

# *Protocol for* 2005 Resource Stewardship Monitoring

Steps for the selection of sites  
under riparian-fish and stand-level  
biodiversity resource stewardship  
monitoring

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Prepared by:  
Wendy Bergerud  
Peter Tschaplinski  
Peter Bradford

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## Purpose of this Document

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This document details procedures for selecting sample sites for resource stewardship monitoring in 2005 for riparian-fish and stand-level biodiversity under the FRPA Resource Evaluation Program (FREP).

## FREP Background

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The objective of FREP is to determine if forest and range policies and practices in British Columbia are achieving government's objectives for FRPA resource values, with a priority on environmental parameters and consideration for social and economic parameters, where appropriate. This will be accomplished by:

- Evaluating the status or trend related to resource and ecosystem values, and determining causal factors;
- Determining whether resource values are being managed in a sustainable manner through standard or alternative forest practices and reporting the results; and
- Recommending options for changes to forest and range policies, practices and legislation, where required.

Resource stewardship monitoring (RSM) is a key component of FREP. It is carried out at the district, or regional level and generally consists of routine overview type monitoring of on-the-ground forest practices to assess whether resource value objectives and/or Forest Stewardship Plan results and strategies are being achieved and/or can be improved. RSM provides valuable information on the status, trends and implementation issues related to specific resource values at the local level. This information identifies "red flags" that may require further investigation and helps focus the efforts of more detailed investigations.

In order to ensure the integrity and usefulness of data collected from RSM, it is important that appropriate direction be provided to field staff to guide them in the selection of sites to be monitored. This protocol for site selection will help ensure that field practitioners select representative sites to reflect the desired sampling populations so that the appropriate data can be collected using an approved scientific method(s). This will ensure that the information relating to a resource value status, trend or causal factor attributed to activities occurring on one site can be compared to the same activities occurring on other sites in the region or province relative to the population being sampled.

## Principles of Site Selection

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A number of statistical design principles were used to develop this site selection protocol. These principles ensure that the data collected and analyzed can be used at multiple scales (district, region and province) with statistical validity and credibility.

### Defining the Population and Strata

The RSM sampling population is the entire population of potential sites<sup>1</sup> that could be sampled for a given resource value. The definition of this population could vary for different values, but must be the same across all districts and regions for each value if regional and provincial statements are to have a solid inferential foundation.

Specific details of the population for each resource value will be determined by the appropriate resource value team (RVT). The definition of the population should clearly describe the criteria by which sites are included or excluded. Examples for riparian-fish and stand-level biodiversity are provided later in this document.

Sites may also be grouped or stratified by various site attributes. When this grouping or stratification occurs prior to sampling in the field and is an integral part of the sampling plan, the strata become part of the definition of the population. Clearly, sites will be stratified by region and district since the sites are selected and sampled within district boundaries. Sites may be further stratified by RVTs after careful consideration of important site attributes. It is preferable that these stratum definitions be consistent across districts and regions and that they relate to the resource value in a significant manner.

When choosing stratifying variables, RVTs must consider some trade-offs. Too many variables and/or too many levels or values for each variable will increase the number of strata and thereby reduce the number of sites within each strata, including the possibility that some strata may have no sites from which to sample. Furthermore, too many strata combinations can unnecessarily complicate the data analysis. As few stratifying variables as possible should be considered. The variables should either make the sampling considerably easier, as in using districts as strata, or substantially reduce the variability of the resource value being measured within the strata as compared to the corresponding variability between strata. As an example, biogeoclimatic subzone might make an appropriate stratifying variable for some resource values.

Strata can also be defined after sampling has been completed by using important site attributes to group sites. For instance, stream type might be a suitable variable for post-stratifying since it is hard to identify whether a cutblock even has a stream much less what type of stream is present prior to the cutblock being visited. Post-stratifying has the advantage of being more flexible during data analysis. On the other hand, there is no control over the number of sites sampled within each stratum using this method, so estimates may not be as good as desired or may be difficult to calculate. Post-stratification can and will be used to help RVTs consider changing the pre-stratification for future sampling.

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1 Note that the term “site” refers to the population units under study. Often, a site will be a cutblock, but this is not always the case.

## Random Sampling<sup>2</sup>

The sites sampled under RSM in 2005 will be selected using simple random sampling (without replacement) within each pre-defined stratum. The primary reasons for using random selection include:

- Sampling result is objective and defensible;
- Sampling errors can be estimated so that confidence limits can be calculated; and
- Determining sample size requirements can be done objectively.

## Sample Sizes

The number of sites sampled within each stratum can vary depending upon available resources, variability in the data, or the expectation of problem sites. For 2005, this value is set at 15 sites per district, although a district may choose to sample more sites. It is possible to determine optimal sample sizes given a variety of assumptions; however, this will not be undertaken until after the 2005 RSM data analysis is completed.

## Targeted Sampling

In some cases, districts may also wish to do some targeted sampling of specific geographic areas, licensees, or other criteria in order to meet immediate operational needs. Targeted sampling has limited value within formal RSM if it does not provide information about the state of the population within a whole district, a region, or the province. It may provide some indication of worst case scenarios, but the targeting itself indicates that we know where policy/practices are most likely breaking down. If we only sample targeted sites, we might miss identifying circumstances where the policy/practices don't work for reasons we did not anticipate.

Data collected through targeted sampling will not be incorporated into the RSM database unless the following conditions are met:

- The target population is one or more of the defined strata for that resource value. This means that the data collected can be appropriately weighted and included during data analysis.
- Sites within the target population or strata are randomly selected with known probability.

From the point of view of the sampling plan, the result of this type of targeted sampling is simply to sample one or more strata more intensively than others.

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2 For more discussion on this topic, see FPRA Evaluator, Technical Note #3 – Why the Units We Select Should be Randomly Selected at: [http://www.for.gov.bc.ca/hfp/frep/repository/FRPA\\_Evaluator-Tech-n03.pdf](http://www.for.gov.bc.ca/hfp/frep/repository/FRPA_Evaluator-Tech-n03.pdf).

## Sampling Procedures

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### Procedures for Selecting Monitoring Sites

1. Each participating district will use the population lists<sup>3</sup> of 200 randomly selected sites generated from the Forest Tenure Administration (FTA). The lists are posted on the Forest Practices Branch FTP server at: [ftp://hfp/mof\\_internal/publish/resource\\_stewardship\\_monitoring](ftp://hfp/mof_internal/publish/resource_stewardship_monitoring).
2. The population lists will be available no later than June 15, 2005; however, in future years they will normally be available by November 30 for the following field season.
3. Districts will begin at the top of the lists and select 15 sample sites working down the list in sequential order.
4. Population selection criteria will be used to select or reject sites from the population list (see below).
5. Districts should follow the rules for deleting sites from the population list (see below).

### Rules for Adding or Deleting Blocks from the Randomly Selected Sample

If a district wishes to collect additional data after completing the first 15 sites on the list, additional sites must be selected continuing on a sequential basis down the list.

Sites should only be removed from the list for very specific reasons which must be recorded. If a site clearly does not really belong to the population, it can be deleted. Questions regarding whether a site is in or out of the defined population should be referred to the Resource Value Team (RVT). One reason a site may be deleted from the population is if active nearby harvesting or other activities in the block make it too dangerous to sample. If there are other reasons for considering deleting a site, these should be discussed with the RVT.

Each RVT may need to develop a protocol for dealing with rulings as to whether sites are within the defined populations to ensure consistent application across districts. RVTs will also need to track any changes to the definitions of the populations since this will affect the data analysis (sampling weights).

### Why Following the Random Order Is Important

It is important for the statistical credibility of the data being collected, and RSM as a whole, that only those sites identified on the list are sampled, and that they are selected in sequential order from the top down.

In general, it is not essential that the chosen sites actually be sampled in the same order they occur on the list, so long as all the sites that were selected get sampled in the

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<sup>3</sup> Specific details on the process used to generate the lists have yet to be determined. It is anticipated that the majority of data will come from the FTA; however, RESULTS data may also be used if up-to-date information is available. These details will be worked out and written up once the procedure is finalized.



required time period (presumably within one field season). Thus, from a practical point of view, selected sites may be sampled in a convenient order based on travel considerations or other reasons.

## Continuous Improvement of the Resource Stewardship Monitoring Site Selection Protocol

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The sampling procedures described in this protocol will be used for the 2005 field season. Upon completion of the data collection and analysis, the procedures will be evaluated to ensure they meet the needs of districts, regions and the province, and are the most appropriate for province-wide implementation of RSM.

## Specific Sampling Populations

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### Riparian-Fish: Site Selection Criteria for 2005 Operational RSMP

Site selection criteria for riparian-fish include:

- Cutblocks limited to those harvested under the Forest Practices Code based on silviculture prescriptions (SPs) approved after June 15, 1997 to ensure that SPs were prepared and forest practices were conducted under full knowledge of Code regulations and the principles and objectives of riparian management guidelines.
- Cutblocks limited to those harvested no later than the end of 2003 to ensure that all streams were exposed to at least two years of post-harvest environmental conditions (e.g., storms).

The sites for the riparian-fish population are actually defined as the individual stream reaches within streams that occur on the sampled cutblocks. It is assumed that all individual streams are statistically 'independent' even if they occur together within one cutblock and/or watershed. Thus, cutblocks will be ignored in the data analysis.

If all of the streams on a cutblock can not be sampled due to their great number then at least one of each stream type present will be sampled. Individual streams to be sampled will be chosen using random selection.

### Stand-level Biodiversity: Site Selection Criteria for 2005 Operational RSMP

Cutblocks will be selected as above for the riparian-fish sites with the addition that the cutblocks must be greater than 2 hectares in size (cutblocks less than two hectares in size will be evaluated under a separate mountain pine beetle monitoring project). If the cutblock meets the above criteria and also contains a stream, it can be assessed for riparian-fish at the same time.

The cutblocks themselves are the sites or population units under study for stand-level biodiversity. No other pre-stratifying variables, other than districts, are anticipated for 2005. Post-stratification during data analysis may identify stratifying variables to consider in the future.

## Contacts

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If you have any questions about this sampling protocol and/or sampling in general, please contact:

Wendy Bergerud	(250) 387-5676 or <a href="mailto:Wendy.Bergerud@gems8.gov.bc.ca">Wendy.Bergerud@gems8.gov.bc.ca</a>
Peter Ott	(250) 387-7982 or <a href="mailto:Peter.Ott@gems7.gov.bc.ca">Peter.Ott@gems7.gov.bc.ca</a>
Peter Tschaplinski (riparian)	(250) 387-3025 or <a href="mailto:Peter.Tschaplinski@gems4.gov.bc.ca">Peter.Tschaplinski@gems4.gov.bc.ca</a>
Nancy Densmore (biodiversity)	(250) 356-5890 or <a href="mailto:Nancy.Densmore@gems2.gov.bc.ca">Nancy.Densmore@gems2.gov.bc.ca</a>
Richard Thompson (biodiversity)	(250) 356-5467 or <a href="mailto:Richard.Thompson@gov.bc.ca">Richard.Thompson@gov.bc.ca</a>
Frank Barber	(250) 387-8910 or <a href="mailto:Frank.Barber@gems6.gov.bc.ca">Frank.Barber@gems6.gov.bc.ca</a>
Peter Bradford	(250) 356-2134 or <a href="mailto:Peter.Bradford@gems1.gov.bc.ca">Peter.Bradford@gems1.gov.bc.ca</a>