FIA Activity Standards Document - Biodiversity Monitoring Standards and Checklist

Effective Date: April 1, 2005

Activity Description - Terrestrial Biological and Physical Monitoring and Aquatic Biological and Physical Monitoring

This biodiversity monitoring standard and checklist applies to all projects initiated under the Information Gathering and Management Component, Monitoring Values for SFM Activity Area -- *Terrestrial Biological and Physical Monitoring;* and *Aquatic Biological and Physical Monitoring*. In addition, RISC standards may apply depending on the specific nature of the project.

To be eligible for FIA funding monitoring projects must comply with this standard and checklist document. It is also recommended that projects be consistent with the accompanying Biodiversity Monitoring Guideline.

This activity standard addresses planning, prioritization and implementation of projects related to measuring baseline information and subsequent measurements to monitor:

a) terrestrial and aquatic biological and physical indicators of sustainable forest management as chosen under the Strategic Resource Planning Component, Sustainable Forest Management Planning Activity Area, Development of Indicators and Targets at the MU Level Activity, or related LRM planning or other strategic planning initiatives; or

b) terrestrial and aquatic biological and physical elements, where the results will be used to assess, analyse, evaluate, or otherwise substantiate the effects, consequences or results of forest practices in an adaptive management process.

Part 1. Standards for Biodiversity Monitoring Projects

1.0 Objectives

1.1 The general objective for terrestrial and aquatic biological and physical monitoring is to evaluate the success of sustaining biodiversity by measuring specific indicators or biological/physical elements, and to contribute to adaptive management of forest practices. The relationship between biodiversity and forest activities is very complex and monitoring must be planned and focused to be effective.

1.2 Subsets of this objective can be examined, e.g., monitoring the effects of using certain silvicultural systems in Caribou habitat. For example, the lichen production might be measured and the population of Caribou might be monitored. The results may be used to improve the effectiveness of forest practices intended to maintain lichen production in the Caribou habitat. The forest management decision might be to continue harvesting using the same or a different system, reduce harvesting, or cease harvesting. The results may also be used to improve regional or provincial guidelines intended for use across the forested land base.

1.3 In certain sustainable forest management processes, the objective is referred to as the criterion.

2.0 Planning

2.1 A monitoring plan (Plan) must be prepared prior to any field work, and must be made available upon request to PwC, MoFR or MoE prior to submission of the

year end report (Report). The Plan must be included in the Report. The Plan must include information on the following:

1. Provide a brief outline of the proposed approach.
2. Identify the management objectives or criteria to be addressed with the monitoring results. Recognize that not all possible questions can be answered because of various constraints (funding, time, practical issues).
3. Specify the indicators to be monitored, and which attributes of these will be measured. For example, if monitoring snags in wildlife tree patches, the following attributes might be measured: species, dbh, height, decay class. Link the indicators/elements to other monitoring efforts where possible, e.g., provincial level biodiversity monitoring, certification schemes, or the FRPA forest resource evaluation program.
4. Identify thresholds for the indicators where possible. Thresholds should be consistent with the description in the accompanying monitoring guideline.
5. Reference the scientific planning process or documents used to select the criteria and indicators.
6. Specify the sample design and statistical significance desired for the proposed monitoring. If the project is innovative, and the sample design and/or statistical significance will be developed as part of the project, mention this in the Plan.
7. Specify the RISC standards that will apply to one of four possible situations:
   a. All applicable RISC standards are followed;
   b. Parts of the applicable RISC standards are followed, specify which part and provide a rationale for the selection;
   c. The entire or partial applicable standards are followed with proposed variances, provide a rationale for the variances;
   d. The proposed standards will be developed as part of the project and will fulfill the requirements for an innovative project. If the project is a continuation of an innovative project initiated in previous fiscal years, under the LBIP, the original innovative work plan must be revised if there are any changes that may affect the standards that will be followed or the subsequent analysis.
8. The repository for the data must be clearly indicated, and is usually specified in the existing RISC standards. All Reports must be submitted to the ministries library, For.Prodres@gov.bc.ca.

2.2 The Plan must be signed by the appropriate qualified registered professional indicating that they prepared or supervised the preparation of the Plan.

3.0 Prioritization

3.1. The highest priority is for Recipients to develop, validate and implement new monitoring tools and techniques that are effective and cost efficient, and are consistent with government's FRPA Forest Resources Evaluation Program. Projects should relate to evaluation or monitoring of the effectiveness of forest practices to sustain biodiversity, fish, wildlife, water or soils values.

4.0 Implementation

4.1. Projects must be implemented to ensure they are repeatable, credible and statistically valid. Sound project management and techniques should be followed.

4.2 Where monitoring projects link to modeling under the *Wildlife, Habitat and Ecosystem Modeling* activity, Recipients might establish ecosystem models to predict indicators of future ecosystem health. The projects must be consistent with the Strategy for Habitat Supply Modeling for British Columbia (http://www.env.gov.bc.ca/fia/biowildlifehat.htm).

5.0 Reporting

5.1 The year end report (Report) must include:

1. The original proposed Plan, highlighting any changes to the proposed Plan owing to decisions made during implementation.
2. A description of the sample design and methods used for measuring and analyses, including any data manipulation that was used, and documentation of the input data (including sufficient details of the collection methods so the project could be repeated).
3. A rationale for the methods used, to demonstrate they are consistent with the stated purpose of the project.
4. An assessment of the effects and effectiveness of the specified forest practices, based on statistical inferences and analyses, as well as modelling where applicable.
5. A description of the proposed or actual scientific peer review of the results.
6. A statement of the validity or usefulness of extrapolating the results (geographically, ecologically, biologically, etc.).
7. A discussion of the lessons learned, documenting how the results will be used to influence forest management decisions.
8. Recommendations for further monitoring.

5.2 All monitoring data (related to land and resources) gathered through the FIA LBIP must be consistent with government approved data content, quality and physical storage standards.

5.3 All resource information gathered in whole or in part through the FIA LBIP will be provided to the Government (Ministry of Sustainable Resource Management) for its operational systems or the LRDW, as per the RISC standard(s).

5.4 The Report must be submitted to the ministries library, For.Prodres@gems5.gov.bc.ca, within one month of the project completion being submitted to PwC.

6.0 General Requirements

6.1 Contractual and Legal Responsibilities:

1. The Recipient must carry out all work consistent with the requirements of the Recipient Agreement, this FIA LBIP Activity Standards Document, and in compliance with the applicable laws of Canada and British Columbia.
2. The Recipient must retain all data, reports, photographs and maps required to be produced by this FIA Activity Standards Document for a period of not less than three years.
3. Despite any Work or improvements on Crown Land that may be performed or made by the Recipient, the sole ownership of all Work Areas and any improvements remains with the Province.

6.2 Qualifications and Responsibilities of Personnel – The Recipient's representative, the Project Coordinator, must have demonstrated skills and work experience in project management and implementation consistent with the nature of the project. This individual has the responsibility to engage an appropriate project team consisting of qualified professionals.

6.3 Based on information collected during forest management planning, if the Recipient deems that the work conducted during a FIA funded project could affect a species or ecosystem at risk, or an identified wildlife (IW) species, they must include documentation in their FIRS submission on where the following information is documented/available (all available sources related to the specific species/ecosystem):

- The goals, objectives and strategies of appropriate species recovery plans; and or
- The designations and management practices under the Identified Wildlife Management Strategy; and or
- Identified and or established Ungulate Winter Ranges (UWR) and objectives; and or
- Other legislated and planning requirements for fish, wildlife and habitat.

Recovery Plans and other existing documents may contain specific standards that should apply to the FIA funded activity, and such standards must be adhered to as part of the FIA project implementation.

Within one month of the project being approved, the Recipient must notify the following contacts and provide them with a copy of the project submission, if requested:

- Recovery Team chair (or designate) (see http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm for a list of chairs); or
- wildlife@victoria1.gov.bc.ca if there is no Recovery Team in place (or contact for Recovery Team chair is not known), or for IW species.

For further information on species and ecosystems at risk, see http://www.env.gov.bc.ca/atrisk/. For further information on identified wildlife, see http://www.env.gov.bc.ca/wld/frpa/iwms/index.html. For information on UWR, or if the Recipient has not historically operated in the area where the FIA funded activity is being implemented, please discuss with your contacts at the MoE regional office.

Part 2. Checklist for Biodiversity Monitoring Projects

This biodiversity monitoring checklist is part of the FIA Activity Standard for monitoring. The purpose is to facilitate FIA Land Base Investment Program project review, approval, and auditing by PricewaterhouseCoopers (PwC), for the Information Gathering and Management Component, Monitoring Values for SFM Activity Area – Terrestrial Biological and Physical Monitoring and Aquatic Biological and Physical Monitoring Activities ("Monitoring").

This checklist is to be used when the Recipient specifically expresses intent to monitor success (effectiveness) in sustaining biological diversity related to forest practices. Such projects may use inventory techniques and RISC standards. However, these projects are distinguished from "inventory" owing to the purposes of monitoring – to document changes to terrestrial or aquatic biodiversity, to identify causes of change, and to contribute to adaptive management of forest practices.

Each step in the checklist connects directly to one of the four steps provided in the accompanying Monitoring Guidelines.

The required Monitoring Plan needs to identify and provide detail for four steps:

STEP 1 – Clear goals, objectives or criteria, and indicators of success.
STEP 2 – Clear connections to forest planning and practices.
STEP 3 – Well-defined monitoring design and protocols.

STEP 4 – Specified feedback to forest management.

Step 1 Clear goals, objectives or criteria and indicators of success

1) **Is a clear description of success stated (e.g., a criterion in the criteria and indicators framework)?** The Recipient must have specified the outcomes desired from management actions. Note the Recipient must first describe 'where they are at' to define movement towards specific outcomes, ie, they must have baseline information or are prepared to collect the baseline information as part of the project.

   The objective of *maintaining well distributed, productive populations of native species, subspecies, and their associated values* is scientifically credible and workable. The Recipient should focus on monitoring priority components of biological diversity (biological richness and its associated values) to be sustained within the tenure or some other designated management area.

   If the project focuses on a different forest management objective, ie, something other than *maintaining well distributed, productive populations of native species, subspecies, and their associated values*, has the Recipient described the scientific rationale and provided peer review of the alternative objective?

   The Recipient should document the appropriate thresholds (as described in the accompanying monitoring guideline) for the indicators chosen, and the level of risk considered acceptable to biodiversity values, to the extent possible. The Recipient should also document the rationale and justification for these metrics, for example identification of the scientific literature or scientific expert used.

2) **Are one (or more) indicators of success clearly defined, including the manner in which they are measured (see Step 3 for manner of measurement)?**

   Three broad classes of indicators useful for defining success in monitoring for biodiversity are recognized. Many monitoring programs will focus on aspects of some or all of these indicators. Some will attempt to relate two or more indicators - e.g. habitat and organisms are obvious combinations.

   A. *Ecological or ecosystem representation* for poorly known species, ecological functions and habitats.

      All ecologically distinct habitat types are represented in areas of the management unit that will not be harvested - to maintain lesser known species and ecological functions.

      The ordination techniques the Recipient is proposing to zone, map and allocate representative ecosystems should be described.

   B. *Habitat* for better-known organisms.

      The amount, distribution, and heterogeneity of habitat and landscape structure important to sustain native species richness are maintained over time. For example, the objective could be to assess whether or not an adequate abundance of snags suitable for Vaux's Swift roosting are maintained over the timber rotation.

      The Recipient should document the known uncertainties when they are proposing to reduce the level of risk, and explain how their definition of appropriate amounts, distribution and heterogeneity of habitat and landscape structure were derived.

C. *Organisms* themselves. These may be sufficiently well known that their responses can guide changes in practice, or so poorly known that information is lacking and needed.

For example, if the purpose is to assess whether or not productive populations and distributions of a native species are being compromised by forest practices, the project might measure abundance and distribution of 1st - year larvae of tailed frogs in relation to practices.

Any organisms being proposed for monitoring should include a clear rationale for their selection, based on high stewardship responsibility and risk to decline from forest practices.

The Recipient should provide the best available information on species presence and absence based on range mapping that informs the sampling protocol.

Step 2 – Clear connections to forest planning and practices

The specific portions of forest planning and practice that are being evaluated for success must be specified. These will be either current practices or, less often, novel practices specifically designed to evaluate potential refinement of efforts to sustain biodiversity.

If current practices are being changed because forecasting is predicting risk to specific species, then quality control standards of data inputs, modeling assumptions of management practices and evaluations of the outputs must be documented including uncertainties of data and interpretations.

3) Have planning and practices specifically meant to sustain biodiversity been clearly defined as part of the sustainable management plan and monitoring plan?

An example could be: Mechanical and chemical management of vegetation will be avoided on 30% of the harvested area to sustain shrub**-** and ground-nesting birds and browsing mammals.

Step 3 – Well-defined monitoring design and protocols

Biological diversity is sufficiently complex that RISC standards are not available for all aspects. Moreover, the complexity often requires innovative combinations of existing RISC standards to be cost effective. The fundamental question is:

4) Does the Monitoring Plan include all the required items and is the project described well enough to be duplicated by others?

The general approach must clearly define one of three basic designs:

1) comparison among alternative management practices to indicate relative success and advantages or disadvantages of the alternatives.
   - e.g., dispersed retention will sustain sufficient shrubs to sustain ground- and shrub-nesting birds without undue consequences to regeneration.
2) evaluation of the generality of an explanatory mechanism to determine if it can be applied to larger and different areas.
   - e.g., Hammond's flycatcher is increased by thinning, but only on sites where understory growth is stimulated by thinning.
3) evaluation of a biologically significant level, or threshold, estimated to be appropriate to stimulate management action.
   - e.g., avoiding mechanical and chemical management of vegetation on 30% of harvested areas is sufficient to sustain ground- and shrub-nesting bird species.

There are generic components of any monitoring program that must be present.

1) Either:
   a) the nature of comparisons is specified (e.g., group versus dispersed retention; group retention with unmanaged forests); or
   b) The mechanism being evaluated is specified (more applicable to simulation studies that are evaluating the generality or accuracy of specified mechanisms/relations); or
   c) A threshold (as described in the accompanying monitoring guideline) estimated to stimulate management action is clearly defined, with its rationale.
2) The monitoring sample design is robust and sufficient to determine effectiveness of planning or practices being evaluated within the area (e.g., BEC variant) to which these will be applied. Experimental designs will be important in evaluating mechanisms or other forms of refinement monitoring, including avoiding confounding among comparisons.
3) The monitoring schedule is clearly defined and supported by a rationale.
4) The sample units employed are specified, including the rationale for their choice.
5) How the data will be archived and made retrievable is specified (data should be georeferenced). If RISC data standards exist then they should be used. If not, then the Recipient should identify the metadata used, the tracking system being proposed, how the information will be quality controlled, collated and archived and available for evaluation.

There are a large number of sub-indicators or measures that could be measured for each indicator. Minimal requirements for selection of sub-indicators or measures include:

1) Ecological or ecosystem representation:
   The methods for defining ecosystem types should be clearly specified (e.g., cluster analysis of site series).

   Background documentation of the process and techniques used to cluster should be made available for evaluation and peer review. The metrics and units of measurement should be specified (e.g., size, shape, forest age).

2) Habitat – There are three broad classes of habitat features for terrestrial or aquatic species:
   Habitat elements: e.g., snags, woody debris, shrubs, hardwoods, pools, riffles;
   Integrative measures of habitat: e.g., vertical or horizontal diversity; and
   Habitat distribution: e.g., patch size, isolation, connectivity, spawning, rearing.

Note: There can be no simple list applicable to all biodiversity questions (e.g., genetic management, poaching, soil productivity, and aquatic environments may all be pertinent). Because of the variety of useful questions that could be asked and the variability in BC's forest types, there is no "correct" set of measurements or units.

What is necessary is that the rationale for the selection of measures is clearly expressed (ideally supported by literature or expert science opinion) and the units are specified (ideally supported by literature or expert science opinion).

3) Organisms:

BC is uncommonly rich in species; moreover the Province currently is evaluating its approach to assigning conservation priorities. Recipients will select species that they believe are informative to the monitoring program or around which unacceptable uncertainty exists.

The minimal requirement, if organisms are being monitored, is that the rationale for monitoring them be clearly expressed (describing why the organism is appropriate to answer the question/comparison, ideally supported by literature or expert science opinion) and that the method of monitoring be clearly described and supported (ideally by literature or expert science opinion).

5) Can and will the selected measures be related to existing forest planning and practice?

The measures being selected for a habitat element, for example, must not only have a rationale for their utility in describing that element, but must be directly related to forest practices.

- e.g., Shrub production increases with canopy removal provided some source is available under the canopy or nearby, and will be encouraged by forgoing vegetation management.

Step 4 – Specified feedback to forest management

The monitoring program or protocol must specify how it connects to forest planning or practice, and explain how measures attained will guide modification of planning or practice. **Without that connection it is an inventory program.** If statutory decisions are required to endorse a change of practice then clear documentation of the data used, and the confidence of the information being brought forward, must be documented for evaluation.

6) Has the Recipient clearly specified how results obtained will guide decisions about forest planning and practice?

The feedback loop is closed as the results are applied back to the initial forest management questions, and revised decisions are made:

- e.g., If large snags cannot be retained within harvestable areas under current practice, alternative forms of wildlife tree retention will be developed.
- e.g., If practice X maintains more windfirm vertical structure than practice Y, then practice X will be increased over the landscape.
- e.g., If the area of productive shrub growth is less than 25% of the harvested area, vegetation management will be further restricted [assumes an initial threshold specified].