropriate, applicable to our work.
Reliability	While reliability is closely related to accuracy, it is more of a relative measure of how much confidence one can place in the data values. Reliability is often used for data that is provided from external providers.
Security	The information is protected against unauthorised access. Security is similar to privacy, except that privacy deals with protecting the entities being modeled by the system, whereas security protects the data themselves.
Timeliness	Time expectation for accessibility of information. Can be measured as the time between when the information is expected and when it is readily available for use.

2.1.1. Quality assurance mechanisms in RESULTS

2.1.1.1. Accessibility

Access is granted according to the access level authorised to the user by his/her manager, and according to his/her account type (BCeID versus IDIR). An online access request service is available to assist authorised applicants in requesting access to RESULTS.

The lowest level access (view and report) allows users to view all opening-related data and run a selection of defined aggregated reports (from a list of available report types configured by the ministry). This list of available reports is based on the most popular requests for reports over a period of time. New reports can be added to this list based on user requests over time. These reports are normally available within minutes of the user entering the report parameters. Sometimes a user has difficulty in locating the appropriate report to glean the desired information given that several generically-named reports are available through different screens.

Users may contact Headquarters to ask for custom reports that present data in a format not captured by the pre-defined reports. These reports are generally available within a few days of user requests.

This mechanism requires strengthening:

1. Increased flexibility in defining desired information would help reduce the number of requests for customized reports.

2.1.1.2. Accuracy

Licensees and professional foresters are responsible for ensuring that the information reported to RESULTS is accurate. Minimal checks are in place by the ministry to assure data accuracy.

2.1.1.2.1. Geometric (spatial) data accuracy

Forest Analysis and Inventory Branch (FAIB) staff use VRIMS to compare RESULTS opening boundaries (spatial) against satellite imagery for currently reported denudations; however it is not yet clear how effectively this process addresses partially cut openings. Openings not within tolerance ranges are identified and reported to Forest Practices Branch (FPB). Headquarters branches are developing a strategy to communicate errors to licensees¹².

RESULTS has no other automated process for initial screening of spatial accuracy. Other issues related to quality of spatial submission are detected through routine field verifications subject to the limitations described in Section 2.1.1.2.2.

2.1.1.2.2. Attribute (text) data accuracy

No data accuracy standards are in place to assure accuracy of RESULTS attribute data. Previous data accuracy standards (in the silviculture surveys program under former

¹² Licensees would be requested to resubmit the data to RESULTS according to the nature of error. This process is under development as VRIMS continues to pilot and establish protocols for error handling.

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legislative framework) were discontinued with the FRPA legislative framework. The silviculture surveys program included standards for field data collection and survey practices. This mechanism provided consistency and a level of confidence in the data values submitted to the ministry. The current organizational model has no data collection standards. Although data submission formatting standards exist, this is not the same as data collection standards which affect accuracy in the field data¹³.

The current mechanism used by the ministry to provide basic data standards, is through FPPR s.86(6) which states that the minister can specify form and manner of submissions. Data formatting specifications are listed in the SISG; however, they do not include field practices or data collection standards, which are mechanisms to ascertain data accuracy. According to a recent legal opinion by the Ministry of Attorney General, a court challenge can determine whether data standards can be interpreted as being integral to "form and manner" of submissions, and whether accuracy standards and formatting standards can come under the direction of "form and manner" of submissions. The legislation is thus ambiguous and cannot be relied upon to secure data accuracy standards requirements.

Field data assessment is the only mechanism that can verify data accuracy. Compliance and enforcement teams field check some data; but are affected by five logistical factors:

1. limited staff assigned to inspections;
2. variable staff experience in conducting silvicultural inspections;
3. a legal requirement that stipulates that the Delegated Decision Maker (DDM) can only issue an order specifying that an obligation has not been met, after providing an Order To Be Heard (OTBH), within a 15 month time. If an opening is not inspected within 15 months of a milestone declaration and information collected to demonstrate that the obligation has not been met, then the data is deemed to be accepted by the ministry without question/review;
4. no current field measurements standards are available – the ministry ceased to update field survey procedures with the discontinuation of the surveys program; and,
5. only a proportion of RESULTS data is checked by compliance and enforcement teams; data not part of the compliance checking process may not be checked or may be checked by other agencies or ministry departments (e.g., FIA data may be checked by Price Waterhouse Coopers and FFT data may be checked by ministry contract coordinators).

Quantity, scope, and timeliness of field inspections may be enhanced somewhat if the Forest Practices Board, an external auditing agency, agrees to engage in post-declaration inspections; however, their staffing/funding levels would constrain sampling; and the same lack of current provincial survey standards would affect field auditors' methodologies.

RESULTS has no standardized mechanism to collect comments, observations, and confirmation of reported data after field inspections, office reviews, and communications with forest professionals regarding forest management actions on an opening. Forest staff turnover, including forest officer inspectors, during an opening's 15-20 year active

¹³ Formatting standards affect consistency of submissions, but have no effect on accuracy.

reforestation lifespan, presents a challenge in tracking not only forest management activities, but also forest inspection activity, on an opening.

This mechanism requires strengthening:

1. Amend the FRPA legislation to include a Chief Forester standard for reported data. (See Section 2.1.1.14).
2. Increase Compliance and Enforcement (C&E) inspection staffing.
3. Increase Headquarters RESULTS staffing.
4. Develop and implement a (or update the former) survey program that describes the data collection and survey methods for all RESULTS data to achieve an acceptable range of data accuracy.
5. Include a field confirmation component as an annual deliverable as part of the ministry service plan key performance measures.
6. Explore the viability of creating a RESULTS Quality Assurance component; i.e., adding additional “for office use only” fields, to RESULTS for ministry staff to report field inspection findings, and flag openings that require correction of data.
7. Consider creating a link with the C&E Compliance Information Management System (CIMS) and then determine what other fields regarding forest inspection parameters (not currently tracked by CIMS) would serve forest officers' inspection needs with respect to field accuracy.
8. Link FREP effectiveness evaluations to RESULTS.

2.1.1.3. Appropriateness

User questions received by the RESULTS Application Help Desk service, and user telephone calls to Headquarters staff, influence annual release updates to format, presentation, amount, and nature of the data. Prior to release updates, users are invited to participate in testing, during which new release version is fine-tuned based on testers' feedback.

Users can be an important mechanism for detection of data quality problems. At this time, when users encounter problems they may or may not report them to the Help Desk. Most often, problems are reported if submissions fail. During periods when the Help Desk receives a high volume of user questions, response time can be slow. This may affect whether a user decides to report a problem that is not essential to making a successful submission.

This mechanism requires strengthening:

1. Strengthen the mechanism by which users report data quality problems to the ministry. (e.g., Create an online problem reporting mechanism).

2.1.1.4. Availability

Data is available within minutes of being submitted, with the exception of during system maintenance periods. Users who subscribe to RESULTS Bulletins are notified of the scheduling of RESULTS system maintenance periods.

2.1.1.5. Believability / Reliability

RESULTS tracks all submissions and changes made to opening records. Suspect data can be reviewed against metadata such as licensee, userid, and date. Custom user submission histories can be generated, for example, to review a given user's or licensee's submissions for consistency in errors. Custom reports can be generated to identify openings with given field parameters for the purpose of correcting historical errors for data correction projects.

Believability and reliability is affected by accuracy as discussed in Section 2.1.1.2. Believability and reliability will improve once a mechanism is in place to assure data accuracy.

2.1.1.6. Business Rule Conformance (Validity)

For certain submissions (e.g., forest cover), related business practices are complex. RESULTS contains some validation checks, documented in the Technical Specifications on the RESULTS web site¹⁴. Users are expected to be familiar with user submission guides and legislation, because RESULTS cannot be programmed, without insurmountable development and maintenance expenses, to check all the complex permutations of legal requirements and submission requirements documented in the SISG.

Table 5 lists some critical information that must be submitted for a given business context. Some of this information is designated "mandatory" through RESULTS validation rules, that return error messages if required data elements are absent, or incorrectly formatted. These rules are embedded within individual online screens in programming language that is not easily reviewed by business specialists.

This mechanism requires strengthening:

1. Compile the submission validation rules in an overview document that serves as a review document for business specialists, who should provide statements regarding their currency and adequacy for current business requirements.
2. Review the validation rules to ensure that they are consistent with business requirements. Identify errors or gaps.

¹⁴ <http://www.for.gov.bc.ca/his/results/techDocs.htm>

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Table 5 RESULTS Key Business Content

Business parameter	Business content rules
Standards Units	Standard Unit (SU) must contain Biogeoclimatic Ecosystem Classification (BEC), Net Area to be Reforested (NAR), and an approved Standards ID that is authorised for the submitting licensee within district. Standards IDs may not be assigned to licensees not authorised to use them, with some exceptions (pending clarifications -- e.g., woodlots, government funded treatments, multi-licensee stocking standards)
Standard Id (stocking standard under FDP/FSP)	Restricted to SUs that belong to the licensee/district(s) under which the Forest Development Plan (FDP)/Forest Stewardship Plan (FSP) was approved.
Amalgamation	New spatial (and forest cover) submission is required by SU. Business rules require fine-tuning.
Disturbance reporting	Harvesting: must provide valid Silvicultural System Code combination, Disturbance Code, Disturbance (harvest) Start and End Dates, Gross Area Non-harvesting disturbance types: Disturbance Code, Gross Area, Disturbance Start and End Dates.
Silviculture reporting (actual)	Activities: must provide Base, Technique, and Method Code, Activity Completion Date, Treated Area, Funding Source. Planting: must provide Seedlot/Veglot information; Species and Number of Trees Planted.
Forest Cover	Must be accompanied by Geography Markup Language (GML) map. Forest cover business rules are under review with respect to mandatory requirements.
Declarations	Free Growing (FG) Declarations: user must confirm that forest cover has been submitted with a minimum of one forest cover polygon containing a FG Stems per Hectare (sph) value. This validation rule crudely checks that a FG forest cover submission has been submitted (not intended to confirm FG status).

2.1.1.7. Completeness

A lack of completeness in reporting activities and other data compromises the ministry's ability to monitor the state of the forest resource.

For example; since 1993 the number of seedlings recorded as sown in the Seed Planning and Registry System (SPAR) has increased while over this same period the amount of seedlings reported as planted in RESULTS has decreased. Activity information is likely not being reported; nevertheless, it is not possible to determine whether any trends in the data suggest a reporting problem or a change in management strategies. Non-governmental organizations,

such as the Western Silvicultural Contractors Association, have published articles that question the discrepancy in the data.¹⁵

Small scale salvage areas that are exempted from reforestation obligations if they are less than one hectare, or where harvesting does not exceed 500m³, do not have legal submission requirements for RESULTS¹⁶. Natural disturbance areas (i.e., denuded by fire and pest) are not tracked in RESULTS, unless silviculture treatments are intended for those areas, or unless they are subject to an existing obligation of a licensee¹⁷. These kinds of areas may represent cumulatively large areas that affect statistics used to estimate inventory and timber supply. Some of these areas may be tracked in RESULTS pending funding availability; and where specific regional or district initiatives and/or directives were undertaken to survey and report these areas.

No provincially-coordinated verification process is yet in place¹⁸ to determine the extent to which harvest and other milestone data in RESULTS is complete on a provincial scale for a reporting period. Nevertheless, submissions are legal requirements, and it is expected that license holders comply with legal submission requirements.

2.1.1.7.1. Validation rules

Programmed validation rules check that data is complete for given submissions: e.g., silviculture activity and milestones (harvest completion, regeneration and free growing). However, given the time consumption and cost to build rules into the system, only a few rules are available. Licensees are expected to ensure completeness regardless of the availability of validation checks.

Some ESF/ RESULTS validation rules to check data completeness in new submissions include:

- Opening definitions with SP Exempt = “N” and Opening Category = “FT-forest tenure type” have legal reforestation obligations and must contain SU definitions with associated SU-required information including SU (GML) map.
- No harvest activity submission is accepted without prior submission of opening definition in which SU(s) are defined.
- Forest cover report with (GML) map must accompany the harvesting reports upon harvest completion.
- All forest cover must be submitted with (GML) map.
- Upon submission of either regeneration or free growing declaration, a forest cover submission is required with (GML) map. RESULTS/ESF rejects declarations with a missing forest cover component.
- A forest cover submission with (GML) map is required to report post-harvest stocking information for areas without regeneration objectives.

¹⁵ Western Silvicultural Contractors Association – Forestry figures don't add up – December 13, 2006 (John Betts) <http://www.wsca.ca/index.php?Page=228.0&Key=633>

¹⁶ However; the ministry is providing guidance to the districts that all Forestry Licences to Cut (FLTC), including those less than 1ha, must be entered into RESULTS where silvicultural activities are anticipated.

¹⁷ A process for submitting information related to areas denuded by fire and pest, that are not associated with a timber tenure, to RESULTS in a timely manner is under development.

¹⁸ Under review by Headquarters staff.

RESULTS can generate special reports, using timestamps. For example, when Cutblock Status changes from “LC” to “S”, and, SP Exempt indicator is set to “N”, and Small Patch Salvage is “N”; then, using the Block Status timestamp, if, after two years, RESULTS received no submission, a report identifies these cutblocks as having overdue reports.

Comparisons with historical reporting trends can generate a rough measure of completeness. One option could be an examination of VRIMS or Forest Tenure Administration (FTA) to highlight the scope of areas known logged, but not reported within an acceptable period.

2.1.1.7.2. Independent verifications of completeness

FAIB analysts require an independent verification process that determines to what extent all harvest activity is reflected in RESULTS. In units where SP exempt blocks are not significant, that verification could be a comparison to annual satellite change detection.

2.1.1.7.3. Missing data project

A three year backlog of paper-based data-loading, together with historical data entry errors associated with the transition from former paper-based submission processes to current ESF, has created an accumulation of missing information in RESULTS that affects ministry annual reports and compliance monitoring. A project team was formed in June 2006 to address the missing data issue. The project’s success is contingent on funding, given that the work requires extensive manual gathering of missing information. A funding request for \$850,000 was issued, of which half has been approved, to launch the first phase of the data cleaning project by hiring five service providers to correct identified RESULTS data under the project plan.

Data correction is planned to be undertaken in prioritized stages, as future budgets allow. Priorities for 2006-07 are:

A. Openings not in RESULTS

1. Tenured openings existing in FTA, not in RESULTS.
2. Tenured openings do not exist in RESULTS, nor in FTA. A cutting permit was issued and a cutblock was not entered into FTA. (usually ‘salvage’ openings). RESULTS submissions of opening definitions (Form A) are impeded.

B. Openings in RESULTS

3. Missing opening definition information.
4. Missing disturbance activity information.
5. Missing SU and/or stocking standard information from silviculture prescriptions or site plans.
6. Missing forest cover information.
7. Unprocessed items in the RESULTS "InBox".
8. Opening nomenclature (e.g., licence, cutting permit, cutblock, timber mark) differs between tenured openings in licensee databases and RESULTS (causes submission failures to RESULTS).

2.1.1.8. Concurrency of redundant or distributed data

RESULTS was designed to reduce submission redundancy among related government databases. Linkages now exist among related databases, so the data is entered only once, and automatically populates the linked databases (e.g., FTA, SPAR, MAPVIEW, and soon VRIMS).

In the transition to ESF, licensees are noticing differences between information in RESULTS and their own forest management systems. Some of these discrepancies cause ESF submission problems; others relate to data entry errors.

By design, ESF forces communication and synchronization among RESULTS clients, over business process and data standards. Any developments and changes to RESULTS must be considered in relation to clients who must make changes to their respective forest information management systems.

2.1.1.9. Consistency

To promote consistency in submissions, data format standards are described in the SISG, RISS-gf, other user materials on the “Technical Documentation” and “Business Documentation” pages of the RESULTS web site, and in the RESULTS training modules. Given that RESULTS does not contain a complete set of programmed checks against legislated legal requirements, the ministry relies on licensees to follow legislated and associated submission requirements.

Consistency is difficult to measure except through audits (for checks not available through RESULTS), or errors tracked through submission failures (for checks that are available through RESULTS), or through reports to Headquarters by ministry staff when they detect consistency discrepancies. For example, ministry staff have reported instances where stocking standards in approved paper submissions are not the same as those input to RESULTS, notably multi-layered stocking standards.

To this point, users have been granted access without a training records check with the assumption that they have completed RESULTS training modules. Based on the kinds of questions received by the Application Help Desk, and reports by the ministry's internal data analysts on inconsistent data residing within the RESULTS database, it is now evident that some users are not trained. Consistency will be improved once all users are trained.

Lack of consistency in data has rendered difficulty in monitoring some programs (i.e. FRPA s. 108).

This mechanism requires strengthening:

1. Restrict access to users who have completed RESULTS training modules (to be implemented on January 1, 2008).
2. Issue a RESULTS bulletin and/or memo to ministry and licensee managers who authorise RESULTS users to access their data. Ask managers to verify that the users identified as having access to their data are trained. Provide a timeframe by which

- time users must be fully trained; after which their access may be subject to being revoked.
3. Develop a certification program whereby trained RESULTS users are tested then certified as being competent to use RESULTS. Restrict access to certified users.

2.1.1.10. Consistent representation

RESULTS validation rules include formatting checks (e.g., integers, alpha-numeric, etc.) to assure some level of consistent representation of data. These rules are described in the SISG and in the RESULTS Online Technical Specifications.

2.1.1.11. Contextual clarity

Published procedures (SISG, RISS-gf) are under review for second edition updates, and some RESULTS nomenclature, codes and data fields are under review, based on questions received by Help Desk staff and calls to HQ staff. Updated training programs will follow the published materials and updated version releases of RESULTS. Q&A's continue to be published to the RESULTS web site until second editions of the procedures guides are available. A staff shortage is affecting timeliness of the second issue updates and response to questions. This shortage will affect the time lag between the next version release of the RESULTS application and updating of the procedures guides to reflect the changes to the application.

This mechanism requires strengthening:

1. Increase staff to improve response time to user help questions and procedures updates.

2.1.1.12. Correct interpretation

Published procedures (SISG, RISS-gf) are under review for second edition updates, based on questions received by Help Desk staff and calls to HQ staff. As they evolve, published procedures will contain both guidelines and examples to improve interpretation of data requirements. Updated training programs will follow the published materials. Questions and Answers continue to be published to the RESULTS web site (until second editions of the procedures guides are available). The RESULTS web site is starting to become cluttered with numerous resource materials.

This mechanism requires strengthening:

1. Review the RESULTS web site and rearrange presentation of user materials to improve user navigation.

2.1.1.13. Currency / Timeliness

RESULTS business rules are directed by legislation and detailed in procedures documents on the RESULTS web site. While the RESULTS team has endeavored to map the system's functions to current business rules, programming of this nature is complex, and alerts have been received by Help Desk staff reporting system function inconsistencies with current business requirements. These inconsistencies are identified as "system bugs" and PTWEB (i.e., system problem tracking) requests are prepared to reprogram the affected functions. Generally, several PTWEB requests are bundled together and solutions are implemented

concurrent with a new release. Occasionally, "emergency" fixes are reprogrammed between releases where critical business areas are affected. Ongoing monitoring is required to identify inconsistencies between system functions and business requirements to mitigate the number of reported alerts.

This mechanism requires strengthening:

1. Review business documents to identify required data elements and confirm their existence in RESULTS.
2. Review RESULTS application to identify data elements that were required under business rules that are now obsolete.
3. Review all validation rules for RESULTS fields against business documents and identify inconsistencies.

2.1.1.14. Definition conformance

FRPA legislation is not clear with respect to data standards. No Chief Forester standard exists for data submitted to RESULTS. The ministry is authorised under FPPR s.86(6) to specify form and manner of submissions. A Chief Forester letter is under preparation and will be distributed province-wide that will set out expectations for form and manner of submissions; however a recent legal opinion suggested that data standards may be argued as belonging or not belonging to form and manner of submissions. The data standards outlined in the business and technical documentation are formatting standards, as opposed to accuracy standards.

This mechanism requires strengthening:

1. A Chief Forester standard for data standards of reported data should be added to FRPA s.169(1)¹⁹
2. Field audits are required to determine the extent of definition conformance with respect to data accuracy, as discussed in Section 2.1.1.2.
3. A review of the data definitions in RESULTS and the published documentation is required to ensure that data field definitions are clear and unambiguous. Unclear definitions can affect definition conformance. While some definitions have been reviewed and revised, further work is outstanding.

2.1.1.15. Interpretability

User questions to the Help Desk, and phone calls to Headquarters, serve as a feedback mechanism for interpretability. Questions and Answers on the web site help clarify interpretability questions for the short term; however, this feature is only effective for users

¹⁹ **Chief forester standards for forest practices 169 (1)**

In prescribed circumstances, the chief forester may establish, vary or revoke standards respecting (a) tree gene resources for purposes related to this Act, including without restriction the following: (i) registration of seed including, without limitation, determination of genetic quality and imposition of conditions on the use of registered seed; (ii) transfer of seed; (iii) storage of tree seed with the government; (iv) parent trees; (v) forest stands, trees or seed having rare or unique genetic values; (vi) stocking standards required for a free growing stand, (b) fire use, (c) the preparation of an operational plan, (d) a forest practice, and (e) a range practice, **and (f) the collection, compilation, and submission of data related to a reporting requirement required under this Act and its associated regulations.** (portion in bold red text is a suggested revision to FRPA s.169(1) to strengthen reporting standards)

who make use of it. Ongoing revisions to the business documentation on the RESULTS web site and definitions in the Application Help pages will improve interpretability.

2.1.1.16. Metadata

Metadata (e.g., Submission Date, Submitter Userid, Opening ID, Ministry Approver Userid) are included with each RESULTS submission. RESULTS tracks the timing of opening creations, ESF submissions, milestone declarations, on-line screen updates, and data modifications. This tool provides a mechanism to review what, when and the extent of data changes. These items can be used for submission tracking and audits. This data tracking function is not yet extensively-used.

This mechanism requires strengthening:

1. Demonstrate the data tracking tool in future training modules.
2. Review the data tracking tool's utility with respect to business questions.

2.1.1.17. Objectivity

The removal of the ministry's survey program has created weaknesses in assuring objectivity in reported data. It is not possible to determine whether information is collected objectively unless enforceable measurable standards are in place. No provincial survey standards are legislated, although "form and manner" of submissions are legislated. Although the ministry has some precision and mapping accuracy standards, and has classified them under "form and manner of submissions", no attribute accuracy standards are in place, and what limited precision and formatting standards exist are being challenged by COFI representatives, who argue they are not legislated standards; and therefore they advocate not following them. Until these arguments are resolved, objectivity of data remains questionable. The ministry does not have adequate staffing levels to field review sufficient openings to verify objectivity. This mechanism will be strengthened if recommended actions in Section 2.1.1.14 are implemented.

2.1.1.18. Ownership

Six primary responsibilities or levels of data custodian exist in RESULTS:

1. RESULTS Application Custodian (Forest Practices Branch) is responsible for the data fields, including specifying the data submission requirements and data standards.
2. Licensee Client Signatory is responsible for the licensee's data, including compliance with legal submission requirements.
3. Ministry Organization Unit Manager is responsible for data from ministry-funded programs (e.g., Regional Manager for FFT submissions, BCTS Manager for BCTS submissions).
4. Professional Forester who oversees the data collection is responsible for the accuracy and correct compilation of the data²⁰.
5. RESULTS User (Submitter) is responsible for correctly submitting data (without typographical errors) as provided by the professional forester.
6. District Manager is responsible for stewardship of the data (including ensuring licensee and ministry-funded program compliance with submission requirements).

²⁰ See http://www.abcfp.ca/regulating_the_profession/documents/guideline-practice-standards.pdf

Examination of user activity by Headquarters analysts suggests that information belonging to given custodians have been changed by unauthorised users (e.g., ministry staff changing licensee data; service providers changing client data through unauthorised accounts).

Questions received by the RESULTS Access grantor suggest that, at this time, not all ministry staff are familiar with the ministry's roles and responsibilities for this database²¹.

This mechanism requires strengthening:

1. Future editions of published procedures will clarify that only those responsible for the submissions are authorised to change their data. Ministry staff may issue notices and administrative remedies regarding incorrect data, but may not change the data unless a formal process is developed as part of a compliance program, or a clearly communicated data correction project.
2. Issue a memo to district and regional managers that clarifies their role with respect to ownership and accountability of the portion of the RESULTS database that describes their land bases.
3. Request that district managers ensure that technical and professional staff within districts are assigned roles and responsibilities in RESULTS; for example,
 - a. Tenures - Ensure data is being transmitted and is accurate.
 - b. C&E - Complete inspections and add notes to the electronic opening files.
 - c. Stewardship/Silviculture - Ensure backlog and data clean-up issues are addressed.

2.1.1.19. Precision

Precision of data cannot be measured in RESULTS without data accuracy standards and a standardized survey program. Although the ministry has published some precision standards (ranges by which data values ascertained through a ministry inspection can differ from the licensee data value) as part of the SISG, there are no formal field practice guidelines in place to ensure precision among ministry inspectors. With the absence of accuracy standards, these precision standards are without context. This role was served well by the former provincial silviculture survey program. With the discontinuation of that program, precision in RESULTS data is not measurable with any degree of confidence. It is doubtful that all licensees are conforming to one given set of data collection standards – each licensee has its own unique data collection and measurement standards, and collectively, this reduces data precision in RESULTS. This reduces the confidence in ability to interpret the data, which ultimately reduces the ministry's ability to monitor the state of the resource.

²¹ See also Table 3 – "Ownership".

This mechanism requires strengthening:

1. Amend the FRPA legislation to include a Chief Forester standard for reported data. Precision guidelines can then be developed under this standard.
2. Develop and implement a, or reinstate the former, survey program that describes the data collection and survey methods for all data that are input to RESULTS²².
3. Review the privately-run survey training program at Malaspina College against required RESULTS data standards.

2.1.1.19.1. Geometric (spatial) data precision

ESF and RESULTS provide coarse validity checks for features and geometry; e.g., no malformed or self-intersecting shapes, spatial data lies within the province. Once this check is completed, a rendered map is created in RESULTS and the GML data is made available in the LRDW.

GML data that represent a newly disturbed or declared free growing opening will be annually incorporated into the VRIMS cut-in process.

Mapping standards are published in the SISG.

2.1.1.20. Privacy

Privacy is managed through the assignment of different accounts to licensee users (BCeID) versus government users (IDIR). Licensee users have access to their own data; government users have access to data from all licensees.

Issues arise when licensees who carry out government-funded work under FIA or FFT programs try to make submissions, under contractual agreements, to openings that are the responsibility of other clients. RESULTS is programmed to prevent clients from making submissions on behalf of other clients, because of privacy concerns.

Prior to the recent implementation of a systems solution to address these cases, a temporary business solution was implemented whereby the contractors were provided with temporary IDIR accounts (which allowed access to information of all clients) and they were required to return a confidentiality agreement which stated that they cannot view other licensee data, and use of the account is restricted to openings specified under the contract.

²² Current legislation does not require submission of a survey. With the wide range and variability of FSP stocking standards, a standardized survey program may be subject to developmental challenges.

2.1.1.21. Redundancy

RESULTS is designed to eliminate redundant data by linking with databases of other agencies. This way, data that can be used by multiple agencies is submitted only once, and then shared among other databases that are linked with RESULTS.

This mechanism requires strengthening:

1. Review RESULTS data fields to ensure that all field values are consistent with linked data bases that share submitted data.
2. Review RESULTS data fields to ensure that all field redundancies have been eliminated.

2.1.1.22. Relevancy

The legal and ministry business framework between FPCBCA and FRPA have changed, and several business practices from FPCBCA no longer apply. RESULTS evolved from the former information systems that were designed to support FPBCBA and earlier legal and ministry business frameworks for silviculture submissions.

Other agencies can access and use RESULTS data to enhance their programs. For example, C&E staff may field inspect openings to review outcomes. While their mandate is specific, they can review RESULTS data along with district opening files and/or licensee's own records when setting up inspection schedules. C&E field inspections are tracked in the Compliance Information Management System (CIMS). This system is restricted to C&E staff use and no formal feedback (to the RESULTS program) process exists when issues with data quality are detected by C&E staff. Likewise, the FREP program also has a specific mandate²³. RESULTS information needs for FREP programs have not yet been determined²⁴. Headquarters representatives from the RESULTS team met with MOE representatives to discuss the feasibility of using RESULTS to meet FPPR s.86(3)(b) reporting requirements for wildlife habitat point features (MOE jurisdiction).

This mechanism requires strengthening:

1. Review RESULTS data fields to ensure that current legislated business requirements and ministry service plan business needs are clearly met with RESULTS data, and that fields associated with previous business requirements are retired and archived.
2. Develop a feedback mechanism to report, to the RESULTS data custodian, any findings of other agencies or programs (e.g., C&E, FREP, FFT, FIA, FTA, TSA, SPAR, VRIMS, ILRR, MOE) that use RESULTS data.
3. Work with MOE staff to determine whether and how RESULTS can serve to collect data to meet FPPR s.86(3)(b) reporting requirements.

²³ The FREP quality assurance framework is described at <http://www.for.gov.bc.ca/hfp/frep/qmgmt/assurance.htm>.

²⁴ Lack of completeness, precision, and reliability of RESULTS data limits the ability of FREP to make confident evaluations of the effectiveness of any program examined.

2.1.1.23. Reliability

Reliability measures in RESULTS have been compromised with the removal of the survey program. Under that program, all surveyors were required to be certified before their data was accepted by the ministry. At present, surveys are conducted to variable and unknown standards, and the ministry lacks sufficient staff to ascertain confidence in data reported under FPPR s.86.

This mechanism requires strengthening:

1. Conduct field audits to establish reliability parameters associated with given licensee submissions.
2. Target and random audit data submitted by selected Userids to establish reliability parameters associated with given user submissions.
 - a. Target audit users who submit repeat errors (detected and analysed with the RESULTS historical tracking tool).
 - b. Target audit users who returned confidentiality agreements (to ensure use is consistent with the terms of the agreements).
 - c. Random audit other users.

2.1.1.24. Security

Information is accessed through BCeID and IDIR accounts. Within these accounts appropriate access level (e.g., update, declaration, approval, preview, project) is granted according to the user business needs. As of June 2007, one contractor grants user access to BCeID and IDIR users. Until June 2007, the BCeID process for granting access was less stringent (did not request manager authorisation or review training records) than that used for IDIR access (required manager authorisation and temporary access was assigned to users who had not yet been trained).

An online access request service was implemented in June 2007.²⁵ This service now restricts security access to users (BCeID and IDIR) whose managers confirm their applications, and to users who indicate they have been trained in RESULTS. The data from these applications will be used for target and random audits to verify information on the application. Users whose application data is deemed to be incorrect may have their RESULTS access revoked.

2.1.1.25. Timeliness

Most information is available within minutes of being submitted. Information submitted to the RESULTS Inbox (e.g., amendment, stocking standards, FRPA 108 applications, amalgamations) becomes available pending approval from the district (contingent upon district staff availability to process Inbox requests).

This mechanism requires strengthening:

1. Inboxes should be monitored by Headquarters and reminders sent periodically to districts who are accumulating items.

²⁵ Available at <http://www.for.gov.bc.ca/his/results/access.htm>

2.1.2. Quality issues identification and analysis

The RESULTS program includes identification and analysis of ad-hoc specialized operational/policy concerns. A typical process would be:

1. An operational/policy concern is detected either through a Headquarters data analysis, or a query received by the APPHELP desk, or by a phone call by a RESULTS user or manager to Headquarters.
2. The scope of a problem/project is identified.
3. A specialized RESULTS report is generated to identify reconnaissance topic sites.
4. Ministry staff field inspect, study or confirm the practice/trend and make generalized statements, and/or refine topic sites.
5. Depending on severity of concern/problem, a more formalized approach may be undertaken to study the problem at a deeper level.

The role of the FPB, as the RESULTS custodian, is to ensure that the data in the system is consistent with published standards, that published standards are consistent with current business requirements, and that current business requirements are consistent with assuring data quality²⁶. This role is important given the inter-data dependencies among different government systems and the responsibility for providing data to the public. Therefore, the ministry must commit to annual field checks to confirm that information supplied meets ministry expectations.

2.1.3. Communication

The primary modes of communication of the RESULTS program include the RESULTS web site, training programs, and memos distributed to districts.

2.1.3.1. Web Site

Procedures and technical specifications relating to RESULTS submissions are posted on the RESULTS web site²⁷. First editions of the primary submission procedures (industry and government funded programs submissions) are available²⁸, and second editions are being developed based on user feedback/questions. Procedures are not yet published for woodlot licenses.

Bulletins, memos to districts, and questions and answers are periodically posted between updates to procedures.

²⁶ Examples of business consistency confirmation may include: application of Standards IDs in an acceptable manner and according to acceptable ecological site classification (e.g., BEC); use of variances occurring in a manner that is consistent with an approved FDP/FSP; or, forest cover reporting truly representative of field conditions.

²⁷ <http://www.for.gov.bc.ca/his/results/>

²⁸ See SISG: <http://www.for.gov.bc.ca/hfp/publications/00026/pdf/fs708-guide.pdf> and RISS-gf: <http://www.for.gov.bc.ca/hfp/publications/00220/resultsSubmission.pdf>

2.1.3.2. Training

Online courses are available for several RESULTS modules, and are accessible through the BC Learning E-Store²⁹:

- RESULTS Overview
- RESULTS Amendments, Updates, and Milestones
- RESULTS Stocking Standards under FSPs
- RESULTS Reporting – Basic
- RESULTS Reporting – Advanced
- RESULTS Planning
- RESULTS and Mapview
- RESULTS Obligation Reporting

These courses should be updated after the second editions of the SISG and RISS-gf become available. Additional courses would be helpful for users with Project, Preview and Approval authorizations. Business uses such as compliance inspection preparation and user tracking can be included in existing courses.

3. Risks to the ministry

Until a fully resourced quality assurance mechanism is in place for RESULTS, the ministry assumes the following risks associated with unreliable data:

1. Decisions and functions of the ministry associated with responsibilities under the *Ministry of Forests and Range Act* (e.g., timber supply analysis and cut control) are based on unreliable data.
2. Data used to support reporting and commitments under the Ministry Service Plan are not reliable.
3. Licensee, BCTS and government reforestation obligations under the *Forest Practices Code of BC act* and *Forest and Range Practices Act* cannot be adequately monitored.
4. Linkages with other agency databases become contaminated with erroneous data. This compromises the ministry's objective to streamline information submissions.
5. The ministry is not able to adequately track silviculture liability.
6. Because the data has a legal basis, it would be used in any court proceedings. Unreliable data can compromise the ministry's defense mechanisms in court proceedings.
7. The ministry is subject to scrutiny by external agencies (e.g., Forest Practices Board) that use the ministry's RESULTS data for public audits and public inquiries. Not only is their ability to effectively use the data compromised, but they can draw erroneous conclusions based on unreliable data.

²⁹ www.learningstore.com/bcmof/

4. Action Summary

As of August 2007, RESULTS will be supported by one Headquarters FTE. An additional FTE serving in a RESULTS support role would distribute the work associated with overseeing RESULTS; and provide a safeguard, during periods of staff relocation, that strategic knowledge related to the maintenance of RESULTS resides within the ministry. The current FTE allocated to RESULTS is not sufficient to oversee custodianship associated with a large corporate database³⁰.

The following actions are recommended under a RESULTS Data Quality Framework. These actions are split into two components: within existing budget; and pending additional funding and resources (increased permanent staff and contract help). The current staffing and financial resources levels allocated to RESULTS is insufficient to run a data quality monitoring program of the scope required to minimize the ministry's current risks.

POSSIBLE WITHIN EXISTING RESULTS BUDGET

1. Document and review RESULTS validation rules.
2. Review and revise RESULTS procedures guides.
3. Increase access security by developing an online submission service that screens for manager authorisation and user training.
4. Amend FRPA s.169 to add a Chief Forester standard for data required to be reported to the ministry.
5. Develop a list of RESULTS performance indicators for the Ministry Service Plan.
6. Implement the RESULTS data correction project.

PENDING ADDITIONAL FUNDING AND HUMAN RESOURCES

7. Establish a field data confirmation program similar to the former silviculture surveys program.
8. Develop standardized quality assurance reports.
9. Create additional reports in the Corporate Reporting System to measure data completeness.
10. Create additional fields in RESULTS to collect field-confirmation metadata.
11. Review all RESULTS fields with respect to current business requirements.
12. Provide increased user help desk and support services.
13. Review and revise RESULTS training modules.
14. Audit user activity in RESULTS (target and random audits) and review access privileges of users with an unsatisfactory number of submissions that do not conform to RESULTS requirements (outside tolerance levels of occasional errors).
15. Develop a certification program for training users with the goal that only certified RESULTS users will receive access to RESULTS in the future.

5. Conclusion

Establishing and implementing a quality assurance framework for RESULTS is a priority for the ministry. A quality assurance framework, resourced with adequate staff and funding, will reduce and/or eliminate risks to the ministry associated with the use of unreliable data to support decisions related to its forest stewardship role under the *Ministry of Forests and Range Act*.

³⁰ The relocation of the previous staff member who acted in this role has resulted in a situation where considerable internal ministry business knowledge previously associated with this position now resides with contractors. Should they cease working with the ministry, the ministry assumes risk associated with loss of internal business knowledge.