

RMA-Stewardship Group Environmental Monitoring Data Management Plan Template

WITH INSTRUCTIONS

[NAME OF PROJECT]

Data Management Plan

[VERSION, YEAR]

This data management plan template is intended to accompany the Guidebook titled: Improving Environmental Monitoring Collaborations Through Co-development of Data Management Plans: *A guide for Resource Management Agencies and Environmental Stewardship Groups*. This version of the template is the extended version that includes instructions for how to fill out each section.

This template is a resource to help Stewardship Groups and Resource Management Agencies better collaborate on environmental monitoring initiatives by facilitating co-development of a data management plan. The template should be completed in full prior to any fieldwork being conducted, as the process of co-developing a data management plan – which should include transparent, face-to-face discussions – helps establish rapport and build trust, and may flag potential challenges that could adversely affect the project.

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Participants, Roles, and Responsibilities

Resource Management Agency (RMA) Collaborators

[RESOURCE MANAGEMENT AGENCY]

- Jurisdiction/Mandate: [Include brief description of the legislated jurisdiction of the agency, including any jurisdictional limitations]
- Interest/Expectations: [Include a brief description of why the RMA is interested in collaborating on the project and what they hope to gain from participation]
- Role and responsibilities: [Summarize the role and commitments that the RMA has agreed to]
- Resources/Capacity: [Identify the resources the RMA brings to the table (e.g., scientific expertise, skills) and any limitations (e.g., available time and/or financial resources)]
- Primary point(s) of contact: [Designate 1-2 person(s) to be the RMA's liaison (the liaison will be responsible for forwarding information to and from other relevant RMA staff); include the name, job title, and contact information, including preferred method of contact]

Repeat for each RMA collaborator

Stewardship Group (SG) Collaborators

[STEWARDSHIP GROUP]

- Group focus/Mandate: [Include brief description of the SG's focus (e.g., stream stewardship) and mandate (if applicable)]
- Interest/Expectations: [Include a brief description of why the SG is interested in collaborating on the project and what they hope to gain from participation]
- Role and responsibilities: [Summarize the role and commitments that the *collective* SG has agreed to (e.g., facilitate data collection for x, y, and z parameters); specific commitments of individual participants are clarified in subsequent sections of the DMP]
- Resources/Capacity: [Identify the resources the SG brings to the table (e.g., local knowledge) and any limitations (e.g., available time and/or financial resources)]
- Primary point(s) of contact: [Designate 1-2 person(s) to be the SG's liaison (the liaison will be responsible for forwarding information to and from the rest of the SG); include the name, position (if applicable), and contact information, including preferred method of contact]

Repeat for each SG collaborator

Code of Conduct

Collaboration is necessary to tackle large, interdisciplinary problems; and it is at the interface of disciplines that truly creative, innovative problem-solving takes place. However, collaboration can also be challenging and, at times, frustrating; and a collaboration is destined to fail if respectful boundaries are not maintained.

Participants in this collaboration have agreed to the following:

- To participate in good faith
- To be inclusive and treat each other with patience, compassion, and respect; including respecting the stated limitations of others (e.g., regarding time commitments)

- To refrain from use of foul language
- To maintain open, honest, two-way communication and feedback, free from unfair repercussions
- To be transparent about concerns and limitations
- To recognize that we are a team working towards a shared goal

The above list is an example only. The collective group, including all collaborators, should work together to create the Code of Conduct for the project; and all must be in agreement before proceeding

Project Description, Goals, and Objectives

Project Description:

- Project name:
- Project purpose:
- Proposed project timeline: [Recommend to include Gantt chart that includes timeline for project as a whole and for each component of the project; e.g., procurement of equipment, installation of equipment (if applicable), monitoring start date (and end date, if applicable), etc.]

Goals and Objectives:

1. [GOAL]

- Objective 1:
- Objective 2:
- ...

Indicator(s) of Success: [Specify how you will know you have achieved this goal, including which metric you will use to evaluate]

- Metric:

2. [GOAL]

- Objective 1:
- Objective 2:
- ...

Indicator(s) of Success: [Specify how you will know you have achieved this goal, including which metric you will use to evaluate]

- Metric:

Repeat for all goals. If each goal is predicted to have a unique timeline, timelines and/or Gantt charts can be included for each goal

Before proceeding, consider the following:

- Are there any other RMAs that should be involved in order to meet the project objectives? If yes, involve said RMAs before proceeding.

- Are the intended end-users different than the RMA and Stewardship Group Collaborators? If yes, involve the intended end-users before proceeding.

Metadata and Documentation

Metadata

Metadata that must be recorded for all parameters, the format in which they are to be recorded, and what device is to be used (if applicable) are:

- Date: [e.g., DD-MM-YYYY]
- Time: [e.g., 24 hour]
- GPS coordinates: [e.g., decimal degrees; using Smartphone]
- Etc.

Metadata that must be recorded for specific parameters only, the format in which they are to be recorded, and what device is to be used (if applicable) are:

[PARAMETER]

- [METADATA]: [FORMAT; DEVICE]
- Etc.

Repeat for all parameters to be monitored

Equipment and Maintenance Record

Have a dedicated binder or shared digital document where equipment and maintenance records are to be maintained. Record how often equipment must be maintained (include marked calendar, if appropriate), relevant protocols, and materials needed in the record binder or document, for reference.

Location of Equipment and Maintenance Record: [e.g., location of digital document or hard-copy]

Information recorded at time of maintenance for each piece/type of equipment:

[PIECE/TYPE OF EQUIPMENT]

- Description of work: [Brief description of what was done]
- Date: [e.g., DD-MM-YYYY]
- Personnel: [Who did the maintenance work]
- Date of next scheduled maintenance:
- [Additional metadata that are relevant for the equipment]

Repeat for all pieces/types of equipment used

Quality Assurance/Quality Control Record

Have a dedicated binder or shared digital document where the QA/QC record is to be maintained.

Location of QA/QC Record:

Information that must be included in record:

- Changes to protocols or methods:
 - Approval process: [Document what must occur, and who must be in agreement, prior to modifying or changing any protocols; e.g., a comparison of current method and proposed method to determine if resulting data are comparable]
 - Description of change to protocol or method:
 - Date protocol or method was changed:
 - Reason for changing protocol or method:
- Training:
 - [Indication of whether or not training is mandatory (including refresher training)]
 - [Description of training and refresher training (who, what, when, where, why, and how), including who provides the training, what skillsets are taught, how frequently training sessions are available (include routine dates, if applicable), where training takes place, why the skillsets are important to learn, and why the methods of training are the most appropriate.]
 - [Additional information relevant for training]

Protocols, Methods, and Materials/Equipment

[PARAMETER]

Sampling Plan

Metric: [Record what you will be measuring; e.g., parts per million, degrees C]

Target/Acceptable range: [e.g., maximum cfu (colony forming units) of E. coli per 100mL, as per Provincial water quality guidelines]

Limit of acceptable change:

Person(s) responsible for data collection/sampling:

Method of data collection/sampling: [Brief description; details are covered in subsequent section]

Data will be recorded (e.g., by hand, tablet, digitally):

Frequency of sampling/recording (e.g., hourly, weekly):

To ensure continuity of data collection and avoid gaps in the dataset: [include description of measures taken, e.g., have backup volunteers on-call; if applicable, details can be described in the 'Communication Plan' section]

Materials and Equipment

[ITEM]

- Purpose/function of item:
- Quantity: *Recommended to purchase extra equipment if there is a risk of damage, failure, theft, or loss*
- Cost per item:
- Lifespan:

- Purchased from: [Company name, name of company representative (if applicable), contact information]
- Delivery time [if applicable]: [The approximate amount of time it takes from the time an order is placed to the time the item arrives]
- Person responsible for acquiring item(s):
- Additional notes (e.g., batteries required):

Repeat for all items, including accessories needed for equipment. Information can also be documented in a spreadsheet to allow for convenient creation of budget

Maintenance of Equipment

[Clearly outline what protocols are to be followed to maintain equipment (if applicable), such as battery replacement, cleaning, etc.; the frequency at which maintenance must occur; and who is responsible for each task. Include also the reason(s) why these methods were chosen and the reason(s) why each step is important to follow.]

Prior to Data Collection

[Include step-by-step instructions for everything that must occur prior to data collection for this parameter, including assembly and/or calibration of equipment, recording of serial numbers (if applicable), labeling (if applicable), etc.; include also the reason(s) why these methods were chosen and the reason(s) why each step is important to follow. For each task, clarify who is responsible for completing the task.]

Quality Assurance

[Clearly outline what protocols must be followed prior to data collection to ensure the quality of the data.]

During Data Collection

[Include step-by-step instructions for everything that must occur during data collection for this parameter; include also the reason why these methods were chosen and the reason(s) why each step is important to follow. For each task, clarify who is responsible for completing the task.]

Quality Assurance

[Clearly outline what protocols must be followed during data collection to ensure the quality of the data.]

After Data Collection

[Include step-by-step instructions for everything that must occur immediately following data collection for this parameter, prior to data being transferred and stored (e.g., having someone review the data for abnormalities or errors, scanning of data sheets); include also the reason(s) why these methods were chosen and the reason(s) why each step is important to follow. For each task, clarify who is responsible for completing the task.]

Quality Assurance

[Clearly outline what protocols must be followed immediately following data collection to ensure the quality of the data.]

Transfer of Samples to Laboratory (if applicable)

Laboratory that samples will be transferred to:

Business hours of laboratory:

Person(s) responsible for transferring samples:

To ensure sample preservation... [describe the timeframe in which samples must be delivered to the laboratory, under what conditions they must be transferred (e.g., on ice), and any other pertinent information related to sample transfer and preservation].

Quality Assurance

[Clearly outline what protocols must be followed to ensure sample preservation and integrity.]

Laboratory Analysis

[Include a copy of the laboratory's protocols and methods. Request to be notified and provided with an updated copy should any changes to protocols or methods occur, including a record of what changes were made and the date changes occurred. Document any changes that occur.]

Quality Assurance

[Include a copy of the laboratory's QA/QC procedures. Request to be notified and provided with an updated copy should any changes to QA/QC procedures occur, including a record of what changes were made and the date changes occurred. Record said changes in the QA/QC Record.]

Repeat for all parameters to be monitored

Before proceeding, confirm with the intended data end-user(s) that the stated protocols and methods – including quality assurance protocols – are sufficient and that, if volunteers adhere to the stated protocols, the end-user(s) will view the resulting data as credible. If the stated protocols and methods are not deemed sufficient, work with the end-user(s) to determine what needs to occur in order for the data to be viewed as credible

Data Transfer, Storage, Organization, and Protection

[PARAMETER]

Transfer

Following data collection, data will be transferred to: [Name of person and/or organization]

Person(s) responsible for data transfer (e.g., laboratory personnel, volunteers):

Method of data transfer (e.g., email):

Upon receiving the data, the receiving person will: [Include a concise list/brief description of tasks, including items such as 'notify the sender that the data have been received', 'manually enter the data to database', etc.]

Storage and Organization

Data will be stored: [Location]

File format will be:

Person(s) responsible for storing and organizing data:

Data organization will consist of: [Describe how the data will be organized, e.g., in folders labeled by parameter, location, site name; how files will be named, e.g., site name-serial number-date; and other pertinent information]

Protection

[Describe how the data will be protected from loss or destruction. Examples include storing hard copies in a different building than digital storage (e.g., hard drives) and/or backing up data to the Cloud]

Person(s) responsible for ensuring the data are protected:

Person(s) allowed to access the data include:

Data will be backed up to: [Location]

Backups will occur: [Frequency; automated or manually]

Backups and/or copies of the data will be stored: [Location]

In the event the data are lost: [Provide steps for how to recover data using backed up copies]

Mechanisms for protecting the data in the event of an adverse change in political climate include:

Repeat for all parameters to be monitored

Data Analysis/Statistical Power

***It is recommended that a statistician be consulted and power analysis performed to determine the optimal sample size and appropriate level of error and variance. Doing so is an investment, as it will increase the efficiency and efficacy of monitoring efforts. Further, consideration should be given to the type 1 error rate that is applied, as utilizing the conventional type 1 error rate of $\alpha=0.05$ may result in substantial and unnecessary risk to the ecosystem being monitored^{1,2*}**

[PARAMETER]

- Target/acceptable range: [E.g., maximum cfu (colony forming units) of E. coli per 100mL, as per Provincial water quality guidelines]
- Limit of acceptable change:
- Statistician consulted (if applicable): [Name and position]
- Results of consultation: [Include recommendations of statistician regarding quantity and quality of data, among other information, required for meaningful analysis]
- Person(s) responsible for data analysis:

¹ Field, S.A., Tyre, A.J., Jonzén, N., Rhodes, J.R., & Possingham, P. (2004). Minimizing the cost of environmental management decisions by optimizing statistical methods. *Ecology Letters* 7, 669-675.

² Legg, C.J. & Nagy, L. (2006). Why most conservation monitoring is, but need not be, a waste of time. *Journal of Environmental Management*, 78, 194-199.

- Method of analysis: [Provide step by step instructions on how the analysis is done, including which statistical test will be performed; any manipulation of data that will occur, e.g., averaging, converting, other calculations; which programs are used, e.g., Excel, R; and include a copy of any code/script or formulas used (this will ensure continuity of analysis in the event of staff or volunteer turnover)] ***Ensure instructions are clearly written in layman’s terms***
- This method was chosen because:

Repeat for all parameters

Before proceeding, confirm that the stated Protocols and Methods will allow for a change in magnitude less than or equal to the abovementioned limits of acceptable change to be detected

Data Sharing

The intended data end-users are: [List RMAs or other institutions]

[PARAMETER]

Those who will have access to the data include:

Privacy concerns (if applicable): [Clarify if the data can be freely shared with others, other than the intended end-user(s)]

Protocols to maintain privacy and/or obtain permission for sharing data include (if applicable): [Describe what must occur and/or who must provide permission prior to data being shared with third parties]

[INTENDED END-USER]

Person(s) responsible for sharing data and/or results of analyses with end-user:

Method of data sharing: ***Consult end-user***; describe how the data end-user would like the data and/or results of analyses shared with them, e.g., raw data, in a report; and how the data/results will be shared, e.g., by email, hard copy]

Timeline/deadlines: [Indicate when the end-user must receive the data and/or results of analyses, e.g., monthly, quarterly, by a specific date/deadline]

Repeat for all intended end-users; note that ‘the public’ can be an intended end-user

Repeat for all parameters

Linking the Data to Action

[PARAMETER]

[INTENDED END-USER]

The data will be used in the following processes: [Identify process, e.g., resource management processes, research initiatives].

Actions taken by [end-user] in response to measurements that are outside the stated 'acceptable range' and/or exceed the stated threshold include: [Describe steps that will be taken, including estimated timelines].

Repeat for all intended end-users

Repeat for all parameters

Public Education

Public engagement and/or education activities will include: [Describe the target audiences, approaches to be taken, activities or events, which results will be shared, and proposed timelines]

Person(s) responsible for planning and implementing activities:

Communication Plan

Meetings

Meetings will be held: [State frequency; e.g., monthly, quarterly. ***Recommended to have routine meetings with predetermined dates/times; e.g., the first Tuesday of the month***]

Purpose of meetings:

Roles and responsibilities:

- Chairing/Co-chairing:
- Booking the meeting room or initiating the video-conference:
- Recording minutes:
- Distributing minutes: [Clarify who will distribute the minutes and how they will be distributed, including to those who could not attend the meeting]

Communication Regarding Data Use

Stewardship Groups must be notified if, and for what, their data are used (including, but not limited to, the intended uses outlined in the "Linking the Data to Action" section).

[INTENDED END-USER]

Person responsible for communicating to Stewardship Group(s) that data were used:

Method of communication (e.g., email Stewardship Group liaison):

Coordination in the Event a Person Cannot Fulfill Their Commitment(s)

If a volunteer cannot fulfill their commitment (e.g., cannot collect samples on a specified day), they must contact [person]. Please give at least [amount of time] notice if and when possible.

If a RMA collaborator cannot fulfill their commitment, they must contact [person]. Please give at least [amount of time] notice if and when possible.

Include any other relevant information and protocols

Support for Volunteers

The following person(s) are available to provide support to volunteers in the event of challenges or questions related to:

- Data collection: [Name of person, contact information]
- Damaged or nonfunctional materials and equipment: [Name of person, contact information]
- *Continue for all expected/possible challenges*

Public Engagement and Outreach

Methods for engaging the public will include: [Describe each communication method (e.g., social media, conferences) for each target audience, e.g., students, homeowners; as well as timelines].

Person(s) responsible for public engagement and outreach: [Specify person(s) responsible for each task]

Additional Stakeholders

[STAKEHOLDER]

Relevance: [Describe why engaging with this stakeholder is likely to be beneficial; e.g., a company or industry whom collaboration must occur to reduce inputs to a stream]

Representative: [Name, position, and contact information]

[Stakeholder] would like to be informed/kept up-to-date on:

Communication will consist of: [Describe how, and how often, communication will occur; e.g., meetings, emails, reports]

Person responsible for maintaining communication with [stakeholder]:

[Stakeholder] has offered to contribute: [If applicable, describe the financial, in-kind, or other form of support offered by the stakeholder]

Repeat for all additional stakeholders

Training

For volunteers participating in this monitoring initiative, training is [mandatory/optional] and refresher training is [mandatory/optional; provide frequency if mandatory, e.g., annual].

Person(s) responsible for training volunteers:

Training will be offered: [Frequency and/or dates]

Refresher courses will be offered: [Frequency and/or dates]

Training will consist of/cover the following skills: *Be specific and thorough when describing how training is conducted*

- [Skill]: [Describe method of training; include details such as location, e.g., in the field or in a class, and other relevant information].
- *Repeat for all necessary skills*
- Data management and recording of metadata: [*Recommended; see Guidebook*]

Documents provided to participants include: [List any field-books, cheat-sheets, or other materials provided]

Upon completion of training, participants will receive: [E.g., a certificate or other proof of completion; can include amount of time certificate is valid until, if applicable]

Budget and Funding

Funding Sources: Details and Stipulations

[SOURCE]

- Date application submitted:
- Date funding received:
- Amount: [Dollar amount received]
- Funding can be used for:
- Funding cannot be used for:
- Required reporting: [Document what the funder requires, including updates, reports, etc.]
- Additional important information: [E.g., application dates for subsequent years of funding]

Repeat for all funding sources (can also document as a spreadsheet)

Budget

Include a spreadsheet that clearly outlines initial and ongoing costs, and which sources of funding will contribute to which costs

Evaluation

Evaluation of the Project/Collaboration

Evaluation of the project/collaboration will consist of: [Describe the process of evaluation, including what methods will be used, e.g., survey, in-person meeting. ***Recommended to include an "Achievements" section that describes social, political, and environmental achievements that have occurred as a result of the project***]

Evaluation will occur: [Frequency, e.g., annually; specify month]

Person(s) responsible for implementing evaluation:

Results of the evaluation will be discussed by all parties at [location/method of communication and date/timeline; e.g., at the Annual General Meeting in (month)]; during which a plan to address concerns will be made.

Evaluation of the Data Management Plan

Evaluation of this Data Management Plan will consist of: [Describe the process of evaluation, including what methods will be used, e.g., survey, in-person meeting]

Evaluation will occur: [Frequency, e.g., annually; specify month]

Person(s) responsible for implementing evaluation:

Results of the evaluation will be discussed by all parties at [location/method of communication and date/timeline; e.g., at the Annual General Meeting in (month)]; during which a plan to address concerns will be made.

Person(s) responsible for updating this Plan following the group discussion:

Evaluation of Training

Evaluation of training methods will consist of: [Describe the process of evaluation, including what methods will be used, e.g., feedback forms, audit by third party]

Evaluation will occur: [Frequency, e.g., every three years]

Person(s) responsible for implementing evaluation:

Results of the evaluation will be discussed by all parties at [location/method of communication and date/timeline; e.g., at the Annual General Meeting in (month)]; during which a plan to address concerns will be made.

Appendices

RMA Collaborator Jurisdiction, Mandates, and Limitations

[If deemed necessary, provide a more detailed summary of RMA collaborator(s)' jurisdiction, mandates, and limitations to avoid potential confusion regarding actions that can be taken in response to results of analyses; and to streamline bringing new volunteers up to speed]

Background Information

[Summarize what is known about the resource/ecosystem being monitored; provide sources/references]