Characteristics of a Good Monitoring Protocol

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Why do we need Monitoring Protocols?

A well-developed, field-tested and reviewed **Monitoring Protocol** is a critical component of Quality Assurance for any monitoring program. Quality Assurance can be defined as "the policy, procedures, and systematic actions established for the purpose of providing and maintaining a specified degree of confidence in data integrity and accuracy throughout the lifecycle of the data, which includes input, update, manipulation, and output". The whole purpose of monitoring is to detect and document change over time. When attempting to scientifically detect and document change based on resource sampling, we must use a very consistent and exactly repetitive method of collecting and recording data. Otherwise, it is not possible to determine if the changes observed within the sample data are a result of the method by which the samples were obtained or of actual changes in the resource being monitored. This requires that very detailed and exacting **monitoring protocols** be established at the start of any long-term monitoring project. Monitoring protocols are:

- A key component of Quality Assurance of a monitoring program to ensure that data meet defined standards of quality with a stated level of confidence;
- Necessary for the program to be credible, so that data stand up to external review;
- Necessary to detect changes over time and for the program to survive turnovers in personnel;
- Necessary to allow comparisons of data among places/agencies.

What should be included in a good Monitoring Protocol?

If a protocol is to meet the objectives listed above, it needs to be much more than a detailed description of field methodology. A good monitoring program will be well thought out and have a high probability of detecting change in the resource being monitored. It is important to make a large up-front investment in the development of the monitoring program and to clearly represent this investment in the protocol document. It has been said that designing a monitoring project is a lot like getting a tattoo – you want to get it right the first time, because making major changes later can get messy and will be painful. Careful documentation of the questions being asked; the sampling framework; step-by-step procedures for collecting, managing and analyzing the data; and expectations on how the data will be presented and used are all part of "getting it right the first time". A good monitoring protocol will include extensive testing and evaluation of the effectiveness of the procedures up front, before they are accepted for long-term monitoring.

No matter how much advanced planning goes into protocol development, minor changes and improvements in such things as methodology and approaches to data analysis and reporting are to be expected, and periodic reviews and improvements to protocols should be a part of the program. For this reason, it is recommended that a Monitoring Protocol consist of three parts:

1. The **Protocol Narrative**: an overview of the various components of the protocol, including the resource issue being addressed, measurable objectives, sampling design, field methodology, data analysis and reporting, personnel requirements, training procedures, and operational requirements. Details for the various components should be provided in the SOPs.
2. A series of **Standard Operating Procedures (SOPs)** that are periodically updated and that present the details on how all aspects of the components described in the narrative will be carried out. The SOPs should be written in the form of instructions, with step-by-step details of how to

carry out the procedure. One of the SOPs should explain the procedure for making revisions to the protocol and archiving previous versions, and each SOP should include its revision history. Data sets should also indicate which version of the protocol was being used when the data were collected. The number and content of the SOPs are determined by the Principal Investigators who develop them.

3. **Supplementary Materials** such as example databases, maps and photographs.

Recommended Format for the Protocol Narrative:

Background and Objectives
- Background/history; describe resource issue being addressed
- Rationale for selecting this resource to monitor
- Measurable objectives

Sampling Design
- Rationale for selecting this sampling design over others.
- Site selection
  - Criteria for site selection; define the boundaries or "population" being sampled
  - Procedures for selecting sampling locations; stratification, spatial design
- Sampling Frequency and Replication
  - Recommended number and location of sampling sites
  - Recommended frequency and timing of sampling
  - Level of change that can be detected for the amount/type of sampling being instituted.

Field Methods
- Field season preparations and equipment setup (including permitting/compliance procedures)
- Sequence of events during field season
- Details of taking measurements, with example field forms
- Post-collection processing of samples (e.g., lab analysis, preparing voucher specimens)
- End-of-season procedures

Data Handling, Analysis and Reporting
- Metadata procedures
- Overview of database design
- Data entry, verification and editing
- Recommendations for routine data summaries and statistical analyses to detect change
- Recommended report format with examples of summary tables and figures
- Recommended methods for long-term trend analysis (e.g., every 5 or 10 years)
- Data archival procedures

Personnel Requirements and Training
- Roles and responsibilities
- Qualifications
- Training procedures

Operational Requirements
- Annual workload and field schedule
- Facility and equipment needs
- Startup costs and budget considerations

References

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Guidelines for Ensuring, Maximizing the Quality, Objectivity, Utility and Integrity of Information Disseminated by Federal Agencies

BASIC SUMMARY

- Implements guidelines in section 515 of the Treasury and General Government Appropriation Act for FY 2001

- This Act requires OMB to "provide policy and procedural guidance for Ensuring, Maximizing the Quality, Objectivity, Utility and Integrity of Information Disseminated by Federal Agencies.

- By 10/01/2002, agencies must issue their own guidance for implementation.

- Agencies are directed to prepare two reports:

    - By 10/01/2002, each agency must provide its information quality guidelines that allow the public to seek and obtain correction of data that does not meet federal guidelines. A report on how these guidelines and their parameters must be sent to OMB.
    - Beginning January 1, 2004, an annual report that lists the number and nature of any complaints made. This report is due annually from that point forward.

- Agencies are directed to develop information resource management procedures for reviewing and substantiating the quality of information before it is disseminated.

- In addition, agencies are required to establish administrative mechanisms allowing the public to seek and obtain correction of information disseminated by the agency that does not comply with the OMB or agency guidelines.

- There are four descriptive elements of data: quality, utility, objectivity and integrity – though it is not clear how each term relates to data. Quality is the over-arching characteristic for the other three terms. Utility refers to its usefulness. Objectivity means it is accurate and clear, as well as presented in the proper context. Integrity means it is secure and is not compromised through corruption or falsification.

What does DOI have to do?

- Adopt a basic standard of quality as a performance goal and should take steps to incorporate information quality criteria into agency information dissemination practices.

- Agencies shall develop a process for reviewing the quality of data before it is disseminated.

- Establish an administrative procedure for the public to challenge data.
    - Includes specific time periods for response
    - Allows for an appeals process

- If an agency disseminates influential scientific, financial or statistical information, agency guidelines shall include a high degree of transparency about data and methods to facilitate the reproducibility (within a limited measure of imprecision) of such information by third parties.

- Must designate the Departmental CIO or some other official to handle.

What does NPS have to do?

- Be prepared for the Departmental proposed guidance.

- Begin developing internal procedures in those NPS program areas from which scientific, financial or statistical information is disseminated.

- Particularly where the NPS has data that may be considered controversial, we may have appeals and be asked to explain the quality methods used to produce the information.

- This would inevitably require a high degree of documentation on how the information was developed.

- Designate a lead official for managing this effort – most likely the NPS FOIA officer.

- The NPS CIO's office has already commented on one proposal by the Department that stated that each bureau should set up a separate reporting and tracking mechanism. Our comment was that this was inefficient and that one system should be established for the entire Department.