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Broadening Participation in Biological Monitoring: Handbook for Scientists and Managers

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The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

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Cover photograph by Eric T. Jones.

Abstract

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Participatory (collaborative, multiparty, citizen, volunteer) monitoring is a process that has been increasing in popularity and use in both developing and industrialized societies over the last several decades. It reflects the understanding that natural resource decisions are more effective and less controversial when stakeholders who have an interest in the results are involved in the process. An adequate number of such projects have now been organized, tried, and evaluated such that sufficient information exists to recommend a comprehensive approach to implementing such processes. This handbook was written for managers and scientists in the United States who are contemplating a participatory approach to monitoring biological resources, especially biodiversity. It is designed as a how-to manual with discussions of relevant topics, checklists of important considerations to address, and resources for further information. Worksheets for developing, implementing, and evaluating a monitoring plan are posted on a companion Web site. The subject matter is divided into 3 stages of a monitoring project encompassing a total of 22 topical modules. These modules can be used in any sequence on an ongoing basis. Stages and modules include (1) planning—documentation, goals, indicators, collaboration, decisions, context, organization, participants, communication, incentives, design, and resources; (2) implementation—training, safety, fieldwork, sampling, data, and quality; and (3) followthrough—analysis, reporting, evaluation, and celebrations. Collaboration always involves colearning, so documenting choices, plans, and activities with the Web site worksheets is integral to the manual's effectiveness.

Keywords: Participatory inventory, participatory monitoring, participatory research, biodiversity, collaborative monitoring, multiparty monitoring, monitoring plan, forest managers, scientists.

Preface

The importance of inventories (one-time enumerations) and monitoring (repeated inventories or observations to detect change over time) for conserving and managing the biodiversity (biological diversity) of temperate and boreal forests was recognized in an international cooperative effort called the Montréal Process.[1] International working groups, through a series of meetings, developed criteria and indicators of sustainable forest management. By their definitions, a criterion is a category of conditions or processes by which sustainable forest management could be assessed. Such criteria are characterized by a set of related indicators that are monitored periodically to assess change. Criterion 1 (the first of six) is the Conservation of Biological Diversity. Indicators are quantitative or qualitative variables that can be measured or described and that when observed periodically, demonstrate trends. Monitoring is the periodic and systematic measurement and assessment of change in an indicator. Hence this international team of experts selected the monitoring of biodiversity as their first means of ascertaining sustainable forest management. Forestry organizations worldwide are now adapting the Montréal Process criteria and indictors to improve and evaluate their forestry practices. A review of global progress and needed work with indicators is provided.[2]

In 2002, the National Commission on Science for Sustainable Forestry (NCSSF) was organized under the auspices of the National Council for Science and the Environment and was sponsored by the Doris Duke Charitable Foundation, Surdna Foundation, The David and Lucile Packard Foundation, and the National Forest Foundation. The NCSSF's mission is "to improve the scientific basis for the development, implementation, and evaluation of sustainable forestry in the United States." The NCSSF focused on the Montréal Process criterion 1: Conservation of Biological Diversity. The commission emphasizes developing knowledge and tools directly relevant to improving sustainable forestry practices on the ground over the next 5 years. The scope of their mandate includes the needs of managed forest lands, industrial and nonindustrial, in the continental United States. This mandate is being carried out through a series of annual competitive grants that are progressively focused on "syntheses of knowledge, surveys of decision-makers' needs, assessment of applications, and development of practical tools."[3]

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[1] Montréal Process Working Group. 1999. Criteria and indicators for the conservation and sustainable management of temperate and boreal forests. 2nd ed. Ottowa, ON: Montréal Process Liaison Office. http://www.mpci.org/. (25 August 2006).

[2] Balmford, Andrew; Bennun, Leon; Brink, Benten [and others]. 2005. The convention on biological diversity's 2010 target. Science. 307: 212–213.

[3] National Commission on Science for Sustainable Forestry. 2005. Science, biodiversity, and sustainable forestry: a findings report of the National Commission on Science for Sustainable Forestry (NCSSF). Washington, DC. 52 p.

In June 2002, the Institute for Culture and Ecology (IFCAE) received a grant from the commission to study the relationship between nontimber forest products (NTFP) and biodiversity in the United States. A key finding was that national forest managers and state forestry departments currently lack the capacity to develop and implement NTFP inventory and monitoring programs, but that precedents exist in other natural resource management arenas, as well as in NTFP management, for involving harvesters in participatory inventory and monitoring.[4] Through a series of meetings with NTFP stakeholders, IFCAE enumerated recommendations for the establishment of participatory NTFP inventory and monitoring processes.[5] [6] Challenges to monitoring the vast array of NTFPs that are harvested from forests in the United States mirror the challenges of monitoring the even greater number of species (biodiversity) in any given forest ecosystem. In both cases, however, managers have a resource they can tap to help them in their task, namely other interested parties, or "stakeholders." As a followup to the recommendations regarding participatory monitoring, NCSSF sponsored this project to develop tools for managers to use in their quest to sustain forest biodiversity through effective monitoring.

Definitions of biodiversity differ, but it is defined in this publication as the variation among all living organisms, including diversity within species (genetic), between species, among habitats and ecosystems, and within the biosphere.[7] [8] This biological heritage, of which we are an integral part, provides all our food resources, much of our energy, many materials, breathable air, climate control, regulation of hydrologic cycles, protection from solar radiation, and the many wonders of sharing our planet with related beings. The numerous ways in which human activity has reduced biodiversity, especially in the last century, have led to a wide range of international efforts to develop sustainable societies that do not further degrade the diversity or function of life on Earth.

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[4] Jones, Eric T.; McLain, Rebecca J.; Lynch, Kathryn A. 2004. The relationship between nontimber forest product management and biodiversity in the United States. Portland, OR: Institute for Culture and Ecology. 59 p. http://www.ifcae.org/projects/ncssf1/. (25 August 2006).

[5] Lynch, Kathryn A. 2004. Workshop guide and proceedings: harvester participation in inventory and monitoring of nontimber forest products. Portland, OR: Institute for Culture and Ecology. 151 p. http://www.ifcae.org/projects/ncssf1/. (25 August 2006).

[6] Lynch, Kathryn A.; Jones, Eric T.; McLain, Rebecca J. 2004. Nontimber forest product inventorying and monitoring in the United States: rationale and recommendations for a participatory approach. Portland, OR: Institute for Culture and Ecology. 50 p. http://www.ifcae.org/projects/ncssf1/. (25 August 2006).

[7] Lovejoy, Thomas E. 1997. Biodiversity: What is it? In: Reaka-Kudla, M.L.; Wilson, D.E.; Wilson, E.O., eds. Biodiversity II. Washington, DC: Joseph Henry Press: 7–14.

[8] Noss, Reed F.; Cooperrider, Allen Y. 1994. Saving nature's legacy: protecting and restoring biodiversity [Defenders of Wildlife]. Washington, DC: Island Press. 416 p.

Inventory and monitoring programs face a particularly difficult challenge when their focus turns to biodiversity. The magnitude of the challenge lies in the sheer numbers of organisms in any given ecosystem and their diverse natural histories. Various approaches have been used to address these difficulties, but monitoring biodiversity can stress the budget and resources of any land management agency, organization, or company. At the same time, stakeholders interested in the sustainable management of forests often have an interest in and sometimes already engage informally in biological monitoring, and have knowledge and skills that can help future projects meet monitoring goals.

Although we discuss aspects of participatory approaches that relate specifically to biodiversity monitoring, almost all the topics we cover apply equally well to a broader topic of biological monitoring. We therefore chose to target a wider audience of managers and scientists by focusing on biological monitoring in general and addressing biodiversity monitoring as an important subset of monitoring issues.

Contents

Introduction

The guidelines in this handbook are specifically designed to help forest managers and scientists address the challenge of inventorying or monitoring biological phenomenon (especially biodiversity), by providing a "how-to" manual for incorporating other participants in such projects and for documenting that process. Specifically, these guidelines are intended for use on discrete monitoring **projects** that could also be parts of a larger monitoring **program.** Some projects within a monitoring program might lend themselves to involving participants, whereas other projects might not. These guidelines will help managers and scientists decide which are appropriate for a participatory approach and offer guidance for broadening participation.

Throughout these guidelines we use a number of related terms such as participants, collaborators, stakeholders, and sponsors. These terms are interpreted differently throughout the literature and organizations referenced herein, so we define our usage as follows:

- Stakeholders are all individuals and organizations that have an interest in the project, its outcome, and its products, regardless of whether they are directly involved or not.
- Participants are any stakeholders actively involved in a project. Depending on the level of their involvement they might or might not have input into the design or implementation of the project. For the purpose of these guidelines, we define "participants" as lacking decisionmaking authority in the project.
- Collaborators are any stakeholders actively involved in the management or administration of a project. They have or share decisionmaking authority.
- Sponsors are any organization or group providing official long-term financial or in-kind support of a project, regardless of active participation.

Managers and scientists might consider a participatory approach to monitoring for a variety of reasons, including stretching limited resources, building understanding among user groups, improving community relations, building cohesion through group learning, reducing conflict and litigation, providing educational opportunities, supporting community development, addressing public concerns, or incorporating local and traditional knowledge into monitoring designs. Participatory or collaborative monitoring may be an effective way to meet National Environmental Policy Act (NEPA) requirements, for example. Once other stakeholders are involved, however, the spectrum of project goals may change according to their unique interests and motivations. Participation helps pool intellectual and physical resources and converts potentially adversarial relationships into mutually beneficial ones. Participatory monitoring is inherently collaborative in the sense that we choose to work together to reach common goals. Participation can be initiated and sponsored by land management agencies and organizations, community groups, resource users, government agencies, nongovernment organizations, or special interest groups. In "Annotated References" and appendix 1, we list references and organizations that have materials on collaboration specific to their interests or

situations. Often participation is described as a spectrum with different levels of relative responsibility and control that are arranged in categories such as consultation, cooperation, collaboration, or colearning; although each participant's role often overlaps these categories and changes over time.

Although these guidelines (and the companion curriculum, app. 3) are primarily designed for forest managers and scientists in the United States who wish to start participatory biological monitoring projects, or who would like to incorporate other participants into ongoing projects, we believe that they will also be useful for community groups or other organizations that want to initiate their own participatory monitoring projects. Similarly, the guidelines also should be widely applicable to other forms of natural resource monitoring.

We discuss sampling designs and methods only to the extent that such topics pertain to involving participants. The first reason is that statistical considerations and the details of species and ecosystems must be tailored to the specific project and its context. Secondly, voluminous information exists on monitoring methods and statistical designs. Elzinga and others (2001) and Mueller and others (2004) are good examples. Third, most forest management organizations already have specialists on their staff, or appropriate expertise can be obtained. Not all such experts, however, are familiar with how participants differ from employees in practical or logistical considerations, so reference to this handbook will allow them to make better decisions about sampling designs and methods.

While preparing the guidelines, we encountered a wide array of pertinent and useful resources for designing participatory monitoring projects. Much can be learned from the numerous organizations that have compiled syntheses of lessons learned. We discuss the focus and applicability of each resource in our "Annotated References" section and appendix 1. The information available in these documents and on the organization Web sites, however, usually differ from this handbook in one or more of the following ways. Some are focused on helping community groups or other organizations (rather than managers) create their own monitoring projects. Some concentrate on sampling designs and methods for certain organisms or environmental conditions. Others concentrate on overseas sustainable development activities. In most instances, the participants, context, and monitoring goals are predefined. None of the other resources that we have encountered provide a generic, comprehensive, and broadly applicable "how-to" manual for managers to use in planning, implementing, documenting, and evaluating a participatory monitoring project. We hope the user will find these guidelines to be a versatile and useful tool that engages interested stakeholders in becoming participants, collaborators, or sponsors in projects that monitor the biological diversity of forests in the United States.

A teaching curriculum is available that training personnel can use to instruct managers on effective use of this handbook.

These guidelines also are accompanied by a teaching curriculum that training personnel can use to instruct managers on effective use of this handbook for planning, implementing, documenting, and evaluating participatory monitoring projects (see http://www.ifcae.org/projects/ncssf3/).

How to Use This Handbook

Design

The guidelines in this handbook are designed for ease of use; that is, as a "how-to" manual for starting or supporting a participatory monitoring project. The following tabulation shows the handbook's two parts: a set of participatory monitoring guidelines and documentation workbook forms available on the project's Web site (app. 3).

The guidelines contain:	**Workbook forms allow the user to:**
Topical modules that can be referenced as needed	Document a monitoring plan
A brief discussion of the important aspects of each topic	Track plan implementation progress
Citations relevant to the module's topic	Collect information to evaluate the project
Checklists of relevant considerations	Ensure transparency and build trust by collaborating on decisionmaking
Annotated references	Enhance data credibility with documented protocols and plans
A list of pertinent organizations	

The guidelines were designed as a comprehensive resource for use by managers and scientists new to participatory processes as well as for advanced users who would benefit from having a reference tool. Thus, the way in which the handbook is used will in part depend on the prior experience managers or scientists have with participatory monitoring. Ideally, users will have participated in a workshop in which the training curriculum was used. The curriculum (app. 3) was specifically developed as a companion product to assist trainers with introducing users to the guidelines and workbook, and to help them get started on designing a participatory project.

The guidelines are a comprehensive resource for use by managers and scientists new to participatory processes as well as for advanced users who would benefit from having a reference tool.

Getting started—
The guidelines are organized according to the broad stages of a monitoring project: planning, implementation, and followthrough. Within each section are modules focused on particular topics that will be most useful to consider during that stage. Please see the "Modules Overview" section for a quick synopsis of the content of the guidelines, including the concepts covered in each module and how they interrelate. Stakeholders might be advantageously engaged at any stage of a monitoring project, and relevant modules can be consulted in any sequence. Most importantly, the "Modules Overview" will help users quickly decide if a participatory approach for a given project is appropriate.

Documentation—
Integral to the use of these guidelines is documenting decisions, events, resources, protocols, and plans relevant to each topic by addressing checklist items. Doing so collaboratively is an excellent exercise in building trust, transparency, effective

communication, and clear agreements. Sharing such documentation as it accrues can provide all participants with a continual record of the project. Shared information can be useful for avoiding or resolving conflicts and disagreements. Such documentation also demonstrates a thoughtful and systematic approach to data quality. The project record also can be used to evaluate progress and determine needed improvements. Portions of the project plan, such as sampling protocols or field emergency procedures, can be copied and carried for use in the field.

Modules—
Although we arranged the subject matter into stages of a monitoring project and topical modules, the modules can be used in any sequence. We suggest the user peruse all the modules before beginning to use the guidelines and workbook. Aspects of the various topics inevitably overlap each other and browsing through our arrangement of topics will provide the user with a better understanding of how to customize the guidelines for their specific project.

Discussions—
We begin each module with a brief introduction to the topic. Managers inexperienced in participatory monitoring or related fields will benefit from these explanations and descriptions in each module. We also include brief examples, suggestions, and recommendations based on lessons learned from organizations with experience in implementing participatory projects, both public and private. The organizations we mention in our discussions are listed in appendix 1. The purpose of the module discussions is to provide the user with a concise synthesis of key points from other resources available on these topics.

Checklists—
Following the discussion, we present a concise checklist of relevant considerations for that topic. Our intent is to help the user verify that no potentially important issues are accidentally overlooked. We encourage users to address and document each checklist item that is germane to their project. Blank forms available on the project Web site (app. 3) provide the means for documenting decisions, events, resources, protocols, and plans relevant to each pertinent checklist item in each module. The workbook forms also allow users to create and document customized checklist items.

Sources—
After each module's overview, we list relevant references. Mutual learning is an excellent trust-building exercise in its own right, and we encourage stakeholders to collaborate in detailed study of the topics that interest them. More citations are provided for topics on which managers are likely to be less familiar than on those of greater familiarity. In the Web site version of this document, each citation is hyperlinked to the reference in the "Annotated References" section so that the usefulness of the reference can be quickly appraised (see http://www.ifcae.org/projects/ncssf3/).

Annotated literature—
All of the references in the "Annotated References" section are annotated with information describing the nature of the document and the topics it covers. Our intent is to help the user decide whether a particular document is worth the effort, time, or expense to acquire. We focused our literature search on readily available literature from national organizations in the United States, although we made exceptions for particularly useful or representative international documents. Whenever possible, we provide Web links for downloading documents directly. There is a large volume of information from international rural development programs that we did not include because it is outside the scope of these guidelines. If the user is interested, the Food and Agriculture Organization of the United Nations, The European Tropical Forestry Network, and the Center for International Forestry Research are good starting points for searching this body of information.

Organizations—
Appendix 1 provides contact information and Web site addresses for organizations we found to have extensive experience with conducting collaborative or participatory projects or programs, and from whom we obtained many of our references and feedback on development of the guidelines. Again, we focused on nationwide programs in the United States, but included a few local, state, and international organizations we considered relevant. Most of these organizations have additional pertinent information (that we did not cite) available on their Web sites.

Case-study links—
Appendix 2, "Case Studies of Collaboration and Partnerships," provides a few Web sites that have extensive links to examples of specific collaborative or participatory ventures. These provide opportunities to network with individuals involved in similar or nearby projects.

Workbook—
On the Web site that accompanies this publication (see app. 3 for more information), a workbook with the checklists from each module is provided. These "Workbook Documentation Forms" serve as an outline of key items in a participatory monitoring project, and individual sheets can be carried in the field or elsewhere. The blank sheets can be reproduced and customized to create your project plan, along with other relevant appended documents. When an explanation of an item in the workbook is needed, the user can consult the guidelines. The handbook is of greatest value to all concerned stakeholders if it is actually put to use to create a project plan by using the workbook forms. We suggest creating a separate plan for each participatory monitoring project if multiple projects are part of a larger monitoring program. Project plans can be kept in electronic format, filed in three-ring binders, and photocopied, or in any other desired filing system. Importantly though, the documentation format and filing system should be easily accessible to all collaborators to enhance the sense of inclusion, participation, ownership, and trust.

Overview of Stages and Modules

This section provides the reader with a quick overview of the topics addressed in each of our modules. It is intended to illustrate the range of pertinent topics and how they interrelate. The major topics and issues to consider for a participatory monitoring project can be divided into three major stages: planning, implementation, and followthrough. Table 1 lists our modules and which stage they occupy as well as the type of information each contains.

Table 1—Stages and modules of a participatory monitoring project

Project stage	Module name	Type of Information
Planning	Documentation	Documenting a participatory monitoring project
	Goals	Determining monitoring goals
	Indicators	Selecting biological indicators
	Collaboration	Evaluating the usefulness and goals of collaboration
	Decisions	Making systematic and collaborative decisions
	Context	Evaluating the context of a participatory monitoring project
	Organization	Organizing the structure of a participatory monitoring project
	Participants	Recruiting, selecting, authorizing, and dismissing participants
	Communication	Developing good understandings and agreements
	Incentives	Understanding motivations, concerns, and anticipated benefits
	Design	Involving participants in project design
	Resources	Obtaining and allocating funds, resources, and support
Implementation	Training	Providing participants with requisite training
	Safety	Ensuring safety and planning for emergencies
	Fieldwork	Planning field activities
	Sampling	Developing sampling designs and data collection procedures
	Quality	Ensuring the quality and credibility of collected data
	Data	Making arrangements for handling, storing, and using data
Followthrough	Analysis	Arranging for periodic data analysis
	Reporting	Arranging for reporting results
	Evaluation	Evaluating and improving the project
	Celebrations	Ensuring the project is rewarding and appreciated

Not every monitoring project that involves participants needs to address all of the stages or module topics in these guidelines; however, becoming familiar with them can help the user avoid obstacles and improve current or future projects. Depending on the goals and context of a particular monitoring project, participants could be involved in any or all of the three stages of the project, or they might be involved with different levels of intensity and commitment at each stage. For example, participants might be included in the planning stage and invited to meetings to identify the goals and objectives of an upcoming monitoring project. Or participants could be included in the implementation stage of a monitoring project by involving them in data collection (in which case the training, safety, and fieldwork modules

would be most appropriate). If a monitoring project has already collected data, participants can help examine the results and suggest further steps for disseminating the information to interested parties. In this case, the analysis and reporting modules of the followthrough stage would be most useful. The stages are simply conceptual; therefore, the modules may be used independently, in any combination, or in any sequence, depending on the needs of each project and its participants.

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Planning Stage

The importance of clear goals cannot be overemphasized. Developing clear goals for the monitoring project is the first step in determining whether a participatory approach is appropriate and will influence all the remaining parts of the project planning. For example, the goal might be to collect presence and absence information on invasive weeds across a large area, in which case large numbers of participants can be involved with little training needed. Conversely, the goal might be to inventory the entire flora of a park, possibly requiring extensive botanical training. A project goal might primarily be to increase public awareness and education about management practices in an area, or it could be to ground-truth remote sensing data. Each monitoring goal can lend itself to participant involvement in different ways and to different extents. Similarly, every monitoring project operates within an organizational structure that must be taken into account when involving participants. Although these guidelines provide an overarching synthesis of participatory monitoring literature and lessons from practitioners, many agencies and organizations provide publications or offices that can help the reader address their own organization's peculiarities and requirements.

Documentation: Documenting a Participatory Monitoring Project Plan—
Clear documentation, shared by all, can turn a participatory monitoring project into an exercise in building trust, resolving conflict, and colearning. This module offers suggestions for how to document everything about the project so that anyone can review and understand the process and results.

Goals: Determining Monitoring Goals—
Defining the purpose and intended results for monitoring goals can be a way of involving participants early in the project. However, even if a project is already underway when participants become involved, taking the time to make sure everyone understands and agrees on the goals of the project will make the overall process more efficient and enjoyable. This module alerts the reader to issues explored in greater depth in later modules, including the regulatory and land ownership context in which a project is taking place.

Indicators: Selecting Biological Indicators—
This module provides background on the use of biological indicators, organizations that can provide detailed information on the selection process, as well as ways to involve participants with local ecological knowledge in the selection of indicators.

Collaboration: Evaluating the Usefulness and Goals of Collaboration— Before entering into a collaboration or participatory project, it is a good idea to evaluate the potential advantages and disadvantages to involving participants in biological monitoring. Participants can be involved in any and all stages of a monitoring project and at varying levels of intensity.

Decisions: Making Systematic and Collaborative Decisions— Making decisions in a clear, systematic, and jointly agreed upon manner will greatly improve trust among managers, participants, and stakeholders. Participants can be involved in decisionmaking at any stage of the monitoring project process. This module offers suggestions for ways managers can incorporate collaborative decisionmaking into their projects, including education, training, neutral facilitation, and general principles for making collaboration work.

Context: Evaluating the Context of a Participatory Monitoring Project— The political, social, cultural, and economic context will likely affect project design and the type and extent of participant involvement. This module suggests ways managers and stakeholders can cooperatively analyze the context of a project and the implications for project design that emerge from such analyses.

Organization: Organizing the Structure of a Participatory Monitoring Project— Participatory monitoring projects can involve several organizations, each with their own structures and goals. This module offers suggestions for sponsorship organizations, defining roles and responsibilities, and developing contracts and formal agreements between organizations. The effectiveness of the project, and the ease of pursuing similar future projects, can be facilitated by explicitly defining the roles and responsibilities of each organization in the early stages of planning.

Participants: Recruiting, Selecting, Authorizing, and Dismissing Participants— This module offers suggestions about identifying participants, fostering leaders within the group, and setting ground rules for respectful behavior. Also included are specific suggestions for working with representatives of stakeholder groups.

Communication: Developing Good Understandings and Agreements— This module offers suggestions for addressing different communication styles, perspectives, and languages among collaborating individuals and groups. Although monitoring projects work better when effective communication builds trust between participants, managers, and scientists, such trust also is often an important goal. Facilitation, communication, and trust-building are such important and specialized skills that this module includes suggestions for obtaining help.

Incentives: Understanding Motivations, Concerns, and Anticipated Benefits—
This module provides examples of the variety of incentives participants might have for becoming involved in a project, both as stakeholders and as individuals. Discussing these incentives during the planning stage can help avoid conflict later. Also included are suggestions for finding common ground among participants and ensuring that everyone benefits from the experience of being involved in the monitoring project.

Design: Involving Participants in Project Design—
Although many people initially assume that participation in a monitoring project is limited to helping with data collection, some of the most successful projects involve participants in the project design or are initially designed by community groups. Stakeholders generally have a variety of skills and expertise they can contribute to a monitoring project. This module offers suggestions for how to determine if collaborating with participants on project design is appropriate, and if so, ways to match their roles in the project to the knowledge, skills, or abilities that each possesses.

Resources—
This module addresses obtaining and allocating funds, resources, and support. Involving participants in a monitoring project can affect the budget in a number of ways, especially by creating opportunities to leverage funds from sources that support public participation in natural resource management and science. Although monitoring projects sometimes involve volunteers, participants can be compensated for their time and effort in a variety of ways. Thorough budgeting and tracking of expenditures can be especially important to the development and maintenance of clear agreements among participants. Also included are suggestions for fundraising, in-kind contributions, and community support.

Although many people assume that participation in a monitoring project is limited to helping with data collection, some of the most successful projects involve participants in project design or are initially designed by community groups.

Implementation Stage

Although it might be ideal to include participants in the early stages of a monitoring project (to build trust and establish common goals), many of the benefits of participation can still be effectively achieved by involving participants after a project has begun. The implementation stage consists of such topics as training, safety, planning field activities, creating sampling designs, devising data collection procedures, and ensuring the data are of high quality and handled responsibly.

Training: Providing Participants With Requisite Training—
This module discusses development and documentation of training programs to suit the needs of the project and match the skills of participants. Any skills that are needed to conduct a participatory monitoring project, and that are lacking among participants, are potential candidates for training. However, training can be time consuming or costly, so resources and time can be saved by assigning priorities, matching training to needs, and investigating cost-effective training strategies.

Appropriate and documented training helps ensure good communication, data credibility, safety, and self-esteem.

Safety: Ensuring Safety and Planning for Emergencies—
This module offers suggestions for creating and documenting safety and emergency plans that ensure everyone has a safe and enjoyable experience while collecting monitoring data.

Fieldwork: Planning Field Activities—
Careful planning of logistics for fieldwork is essential to the smooth operation of a monitoring project. Involving participants in fieldwork need not be significantly more time consuming if travel, schedules, equipment, safety, and support activities are explained and clearly discussed before fieldwork begins.

Sampling: Developing Sampling Designs and Data Collection Procedures—
Experts should create sampling designs, but participants are more likely to implement sampling protocols carefully and appropriately if they understand the rationale behind the design. Participants might also be able to lend insights that make the design more efficient. Understanding the reasoning behind the chosen sampling designs and protocols will enhance participant understanding of, and trust in, the monitoring results.

Quality: Ensuring the Quality and Credibility of Collected Data—
Developing a quality assurance plan does much to effectively address concern on the part of managers and scientists about the credibility of data collected by participants. Many projects use third party auditing to alleviate concerns about data quality. This module offers suggestions for developing a quality assurance plan, quality control procedures, a quality assessment plan, and other ways to address the issue of data quality.

Data: Making Arrangements for Handling, Storing, and Using Data—
This module discusses data handling, backup, filing, compatibility with other databases, and accessibility. Also addressed are issues of data ownership, use, and distribution; topics that are of particular importance in the context of former grievances or mistrust among collaborators.

Followthrough Stage

Even if participants were not involved in the planning or implementation stages of a monitoring project, involving them in the analysis and reporting of the monitoring data can ensure that results are useful to stakeholders and might help build trust for the next monitoring project. This followthrough stage is yet another opportunity for participants and managers to learn from each other and to determine the next steps for the monitoring project and the collaborative relationship that has been built.

Involving participants in the analysis and reporting of the monitoring data can ensure that results are useful to stakeholders.

Analysis: Arranging for Periodic Data Analysis—
Although statistical analyses should be conducted by experts, participants can contribute insight and local expertise to the review and interpretation of the results. This module offers suggestions for anticipating the time and money required to conduct periodic analysis of monitoring data, as well as ways to involve participants in interpretation of the results.

Reporting: Arranging for Reporting Results—
Disseminating project results to interested parties, and ensuring they are used, is a followup process that rewards participants with the feeling that their time and efforts were worthwhile. If monitoring results are being used to resolve conflicts over land management, prior agreements about how results are reported and used can prevent or alleviate subsequent animosity. This module offers suggestions for reporting results, addressing concerns, archiving publications, and making sure everything is disseminated in formats and languages that all stakeholders can understand.

Evaluation: Evaluating and Improving the Project—
Evaluation of a participatory monitoring project mirrors the cyclical process of adaptive forest management. As with adaptive management, the process (implementation, monitoring, evaluation, adjustment) is most effective when it is inclusive of all stakeholders and points of view. This module offers suggestions for ways to continually evaluate whether the participatory monitoring project is meeting both its biological and collaboration goals and to revise the process if goals are not being met.

Celebrations: Ensuring the Project Is Rewarding and Widely Appreciated—
Rewarding and celebrating everyone's contributions to the monitoring project helps sustain motivation and is fun. Public acknowledgement is usually highly appreciated and provides a forum that also enhances community appreciation and support.

Planning Stage

Documentation:

Documenting a Participatory Monitoring Project

Purpose—

Documenting a participatory monitoring project with the "Workbook Documentation Forms" provided at the project Web site that accompanies this publication (see app. 3 for more information) creates (1) a project plan; (2) a means of tracking implementation of the plan; and (3) material for review, evaluation, and revision of the plan. There are a variety of reasons for doing this; examples include:

- Strategic planning.
- Establishing credibility.
- Improving communication.
- Ensuring high-quality data and results.
- Creating institutional memory for future reference.
- Protection against liability claims or litigation.
- Providing a source for contact information.
- Providing material for periodic review and evaluation.
- Providing reference materials for funding applications.
- Providing reference material for outreach or education.
- Documenting agreements such as contracts or memoranda of understanding.
- Documenting processes such as decisionmaking methods or communication norms.
- Documenting protocols such as how to conduct meetings or field sampling procedures.
- Documenting safety, emergency, or quality assurance plans.

Process—

Documentation can require upfront time commitment that will likely save time throughout the project. The effort expended should be commensurate with perceived benefits and the complexity of the project. Consideration should be given to who should be responsible for documentation tasks and how much time should be devoted to them. Key points to document about process are:

- When major decisions are made.
- What formal or informal agreements are made.
- How, when, where, and by whom data are collected.
- How participants are trained.
- How and by whom data analysis is conducted.
- How results are generated and reviewed.

Documentation can take a variety of forms depending on the object to be recorded. Examples include:

- Contact information for participants
- Meeting notes
- Informal agreements

- Narrative descriptions of the project plan
- Signed forms
- Contractual agreements
- Evaluation forms
- Training manuals
- Sampling protocols
- Reference materials
- Reports of monitoring results
- Published articles
- Computer files
- Databases
- Audio tapes
- Photographs, electronic images, or videos

Whatever the form or purpose, documentation should cover the essential categories of who, what, when, where, and how. Making all the documentation available to all participants helps build trust. Understanding and communication are facilitated by deciding in advance who keeps, copies, and distributes documentation, and how often or under what circumstances. It also is important to identify any sensitive or proprietary information and collaboratively decide how it will be handled. For example, traditional knowledge held by the local Native American tribe about the location of particular plant species might need to be handled separately from other data.

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Checklist—

- ☐ What are the objectives for documenting various aspects of the project?
- ☐ What should be documented and how often should it be updated?
- ☐ Who will be responsible for maintaining the various aspects of documentation?
- ☐ How much time will be required to document each facet of the project and who will do it?
- ☐ If more than one party or individual updates the same documentation files, how will their work be coordinated?
- ☐ What will be the process for sharing documentation among participants?
- ☐ What information can or should be kept in a central file; what parts can be accessed by participants, and how will they be able to access it?
- ☐ Will there be any sensitive or proprietary information gathered, and how will it be handled?

Sources—

Behar 1996; Collaborative Forest Restoration Program 2003; Daly, n.d.a; Dukes and Firehock 2001; Herron and others 2004b; Hunt and others 1996; NRCS, n.d.

Goals:
Determining Monitoring Goals and Indicators

Purpose and intended results—
Beginning with a clear understanding of the purpose and intended results of a monitoring project is essential to success. Clear understanding of goals is especially important in collaborative endeavors. If there is not a common understanding of purpose, stakeholders will follow divergent paths. If there is not a common understanding of what all the collaborators wish to achieve, efforts are likely to be misdirected or unfocused, and disappointment can be expected. Documentation of such understandings can take the form of vision statements, mission statements, goals, or objectives. Often it is useful to create a series of such statements from the more general to the more specific. Many groups find that holding one or more meetings solely for the purpose of establishing the goals and objectives of a monitoring project is time well spent.

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Indicators and measures—
Once all collaborators understand and agree on the project's purpose and intended results, then it is much easier to select indicators that are likely to yield useful information within the budget and timeframe of the project. Indicators are what will be measured or evaluated. Indicators (such as the viability of the population of an endangered species) can then be tracked with specific measures (for instance, abundance of reproductive females in a given area). Often there is historical data available about past ecological conditions in an area, including stories and observations made by local people. Exploring these sources of information before defining goals, indicators, and measures can sometimes help focus and improve the efficiency of monitoring efforts.

Biodiversity monitoring—
Because it is not possible to monitor every organism, monitoring of biodiversity must, by its very nature, involve abstractions and assumptions about what to monitor. Examples of approaches include focusing on endangered species, economically important species, charismatic macrofauna, indicator species, native or introduced species, rapid diversity appraisals, or creating species lists (of organisms that are easy to see and identify). The means of inventorying or monitoring biodiversity will depend largely on the goals of the project and the available resources. Although inventories, that is, one-time enumerations, are occasionally the goal of a biodiversity project, we focus predominantly on monitoring trends in biodiversity. Details on indicators and measures for biodiversity monitoring are discussed in the "Indicators" module.

Context—
The purpose of monitoring biodiversity is always imbedded in a larger context. For example, federal land management agencies sponsor ongoing scientific data collection such as Forest Inventory and Analysis (FIA) Program in response to legal, policy, or regulatory requirements. For corporate forest landowners, the requirements of the Endangered Species Act or Habitat Conservation Plans might motivate monitoring projects. For local communities, it could be the desire to create local forest employment opportunities that are sustainable. For Native Americans, the context could be maintaining the health of important natural resources for cultural use or traditional livelihoods. Often, the context of a monitoring project has many aspects that overlap, especially if there are multiple stakeholders involved. If a monitoring **project** is part of a larger monitoring **program** such as FIA, then careful attention must be paid to the degree of compatibility between the goals of the local project and those of the larger program, including how much effort will be allocated to meet the needs of each. Considering the total context of a monitoring project is essential to developing clear understandings about purposes and intended results. We address these and other aspects of context in greater detail in the "Context" module.

Checklist—
- ☐ What are the specific monitoring goals of the project?
- ☐ What is the process used to reach agreement on those goals?
- ☐ If the project is part of a larger program, what are the goals of that program?
- ☐ Is there overlap or conflict between local and larger scale monitoring goals?
- ☐ How will project resources be allocated between the project and larger programs?
- ☐ What will be the overall context of the monitoring project?
- ☐ For each monitoring goal, what indicators and measures will be used to address each goal?

Sources—
Bliss and others 2001; Collaborative Forest Restoration Program 2004a, 2004b, 2004e; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Elzinga and others 2001; Kerns and others 2002; Krishnaswamy 2004; Lawrence and Ambrose-Oji 2001; Lindenmayer 1999; Lynch and others 2004; National Commission on Science for Sustainable Forestry 2005; Ottke and others 2000; The Secretariat of the Convention on Biological Diversity 2001a, 2001b; Wright, n.d.

Indicators:
Selecting Biological Indicators and Measures

Definitions—
Indicators are quantitative or qualitative variables that are monitored periodically to reveal trends. Data collection and analysis in biological monitoring programs is usually organized around indicators. Monitoring biodiversity might include chemical indicators (water quality) or physical or structural indicators (coarse woody debris or snags in a forest), but often focus on the use of biological indicators such as indicator species (cavity nesting birds).

Background—
In 1995 the United States signed on to the Montreal Process as a member country and agreed to adopt and develop the use of indicators to measure and advance sustainable forestry in the United States. One aspect of sustainable forestry identified by the Montreal Process is the conservation of biodiversity. Diversity is important at all levels of biological organization (genetic, population-species, community-ecosystem, and regional-landscape) and consists of structural, functional, and compositional attributes (for instance, age classes, nutrient cycling, and successional-stage, respectively). Hence, indicator variables for monitoring biodiversity would ideally be chosen at all levels of organization and for all three attributes of ecosystems. However, this is rarely possible with limited time and resources; hence, selecting indicators that serve multiple purposes and are tightly correlated with attributes of concern will improve efficiency in a monitoring project.

Selecting indicators—
Developing reliable and cost-effective indicators of forest health is a relatively recent and ongoing pursuit in conservation biology. A major challenge is to refine the broad indicators established for assessing sustainable forestry at a large scale (across forest ecosystem types and ownerships) to be locally appropriate, credible indicators. Scientists and other stakeholders are developing several useful tools to aid in the process of selecting and using indicators. The following list provides several examples (see app. 1 for details):

- Manomet Center for Conservation Science
- Roundtable on Sustainable Forests: Criteria and Indicators
- Local Unit Criteria and Indicators Development Project
- Sustainable Forest Data Working Group
- Forest Stewardship Council (use of indicators in forest certification)

After collaborators agree upon a project's goals and objectives, they can select the specific indicators to measure the progress toward achieving those objectives. At this point, it can be useful to explore the variety of sources of historical ecological conditions in the area in order to determine what indicators might be most

sensitive to change. Local archives, county records, and older members of the community are all places to look for background data when selecting indicators. Stating explicitly what attribute of an indicator is to actually be measured (such as the spatial extent of habitat for a species of concern) can help ensure that the indicators selected will be appropriate. Choosing indicators with preexisting baseline information also can reduce the project's workload or build on existing knowledge.

Selecting measures—
Once indicators have been selected, determining how they will be measured and evaluated is the next step. Measurable characteristics that change in response to disturbance or threat might be especially pertinent to project goals. For example, if the selected indicator of ecosystem health were the population viability of a bird species threatened by nesting habitat loss, then an appropriate measure might be the abundance of currently used nests in the target area. A measurement variable can be broad, such as species richness, or narrow, such as the abundance of a single species or population. For a given indicator, there might be several variables to measure, and different sampling designs or methods might be necessary for each. It is possible that at the research design stage, collaborators will realize that they do not have the resources to measure the indicators they have chosen, and thus might need to revise the project goals and choice of indicators to match their capacity.

One approach suggested by the Manomet Center uses three types of measures for any biodiversity indicator (such as habitat for cavity-nesting birds): a condition measure (such as density of snags), a pressure measure (such as area of timber harvesting per year), and policy-response measure (such as the presence of a management plan for snags). These indicators are only beginning to be field tested, so keep in mind that selecting indicators for biodiversity monitoring and sustainable forestry is a rapidly evolving area of science subject to change. Also, for narrowly focused biological monitoring projects, nonbiological indicators like policy response may not be appropriate. Likewise, broader studies may need additional indicators such as cultural use indicators (for example, presence of subsistence harvesting of a species).

Considerations for participatory approaches—
The level and involvement of different participants in the indicator and measures selection process is partly determined by who initiates the monitoring project. For example, established monitoring projects might wish to invite local volunteers or contractors to assist only with data collection, because the indicators and measures have already been selected and are no longer easily changed. Other types of monitoring projects involve community members, managers, scientists, and other stakeholders from the beginning. Involving stakeholders can have many practical benefits. For example, involving local participants can improve the indicator selection process by drawing on their knowledge of local ecosystems. Knowledge such

as where certain species exist, unusual ecosystem phenomena, or existing cultural use patterns might be useful for selecting indicators that are practical, important, or essential to measure. A variety of other reasons exist for involving stakeholders; many of them are listed in the "Collaboration" module. Every biological monitoring project will have some level of social, cultural, economic, managerial, and political context that can affect, as well as be affected by, the project results. Having a decision process that involves stakeholders will likely improve the chance that appropriate and useful indicators and measures are selected.

Checklist—

- ☐ Should stakeholders be involved in the indicator selection process, and if so, how?
- ☐ If circumstances warrant, how will stakeholders be contacted and invited to participate?
- ☐ What specific indicators of biodiversity or other biological values will be monitored?
- ☐ Do the indicators address the goals of the project?
- ☐ Do the selected indicators have useful background information or baseline data?
- ☐ Are the indicators useful in ascertaining disturbances or threats to biodiversity?
- ☐ How will indicators be measured?
- ☐ How will indicators and measures be evaluated for efficacy, cost effectiveness, and practicability?

Sources—

Balmford and others 2005; Collaborative Forest Restoration Program 2004a; Hilty and Merenlender 2000; Kelly and Harwell 1990; Lindenmayer 1999; Montreal Process Working Group 1999; Morrison and Marcot 1995; National Commission on Science for Sustainable Forestry 2005; Noss 1990; The Secretariat of the Convention on Biological Diversity 2001b; Whitman and Hagan 2004; Working Group on Criteria and Indicators 2001; Wright, n.d.

Collaboration:
Evaluating the Usefulness and Goals of Collaboration

Overview—

All humans collaborate; it is part of our social nature. Generally we collaborate with those with whom we share much in common, but at other times we differ in many regards yet share some common interests. Collaboration helps pool intellectual and physical resources and converts potentially adversarial relationships into mutually beneficial ones. Participatory monitoring is inherently collaborative in the sense that we choose to work together to reach common goals. Successful collaboration depends on understanding where our goals overlap with those of others, and determining whether it is worth our while to work together to achieve these common goals. Some of our sources describe collaboration as a spectrum with different levels of relative responsibility and control that are arranged in categories, such as consultation, cooperation, collaboration, or colearning, although each participant's role often overlaps these categories and changes through time.

Incentives for collaborating differ widely. Sometimes participants in a monitoring program share many common interests. The Audubon Society's international bird counting program ("The Christmas Bird Count"), conducted by volunteer bird-watching enthusiasts, is an example. Sometimes participants in a monitoring program have an economic interest in sustaining a resource. For instance, nontimber forest product harvesters (such as ginseng or mushroom collectors) might participate in agency monitoring of target species in exchange for access to the resource. Sometimes collaboration arises from adversarial circumstances such as frustration with litigation of natural resource management decisions or threats of legal mandates. In each case, a thorough and shared understanding of the reasons that motivate stakeholders to collaborate is essential to the success of the project. In this module's discussion section, we emphasize the need for clarity regarding reasons to collaborate, mention some forms of collaboration, list advantages, disadvantages, and barriers to collaborating, and suggest means to make collaboration work. Many of the essential elements of making collaboration work are detailed in subsequent modules.

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Collaboration goals—

Common reasons that managers might consider a participatory approach to monitoring include:

- Stretching limited resources.
- Building understanding among user groups.
- Improving community relations.
- Reducing conflict and litigation.
- Providing educational opportunities.
- Supporting community development.
- Addressing public concerns.
- Incorporating local or traditional knowledge into monitoring designs.

Once other stakeholders are involved, however, the spectrum of collaboration goals often expands to accommodate their unique interests and motivations. These will be explored in greater detail in the "Incentives" module, but examples include personal enrichment, economic self-interests, or influencing management decisions. If collaborations are to be successful, it is essential that all stakeholders reach a clear, explicit, mutual, and, preferably, written understanding of the purpose and focus of their collaborative effort before proceeding further.

Because collaborations that revolve around participatory monitoring might involve diverse stakeholders, beginning with broad vision statements or mission statements can provide a useful means of establishing common ground for proceeding to the more difficult tasks of developing specific goals, objectives, processes, and means.

Types of participatory monitoring—
Collaborating with other participants to monitor biodiversity or other biological resources can be as simple as cooperating with "Jane Doe" to count the number of butterflies that migrate through her backyard or as complicated as a nationwide, volunteer-based, water-quality monitoring program (such as the U.S. Environmental Protection Agency's National Water Quality Assessment Program). Some projects will involve participants through all stages of the project; others might only need participants to assist with data collection. Managers or scientists often initiate projects, but others could develop when a community approaches managers with monitoring needs. Some complex programs that coordinate many local projects can be tightly prescribed and centralized (such as the Atlantic Coastal Cooperative Statistics Program), whereas others are decentralized and open to innovation (such as the Canadian Community Monitoring Network). Reasons for collaborating can derive from mutual interest, job requirements, economic concerns, traditional uses, cultural identity, legal requirements, or unresolved conflicts. Collaboration can be initiated and sponsored by land management agencies and organizations, community groups, resource users, government agencies, nongovernment organizations, or special interest groups. In the "Annotated References" and "Appendix 1," we list a number of references and organizations that provide information on collaboration geared to particular interests or situations. Not only does participatory monitoring vary widely in the forms it can take, but it is always molded by the context in which it occurs, and is usually dynamic and evolving. The precise form of a particular participatory monitoring project will determine the constellation of advantages and disadvantages that are associated with collaboration. These considerations also differ by the participant's perspective. Here we list some of the potential advantages and disadvantages of collaboration.

Potential advantages—
- Work is shared.
- Scope, relevancy, and efficiency of ecological monitoring is increased.
- Efforts are coordinated and duplicate efforts avoided; participant competencies complement each other.

- Collaboration entails an innovative and entrepreneurial approach to problemsolving.
- Collaboration focuses on problems and solutions rather than positions and advocacy.
- Participants' viewpoints and knowledge are identified, appreciated, and can inform and improve decisions.
- Decisions made more effectively, are more durable, are more likely to foster action, and can be implemented.
- Monitoring results are considered more credible by all stakeholders.
- The process addresses ecological complexity and is integral to adaptive management.
- All collaborators are accountable and responsibility is shared.
- Participants become interdependent.
- Stakeholders are empowered to potentially influence management decisions and policy.
- The capacity of local participants is improved by enhancing their knowledge, skills, and abilities; by improving social relationships; and by developing leadership skills.
- The capacity of local communities is enhanced through economic development, and by developing organizations that can sponsor or facilitate new community improvement projects.
- Decisions are decentralized and power is shifted toward the stakeholders most affected.
- Mutual understanding and trust are enhanced by a transparent process.
- Greater understanding reduces conflict.
- Public support for management decisions is increased.
- Local communities develop a stake in ensuring forest resource use is sustainable.
- Public appreciation of the importance of biodiversity is enhanced through education.
- Power-sharing promotes social justice.
- Monitoring is based on multiple sources of ecological knowledge (local, conventional, and traditional).

Potential disadvantages and barriers—

- Collaboration requires time, effort, mutual trust, and clear understanding to build effective communication.
- Participants might lack familiarity with collaboration or opportunities for training.
- The time and effort needed to create successful collaborations increases with greater levels of conflicting interest, mistrust, diverging values, or hidden agendas.
- Needed time and effort also increase with projects of increasing scale or complexity.
- Collaboration might require long-term commitments on the part of participants.

- Important or essential stakeholders might not want to collaborate.
- Collaborative decisions reached through an agreed-upon process might run counter to a participating stakeholder's interest or agenda.
- Collaborative decisions might reflect least controversial alternatives rather than most useful or effective choices.
- Collaborative organizations might lack the authority to enforce their choices or decisions.
- Concerns over validity of data collected by stakeholders with conflicts of interest could dissuade potential supporters.
- Even after extensive effort, participants run the risk that collaboration might not meet the project goals.
- Projects that fail can discourage others that would otherwise be more likely to succeed.
- Divergent or irreconcilable interests, values, attitudes, perceptions, cultural paradigms, or agendas might exist among stakeholders.
- Government policies, regulations, procedures, laws, and lack of political will can interfere.
- Lack of institutional capacity, funding, staff, or resources can be an impediment.
- Staff members that experiment with collaboration can lack agency support in the form of job assignment, training, and advancement opportunities.
- Training, organizational capacity, participant skills, or commitment to improvement might be needed.
- Unrealistic expectations, or lack of immediate tangible results can be discouraging.
- Lack of trust, discomfort, or lack of commitment to group processes can impede progress.
- Fear of inappropriate use or sabotage of results can discourage involvement.
- Issues of ownership or custody might need to be settled.
- Unequal power relationships among stakeholders can hinder interaction.
- Educational, language, and literacy barriers or unfamiliarity with formal scientific methods can slow progress.
- Labor relations and issues of compensation might need to be resolved.
- Welfare, disability, or legal status can hinder involvement.
- Perceived grudges for past or ongoing injustices might complicate communication.
- An ongoing collaborative monitoring process might lead to complacency about urgently needed action.
- Agency personnel might be frustrated by continuous and conflicting public criticism, shifting management objectives, lack of appreciation and job insecurity.
- Community resources, organizational capacity, participant skills, or long-term commitment might be lacking.
- Participants might fear regulatory reprisals from inadequate or poor-quality data.

Weighing the advantages and disadvantages—
The process of weighing the advantages and disadvantages of a participatory approach to monitoring entails determining which of the advantages, disadvantages, and barriers apply to your particular circumstances, determining how important each is, and deciding how difficult the barriers will be to surmount. A useful exercise to put the analysis in perspective is to ask: "Compared to what?" The current situation might include unmet goals, inefficient or unsuccessful management strategies, a nonholistic approach, continued contention or litigation, wasted time, government intervention, threatened livelihoods, legislative mandates, or harm to the resource. Put in this perspective, the status quo might be less acceptable than the risks that could accompany a collaborative approach. For suggestions on how to navigate these challenging decisions, see the resources listed in the following "Decisions" module for methods that facilitate good decisions about complex issues.

Checklist—
- ☐ Who will document the collaboration goals of a participatory monitoring project and how?
- ☐ How were the goals derived and who participated in that process?
- ☐ What are the advantages of a participatory approach for this project?
- ☐ What are the disadvantages of a participatory approach for this project?
- ☐ What seem to be the barriers to implementing a participatory approach for this project?
- ☐ How will the relative importance of each advantage, disadvantage, and barrier be determined?
- ☐ What process will be used to analyze the relative benefits and drawbacks to using a participatory approach to monitoring?
- ☐ What is the plan for minimizing the disadvantages and barriers and making the collaborative effort work?

Sources—
Abbot and Guijt 1998; Balcazar and others 1998; Ballard 2004; Ballard and others 2002; Behar 1996; Bliss and others 2001; Brechin and others 2002; Christoffersen 2003; Collaborative Forest Restoration Program 2003; Collaborative Stewardship Team 2000; Cornwall and Jewkes 1995; Coughlin and others 1999; Daly, n.d.a, n.d.c; Dukes and Firehock 2001; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; Godfrey 1994; Guijt and others 1998; Jones and others 2004; Krishnaswamy 2004; Kusel and others 2000; Lawrence 2003; Lawrence and Ambrose-Oji 2001; Lynch 2004; Lynch and others 2004; McNeely 1995; Moote and Becker 2003; North-South Environmental, Inc. 2004; Resolve, n.d.; Sirmon and others 2002a, 2002b; Sithole 2002; Stockdale and Corbet 1999; Sullivan 2000; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; Voluntary Sector Initiative 2002a; Wondolleck and Yaffee 2000; Yaffee 2002; Yaffee and Wondolleck 2000.

Decisions:
Making Systematic and Collaborative Decisions

Systematic decisionmaking—
Collaboration involves many decisions. Sometimes decisions are complex and must be forged from disparate values and perspectives. Making systematic decisions involves using clear, understandable, and jointly agreed-upon processes so that choices are perceived to be fair and logical. Doing so improves the likelihood that all parties to the decision will be satisfied with the results.

Collaborative decisionmaking—
Decisionmaking within groups can take a variety of forms such as majority rule (Robert's Rules of Order), group consensus (in which all agree), or mediated discussions such as principled negotiation (based on interests rather than positions). The process of deriving decisions in a transparent (open, clear, and understandable), inclusive, systematic, and fair manner can be a powerful trust-building exercise, but outside help often is needed. Facilitation of the decisionmaking process by a neutral party, especially in large or diverse groups, can be crucial in reaching positive outcomes. Facilitation services abound, both locally and on the Web. Getting recommendations for good facilitators can be worth the effort, because use of unskilled facilitators can be counterproductive.

Prior agreement about decisionmaking principles and procedures will improve acceptance of decisions.

Essentially, collaborative decisionmaking processes can be considered "micropolitics," and many of the dynamics of interaction revolve around the relative power and persuasive abilities of the participants. Prior agreement about decisionmaking principles and procedures will improve acceptance of decisions even if some parties disagree with the results. This can be especially important in consensus-based processes where unanimous agreement on some aspects of a project might be an unattainable goal that would stall progress.

Education and training—
Understanding how to apply systematic and collaborative decisionmaking in monitoring projects is a valuable skill. Depending on the existing skills of the project coordinators and scope of the project, organizers might benefit from formal training. Such opportunities are widely available in the pubic and private sector, as well as in a large body of literature and on Web sites. Our citations provide a small sampling of the literature that covers avoidance of common decisionmaking mistakes; organized step-by-step methods for identifying, evaluating, and selecting alternatives; and ways to document the reasoning that leads to specific choices. In one instance, this process has been codified into a user-friendly software program (see "Sources" below).

Making collaboration work—

Listed here are several fundamental strategies for improving the effectiveness of collaborative decisionmaking:

- Start with small, noncontroversial projects to build relationships, trust, and shared vision.
- Try to make every step of the process a collaborative venture, at least within subcommittees or working groups.
- Remain open to new approaches and ideas.
- Make stakeholders feel welcome and create opportunities for their involvement.
- Allow adequate time.
- Provide prompt feedback to all participants at each stage of the process.
- Make sure participant expectations and needs are explicitly understood by all.
- Treat each other with respect.
- Illustrate with positive examples.
- Get help when needed.

Checklist—

☐ How familiar are participants with alternative decisionmaking processes?

☐ What training will be used so that participants become familiar with the principles, advantages, disadvantages, and applicability of various decisionmaking methods?

☐ What decisionmaking processes will be used in various circumstances and how did issues like group size, level of dissention, or importance of the decision affect the choice of process?

☐ Who will make decisions for each part of the project, and how will such individuals or groups be held accountable?

Sources—

Berg and others 1998; Coughlin and others 1999; Daly n.d.a; Dukes and Firehock 2001; Justice and Jamieson 1999; Kaner and others 1996; Russo and Schoemaker 1989; Schmoldt and others 2001; Sirmon and others 2002a, 2002b; Sithole 2002; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; Voluntary Sector Initiative 2002a.

Context:
Evaluating the Context of a Participatory Monitoring Project

Definition—
"Context" is used here to describe the circumstances, events, or environment of a participatory monitoring project. We discuss various aspects of the overall context and how these interact, including political, legal, policy, environmental, regulatory, procedural, organizational, community, land tenure, economic, and cultural aspects. The overall context of a monitoring project is invariably multifaceted and each aspect of the context affects the collaborative process and the design of a monitoring project. For example, monitoring of biodiversity on corporate timber plantations could entail political issues for environmental groups and economic or property rights issues for timber companies. Time spent building trust could be especially important in this context, and the monitoring project might work better if explicit understandings were reached in advance. Mutual understanding of the motivations to collaborate could lead to win-win situations where species are conserved and timber companies avoid onerous regulation.

Collaborative description of the context—
Stakeholders can be invaluable in helping to explicate the context of the monitoring project, but not all participatory monitoring projects will merit the same levels of involvement from stakeholders. Time and budget permitting, however, the more opportunities that are created for participants to be involved in defining the relevant context, the greater will be their vested interest in success of the project. All stakeholders have different perspectives on what the important factors are, how important they are, and how they interact. By soliciting and weighing all these perspectives, a more accurate picture of the context of the project will emerge to inform subsequent decisionmaking.

The more opportunities that are created for participants to be involved in defining the relevant context, the greater will be their vested interest in success of the project.

Political context—
No natural resource management issues exist outside a political context. Relationships between more powerful stakeholders (such as well-educated, higher income, English-speaking, or politically connected people) and less powerful stakeholders (such as people with less formal education, low income, or poor English-speaking skills) often influence the tactics that such parties employ to influence decisions. For instance, less powerful stakeholders sometimes feel they have few effective choices other than to be obstructive. Political considerations also influence the likelihood that various stakeholders would be inclined to join a participatory project. For instance, less powerful stakeholders might worry that the project leaders will take advantage of them or that the process will work against their interests; thus, they could fear that by participating they might lose their right to protest decisions that end up being adverse to their interests. Or parties might anticipate regulatory reprisals from what they consider inappropriate interpretation and use of results. Addressing the political context often entails paying careful attention and

dedicating sufficient time to building trust among participant stakeholders. Unless powerful stakeholders (for instance, government agencies) approach participatory projects with integrity and long-term commitment of policy, personnel, and resources, other stakeholders can easily become disillusioned and mistrustful. Making a series of consecutive short-term commitments that are periodically reviewed and renewed is one approach to avoiding broken promises in a changeable world.

Legal context—
Laws can constrain or expand the options of agency personnel. They also can affect the legal status of participants. They affect safety, liability, compensation, organization, access, real estate property rights, and intellectual property rights. Laws also can provide incentives to collaborate in order to avoid litigation or legislative mandates. For example, collaborative monitoring can be an excellent way to help meet NEPA requirements. Invariably laws are complex. Collaborators might wish to consult experts or lawyers to help them fully understand the legal context and ramifications of a participatory monitoring project.

Policy context—
Policies drive the relative allocation of resources within an organization to different tasks. If an organization does not have an official policy of encouraging collaborative partnerships, employees might have little official incentive to risk such innovations. The official policy of many federal agencies and other organizations has shifted toward support for collaborative efforts during the last decade, but these policy directions have yet to filter down to managers in many cases. The process of implementing policy can be bureaucratically complex, involving changes in regulations, procedures, forms, norms of behavior, and sometimes recalcitrant personnel. Nevertheless, there is a growing array of collaborative and participatory monitoring projects for air, water, fisheries, and forestry that demonstrate strategic benefits of participation. Policy accords to promote such projects also can be developed between organizations. Policy incentives for such endeavors are likely to continue increasing.

Regulatory context—
Regulations are the means by which organizations implement policy. Designing new regulations to supplant old ones takes time and teamwork, and if the results are not clearly communicated, employees can be confused about which regulations apply or are given the greatest emphasis. Regulations regarding use of volunteer labor or contracting authority to compensate participants are several examples. Training is often required for managers to become familiar with new regulations. However, once a system is set up for volunteers or others to work on monitoring activities, subsequent projects will be progressively easier to implement. Some agencies have developed guidelines for navigating regulations related to volunteer involvement, such as the USDA Forest Service's *Managing Volunteers and Partnership Guide* referenced below.

Procedural context—
Regulations are executed with procedures and documentation forms. Such procedures are often driven by accounting or liability considerations. Although following such procedures can be very time consuming, they also prevent subsequent problems and serve to make agreements and arrangements explicit. All stakeholders should understand the procedural requirements of the participating organizations so they can comply as needed and appreciate the work that others need to perform. Although using the workbook portion of this handbook to document a participatory monitoring project will add an additional layer of paperwork, much of the documentation might already be required by an organization and can simply be incorporated as part of the project plan.

Organizational culture context—
Organizational culture is too often one of the largest barriers to effective collaborations. Reasons differ but include lack of support for personnel who wish to experiment with collaboration or recalcitrant attitudes on the part of key personnel. Lack of support can take the form of not listing collaboration among job duties, performance evaluations that do not value such efforts, lack of training opportunities, and frequent personnel transfers. Negative attitudes toward collaboration on the part of managers might be the result of previous negative experiences; lack of training or experience with collaborative processes; fear of the process owing to perceived lack of control over the situation; lack of appreciation for the opinions, needs, and abilities of others; avoidance of controversy or additional work; and inherent complacency.

Environmental context—
Every project has an environmental context that consists of temporal and spatial components as well as the structure, function, and process of the ecosystem. Temporally, relevant questions might include: At what stage of succession, decline, improvement, trend, or risk are the environmental conditions? Is the goal of the project to detect early warnings of change, or to determine trends in improvement or decline? Spatially, possible questions include: Where in the landscape will this project occur? What is the relationship of the project site to surrounding properties? To help define how a monitoring project relates to issues of ecosystem components, functions, or processes, participants might help create a conceptual map or model of critical species, benefits derived from the local forest, and how forest conditions respond to human activities.

Community context—
Many successful collaborative projects in recent years have been community sponsored. Such efforts typically arise from the lack of local resource-related jobs or land use controversies. Some collaborative efforts arise in response to resource threats (such as the spread of invasive species or development of forest stands susceptible to catastrophic fire), and community groups join managers to address

the problem. To the extent that such endeavors offer forest managers unique opportunities to accomplish their monitoring goals in a context of declining budgets, such individuals are becoming increasingly willing to work with community groups. Many successful collaborative monitoring projects have resulted from managers remaining open to community-based leadership and initiative.

Land tenure context—
Land ownership is a human concept. Organisms will occupy available forested habitat regardless of whoever owns the land, so forest biodiversity issues cross all ownership boundaries. Land ownership, management goals, and forest practices do, however, have a great deal of impact on habitat availability and quality. Public lands typically have different management goals than tribal or private lands, resulting in varied forest management practices and concerns. For any given participatory monitoring project, land tenure will influence issues such as access rights, relative support for the project, allowable monitoring procedures, interactions with other land users, and publicity.

Economic context—
The economic context of collaboration can be exceedingly important to some stakeholders and secondary to others, often depending on factors such as each participant's employment status. Recognizing and accommodating these differences is critical to a sense of fairness, full participation on the part of all stakeholders, and appropriate benefits accruing to each. Stakeholder groups might have economic interests, for instance in rural economic development through sustainable natural resource use. Some participants in a collaborative monitoring project might have a vested interest in the harvest of the particular natural resource that is being monitored, such as a water resource or a nontimber forest product like wild mushrooms. Whenever participants that favor a particular outcome are involved in a collaborative project, safeguards to ensure accurate data and nonbiased interpretation (such as thorough training or third-party auditing) become more important for producing results that all parties accept as credible.

Cultural context—
The cultural context involves the norms of the participants, stakeholder groups, and the local communities. Such norms can be as simple as when people like to start work or where they are comfortable meeting. People often use different modes of expression or entirely different languages. Planning with these factors in mind will greatly improve the experience and efficiency of a participatory project. Organizations in turn, whether public or private, have their own "culture" that might be very foreign to participants from outside the organization. Often individuals from different cultural backgrounds can have fundamentally divergent epistemologies (ways of understanding and viewing the natural world). Such differences often result in divergent opinions about, and conventions regarding, the rights and responsibilities

of humans as they interact with nature. For instance, local ecological knowledge or traditional ecological knowledge are terms currently being used to describe the ways that local cultures come to understand their world through long experience interacting with nature in a specific place. The knowledge and experience that local people contribute can be a valuable asset to the design and implementation of a monitoring project. Meshing these ways of understanding the natural world and our place in it with scientific perspectives can be challenging and involves mutual understanding, respect, and open minds. Clear communication is essential to bridging cultural divides.

Checklist—

- ☐ What are the important aspects of the project's context, political, legal, policy, environmental, regulatory, procedural, organizational culture, community, land tenure, economic, cultural, or others?
- ☐ What are the issues and considerations for each aspect of the project's context?
- ☐ How do these contextual issues interact in ways that might affect the project?
- ☐ What are the supportive aspects of each aspect of context, and how can they be used to optimal advantage?
- ☐ What contextual aspects might be barriers to collaboration, and how can participants plan to address these issues?

Sources—

ACCSP 2002; Ballard 2004; Coughlin and others 1999; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Godfrey 1994; Krishnaswamy 2004; Kusel and others 2000; Liegel and others 1998; Lynch and others 2004; Moote and Becker 2003; Moote and Loucks 2003; Moseley and Wilson 2002; National Forest Foundation; U.S. Department of Agriculture, Forest Service, National Partnership Office 2005; North-South Environmental, Inc. 2004; National Resources Conservation Service [NRCS], n.d.; Resolve, n.d.; Sirmon and others 2002a, 2002b; Sithole 2002; Stockdale and Corbet 1999; U.S. Department of Agriculture, Forest Service 2004; Voluntary Sector Initiative 2001, 2002a; Wong and others 2002.

Organization:
Organizing the Structure of a Participatory Monitoring Project

Organizational structure—
Other than small or simple participatory monitoring projects, most will benefit from an explicit organizational structure. Such a structure could entail modification of an existing project (in an established organization) to be more participatory, or it might involve the creation of an entirely new organizational structure or program. The complexity of such an organization depends on factors such as who initiates the project, the number of stakeholders, the context, anticipated duration, degree of needed coordination, or the complexity of arrangements. In some instances, one organization sponsors the project and collaborates with participating individuals. In other cases, multiple organizations collaborate to address common goals. Organization can be hierarchical or decentralized, and in either case it can be multilayered such as numerous projects collaborating to form a monitoring program. For instance, NatureMapping in Canada is a decentralized program of voluntary monitoring projects, whereas the Atlantic Coastal Cooperative Statistics Program is a highly organized and hierarchically structured collaboration of multiple political jurisdictions, agencies, organizations, companies, and individuals. Organizational structure can take the form of abstract policy accords or specific contractual agreements. In all cases, the organization stems from the recognition that coordination is useful and that having an common governing body, that represents all collaborators, is often the most efficient way to conduct business.

Other than small or simple participatory monitoring projects, most will benefit from an explicit organizational structure.

Forming organizations (such as advisory groups or task forces) is usually more efficient than communicating with all the members in each stakeholder group. Improving communication and building trust takes time, so collaborators often benefit from starting with small, noncontroversial projects such as joint fact-finding or field trips. As participants become more comfortable with each other, incremental steps can lead to organizing more elaborate projects or means of interacting.

Sponsorship organizations—
"Sponsors" are any organization or group providing official long-term financial or in-kind support of a project, regardless of active participation. Sometimes sponsors initiate the projects, and other times they are approached for assistance after a project is underway or organizers are seeking funding to maintain a program. Public land management agencies can provide long-term institutional support for a project, but sometimes are perceived as biased or subject to the whims of politics. Universities are good long-term sponsors because they typically have fewer vested interests in resource management decisions, are perceived as more objective, and are deemed less susceptible to political influence. They also have the capability to provide project coordination, logistical support, data archiving, statistical analysis, and peer-reviewed reporting. For example, undergraduate and graduate research projects, under the supervision of a professor, can provide a respected link between

agencies and community groups while also fulfilling educational goals. Independent nongovernmental organizations are also good sources of project coordination and logistical support. Depending on their mission, they also can act as intermediaries between stakeholder groups and land managers. For instance, when the collaborative context involves controversy, neutral facilitative organizations can provide safe common ground.

Roles and responsibilities—
Whatever organizational structure is chosen by the collaborators, roles and responsibilities must be clearly delineated if the effort is to function smoothly. For instance, if an organizational structure is multilayered, explicit understanding concerning the roles and responsibility of each layer of the organization will reduce the risk of working at cross-purposes and thus improve coordination. As another example, the role that each participant plays in representing other stakeholders or collaborating organizations should also be explicit if the individual is to be accountable to both the participatory project and to the group or organization they represent.

Designating a selected individual responsible for project oversight can foster project stability. The success of partnerships can revolve around capable, committed leaders who champion the project (see "Participants"). Assistants to project leaders, who become equally familiar with the details of a project, provide backup for project continuity if a leader resigns or is unable to continue with their duties. Leaders are not necessarily the decisionmakers of a project. Who is authorized and expected to make various decisions should be clearly defined to avoid overlooking issues or generating disputes (see "Decisions"). For instance, most organizations have treasurers or financial assistants responsible for tracking the use of funds. A volunteer coordinator might be responsible for arranging field activities. Leadership roles and organizational structure also have legal ramifications such as liability for personal injury, property damages, or misuse of data. Whatever the role, determining clear responsibilities and authority can facilitate leadership and coordination.

Contracts and formal agreements—
All participants, collaborators, and sponsors on a project can benefit from formalizing their roles and responsibilities in written agreements. For a short-term volunteer, the contract might be a simple release form (see app. 3 for more information). For longer term commitments or roles with greater responsibility, participants might wish to negotiate the terms of their involvement. The more detailed the written agreements, the less margin for misunderstanding or disagreements, especially when organizational relationships become complex, issues are divisive, personnel come and go, or when legal ramifications or substantial funds are involved. Contracts can include any necessary liability waivers that project manager desire or that might be required by insurance companies or other entities. Some financial sponsors, such as federal agencies, also might require paid participants to verify that they are citizens or have documentation allowing them to work in the country.

In addition to contracts there are other types of formal agreement that can benefit a project. One such document is a memorandum of understanding. This is an especially common means of formalizing collaborative relationships among government agencies, or among different hierarchical layers within an agency. Another such approach is the formation of a new organization such as a nonprofit corporation. Creating a new organization also can be a method to raise funds for the project, manage the money, and create a lasting institutional structure. Whatever the mechanism for formal agreements, the intent is to provide clarity and mutual understanding, thus avoiding conflicts, disagreements, or overlooked issues.

Checklist—

- ☐ Is there an organization that is willing to collaborate as a sponsor of the participatory monitoring project, and do all the potential collaborators endorse this idea?
- ☐ Should the participatory monitoring project have an independent organizational structure, and why?
- ☐ What type of organizational structure is best suited to the project, considering:
  - Hierarchical or decentralized structure.
  - If it is an independent project or part of a larger program.
  - Degree of complexity.
  - Anticipated duration.
  - The number and kind of stakeholders, participants, or collaborators.
  - Potential for controversy.
  - Funding considerations.
  - Liability considerations.
- ☐ What roles and responsibilities will each participating group or organization assume?
- ☐ Who will be the representatives from each stakeholder group or organization, and how will they be accountable to both the collaborative effort and the interests they represent?
- ☐ Within the organization that is coordinating the participatory project, who will be the leader and what will be their role and responsibilities?
- ☐ How can the leader be contacted and who can act as a backup person?
- ☐ What are the other critical functions in the organization, who will be the responsible individual for each, how can this person be contacted, and who will offer backup help when needed?
- ☐ What formal arrangements are most appropriate for making agreements among organizations or levels within organizations?
- ☐ What are all the elements such agreements should contain?
- ☐ How can such formal arrangements be renegotiated or changed?
- ☐ How will the agreements be implemented and documented?

Sources—
ACCSP 2002; Behar 1996; Christoffersen 2003; Collaborative Forest Restoration Program 2003; Coughlin and others 1999; Daly, n.d.a; Dukes and Firehock 2001; Dvornich and others 1995; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; Kusel and others 2000; Moote and Loucks 2003; National Forest Foundation; U.S. Department of Agriculture, Forest Service, National Partnership Office 2005; North-South Environmental, Inc. 2004; Resolve, n.d.; Savan and others 2003; Sirmon and others 2002a, 2002b; Voluntary Sector Initiative 2001, 2002a; Wondolleck and Yaffee 2000.

Participants:
Recruiting, Selecting, Authorizing, and Dismissing Participants

Participants—
Participants are any stakeholders actively involved in a project. Depending on the level of their involvement they might or might not have input into the project process but lack decisionmaking authority. Whoever the participants are, mutually beneficial outcomes are more probable if affected stakeholders are represented in a balanced and fair manner, and if they can all participate equitably regardless of their financial status, available resources, or social and political power. Understanding each participant's incentives early in the project's development can help achieve these mutually beneficial outcomes (see "Incentives"). Similarly, honoring and rewarding participants for their work throughout the project can ensure that the project is enjoyable for all, as well as productive (see "Celebrations").

Stakeholder groups—
"Stakeholders" are all individuals and organizations that have an interest in the project, its outcome, and its products, regardless of whether they become directly involved in the actual monitoring process or not. There are numerous types of individuals, groups, or organizations that might be interested in joining a participatory monitoring project. Examples include:

- Nonaffiliated volunteers
- Land managers
- Forest workers
- Landowners
- City, county, state, and federal government agencies
- Native American tribes
- Community groups
- Schools
- Educational organizations
- Rehabilitation organizations
- Religious groups
- Businesses
- Corporations
- Economic development organizations
- Trade associations
- Researchers
- Colleges and universities
- Clubs
- Recreational groups
- Hunting or sporting associations
- Park associations

- Environmental or conservation organizations
- Habitat restoration groups
- Other nongovernment organizations or special interest groups

Representatives—
Individuals will often be selected, or select themselves, to represent a stakeholder group or organization in a participatory project. Several considerations apply to representatives. In collaborative processes, an individual might need to distinguish between representing themselves and others. For instance, a government agency representative might need to be very clear about when they are expressing personal opinions and when they speak for government policy. The same is true for representatives of other groups. Conflicts and misunderstandings can also arise when collaborators assume that an individual's opinion, word, or agreement represents the consensus of the stakeholder group they represent, when in actuality the group's members are in disagreement or the representative does not have conferred authority to speak for the group as a whole. In fact, some stakeholders might not even be aware that a particular individual is claiming to represent them, so it can be useful to check. Additionally, individual representatives come and go, such as when agency personnel are transferred, thus creating the need to form new relationships and renegotiate agreements. Clear understanding of how and to what extent an individual represents others can prevent troublesome misunderstanding and disputes. When participants representing a group continually keep their members informed of the progress of the monitoring project, they enhance two-way communication and avert potential misunderstandings; for instance, by distributing notes from project meetings or making sure members have access to planning documents. The stakeholder group might refrain from complaining publicly about agency decisions and ask their representative to convey concerns.

Individuals—
Individuals can also participate on their own behalf. Volunteerism is a long and honored tradition in the United States. When individuals are participating on their own behalf rather than representing an organization, they are most like employees. For instance, managers who plan to work with volunteers often find such individuals appreciative of recognition in the form of position statements that detail job title, purpose, responsibilities, qualifications, timeframe, location of work, evaluation of work, benefits, and other factors. Individuals also have some motivations for participating that differ from those of representatives or stakeholder groups. These are discussed in "Incentives" module that follows.

Recruitment—
Although stakeholders often express their own interest in participatory projects, active recruitment is sometimes necessary to acquire enough help or ensure equitable representation. Sometimes an announcement in the newspaper, a brainstorming session, or calls to selected organizations will meet the need. In other circumstances, formal scoping processes might be necessary to identify public

concerns and willingness to participate. This process can include activities such as broadly advertising in appropriate media and venues, or hosting outreach activities for minorities or traditionally underrepresented groups. Some stakeholders might be harder to reach than others and are therefore often excluded from agency or community-based projects. Yet these people might have an interest in the goals of the monitoring project and extensive applicable knowledge. For example, organizations such as Wallowa Resources in rural eastern Oregon have made efforts to involve hard-to-reach people and skeptical citizens in local monitoring projects. They were rewarded with greater acceptance of the monitoring results and broader public education.

Selection—
Individuals can make or break a collaborative effort, hence thoughtful selection of participants is important. To avoid hard feelings and disagreements, however, the selection process should be carefully designed, objective, fair, transparent, and agreed-upon by all collaborating organizations. For instance, determining minimum skill requirements for particular duties or physical fitness standards for fieldwork can be appropriate criteria if they are not misused to discriminate. Usually the knowledge, skills, abilities, as well as the available time and motivation of each volunteer, can be matched to some important task. Willingness to help, or to make long-term commitments to a project, are important criteria regardless of personal qualifications or impediments. It thus behooves organizers to match skills with needed work in inventive ways, and provide training as needed. Some individuals who could otherwise bring needed competencies to a collaborative effort might need support if they are to participate. Examples include financial help; transportation; care for children, pets, or other dependants; permission or leave from job supervisors; translation services; or accommodations for physical disabilities.

Willingness to help, or to make long-term commitments to a project, are important criteria regardless of personal qualifications or impediments.

Roles, responsibilities, and authorization—
Participants can play a variety of roles in a project. In addition to the typical contributions of data collection and fieldwork, their contributions can include voting on decisions made during the monitoring project, providing expertise, convening and leading meetings, facilitating processes or interactions, acting as an observer, or taking notes. Rotating roles and responsibilities is a good way of sharing perspectives, broadening collective competencies, and providing for backup skills within the group. If individuals who are selected to represent the project, or who are assigned specific responsibilities, are conferred official authorization, certification, or credentials by the project, then they can verify such authority when questioned by individuals who are unfamiliar with the arrangement. For instance, if field personnel are confronted about their activities by landowners, leaseholders, or law enforcement officials, they should have documentation to show their authorization to be where they are and do what they are doing. Background checks and photo identification might be a good idea if participants will have access to sensitive properties or proprietary records, or will be working with minors. Certification or credentials can also confer a sense of self-worth and of being valued by the group.

Leaders—
One of the most important roles that any participant can assume is that of a leader or champion for the project. Such an individual might be the hired president or chief executive officer of a nonprofit organization coordinating the participatory monitoring project, or it might be a manager with the vision to try new ideas. Whatever the case, such individuals will be more effective if they are capable, competent, well-rounded, responsible, respectful, tactful, active, and motivated. Certainly other descriptors are applicable, but a good leader can play a key role in the efficacy and success of a participatory project, so such individuals should be encouraged and supported. Project managers might wish to consider enticing participants to assume leadership roles by providing rewards such as compensation, letters of recommendation for work well done, school credit for students, access to resources for forest workers, or other benefits within their means. Empowering individuals to take on leadership should not result in disempowering other participants or making them feel less valued. Participants that recognize the opportunities of assuming a leadership role can feel empowered to undertake a variety of project tasks, such as:

- Recruiting, training, and mentoring new participants.
- Coordinating participant schedules or logistics such as travel to the field and lodging.
- Facilitating group discussions.
- Helping to assure quality control in data collection and management.
- Helping to maintain continuity in long-term projects.
- Documentation.

Disruptors—
Individuals with assertive personalities who habitually engage in disruptive, obstructive, distracting, self-aggrandizing, or disrespectful behavior can greatly hinder or doom a collaborative effort. On the other hand, such individuals can become useful participants in the collaborative process if there is adequate facilitation, training in communications skills, agreement about appropriate norms of behavior, time to develop trust, and support from others. Fostering a supportive environment with open communication will likely take care of most disruptive behavior. In extreme cases, the group might need to dispassionately examine the tradeoffs between continuing to include such individuals and finding a means of dismissing or excluding them. Such actions can of course have negative unforeseen consequences, so groups might wish to develop guidelines for respectful behavior that each new participant must affirm before they join the project. With such clear frameworks for personal behavior and group norms, dismissing uncooperative participants becomes less about personal likes or dislikes and more focused on making the group function effectively.

Checklist—

- ☐ Which stakeholder groups will be involved in the project, how will this decision be made, and how will it be documented?
- ☐ Will outside experts in the fields of facilitation, community organizing, or communication and outreach be sought to help the project? If so, which organizations or individuals are possible options?
- ☐ What outreach or recruitment activities are needed to ensure equitable and balanced representation of all parties with an interest in the project?
- ☐ What opportunities exist to involve other types of organizations in the project?
- ☐ How will clear and explicit understanding about the role of individuals who represent other groups or organizations be documented, especially if they contribute both personally and as a representative?
- ☐ How will representatives verify their authority to speak on behalf of those they represent?
- ☐ How will agreements and understandings with organizations and their representatives be evaluated and revised in the event that new representatives replace departing ones?
- ☐ If participants are individuals acting on their own behalf, what will be the mechanisms that ensure they are valued as a part of the participatory project or sponsoring organization?
- ☐ If recruitment is necessary to ensure adequate help or balanced representation, what rationale and criteria will guide the selection process?
- ☐ What support or incentives might be needed to involve reluctant or disenfranchised participants?
- ☐ What criteria will be used for selecting participants? How will these be documented?
- ☐ What knowledge, skills, or abilities does each participant possess that pertain to the project?
- ☐ How will individuals be matched to project tasks?
- ☐ How can roles and responsibilities be rotated or shared in order to spread competency and create backup skills?
- ☐ How will natural leaders be supported and encouraged?
- ☐ Do norms of personal behavior need to be developed in advance of selecting participants? If so, how and by whom will they be developed so that they are widely acceptable?

Sources—
Ballard 2004; Behar 1996; Bliss and others 2001; Bramson 1981; Brinkman 2002; Canadian Information System for the Environment 2001; Collaborative Forest Restoration Program 2003, 2004a; Coughlin and others 1999; Daly, n.d.a**;** Dukes and Firehock 2001; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; Godfrey 1994; Kaner and others 1996; Krishnaswamy 2004; Kusel and others 2000; Lengeler, n.d.; Lynch and others 2004; McNamara, n.d.; Moote and Loucks 2003; Natural Resources Conservation Service, n.d.; North-South Environmental, Inc. 2004; Resolve, n.d.; Sirmon and others 2002b; Sithole 2002; Stockdale and Corbet 1999; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; U.S. Department of Agriculture, Forest Service 2004; Voluntary Sector Initiative 2001; Wondolleck and Yaffee 2000.

Communication:
Developing Good Understandings and Agreements

Building trust—
To effectively collaborate, participants must trust one another. Building trust requires clear and nonthreatening communication, but engaging in clear communication with individuals who do not share our background can be very difficult. Developing trust takes time and shared experiences. The more different individuals are, and the greater their original distrust of each other, the longer mutual trust takes to develop. Communication is a process, however, and there are methods to improve its effectiveness.

Building trust requires spending time together, getting to know each other, and reaching clear understanding and agreements.

Means for improving the effectiveness of communication can involve appropriate styles of communication, focusing on each other's perspectives and use of language, meeting and communicating in appropriate venues, and getting help or training in effective communication techniques. Inevitably, the process of building trust requires spending time together, getting to know each other, and reaching clear understanding and agreements. One of the best ways to do this is to participate in projects. For this reason, working with each other to address all the applicable considerations listed in the modules of this handbook is an excellent trust-building exercise in and of itself.

Communication styles—
People differ in the way they communicate. For instance, some individuals are action oriented and others focus on building relationships, some wait for others to finish their thoughts and others interrupt frequently in a fluid brainstorming style, some like to hear themselves talk and others concentrate on listening carefully. All are appropriate styles in some circumstances and not useful in others. Learning to understand and appreciate these various styles can prevent hard feelings or frustration. Regardless of style, communication is facilitated when it is respectful, civil, open-minded, inclusive of all viewpoints, thoughtful, frank, honest, nonaccusatory, noncoercive, unrushed, and safe. In situations where some individuals feel intimidated by differences in power, education, language skills, or feared repercussions, providing the time and support for them to be heard and appreciated is especially important. The references listed below include a variety of helpful documents for addressing various communication styles.

Perspectives—
All humans perceive their world through the lens of their past experiences, and those experiences differ widely. Fundamental differences such as worldviews or paradigms consist of sets of assumptions about the way the world works, what humans are like, how we should behave, and what is important. These assumptions often lead to preconceived notions about what people in other cultures or socioeconomic groups are like. We also have preconceived notions about the best way to understand the world, be it science, tradition, religion, or direct personal

experience. When our worldviews, assumptions, perspectives, and preconceived notions differ significantly from those of other individuals with whom we are trying to collaborate, clear communication often requires additional effort. Building trust and providing a comfortable context to begin the process of appreciating each other's viewpoints can be facilitated by activities such as visiting each other's homes or places of work; taking field trips together; joint fact finding; undertaking small projects; or sharing informal meals, music, or recreational activities. Structured communication and learning exercises are other ways to explore alternative perspectives. Examples include:

- Framing issues.
- Creating vision statements.
- Hosting guest speakers.
- Sharing reading assignments or movies.
- Hosting training courses that compare the scientific method with traditional ecological knowledge.
- Exploring each other's expectations.

Language—
Because language is the medium through which we communicate our varied perspectives, our use of different words, phrases, acronyms, terminology, or native tongues is natural. A rancher is unlikely to describe a creek in the same manner as a university researcher. A retired elementary school teacher is unlikely to understand the management acronyms of a Bureau of Land Management forester. A Hispanic migrant worker or Asian immigrant could have difficulty understanding English. Outside facilitators or translators also can be helpful with our use of language. Nobody should feel embarrassed or hesitant to ask others for clarification or help with translation. Neither need we take our differences too seriously. To promote sensitivity with language differences, participants might consider tools such as humorous skits and role playing.

Meetings—
Getting things done in a group usually requires meetings, so meetings often are the context where communication difficulties become apparent. Meeting coordinators or project leaders might not be the best individuals to facilitate communication. Often professionals have more training and an objective perspective. Early decisions about whether professional outside facilitation will be worthwhile can avert later difficulties. Some suggestions are discussed in the next section, "Getting help." Meetings work better in venues where all the attendees feel comfortable sharing their opinions candidly, and where they are comfortable with the location, facilities, access, schedule, and activities. Elements as simple as chair and table arrangement can help or hinder open and balanced communication. Group size and the diversity of the participants are important determinants of social dynamics and personal interactions. Meetings usually result in more useful outcomes when they are focused by leaders, ground rules, agendas, note-takers, and shared minutes.

First meetings can be awkward if participants do not know each other. One way to engage everyone in such a meeting would be to ask each person to describe how he or she envisions a vista or landscape located in the area that will be monitored. Individuals will likely emphasize positive and negative attributes they recognize and can relate to in each other's images.

Getting help—
Clear communication is such an important facet of modern society that human resources for assisting the process are abundant. One need only look as far as city or county courts to find local professionals who specialize in facilitation and mediation services. Library books and Web sites abound; some are listed in the "Annotated References." Local community colleges or other schools likely teach courses on the topic. The group need not spend a lot of money on a consultant if selected members of the group receive training. Sometimes overcoming hurdles can be as simple as agreeing to group norms of behavior or taking time to let emotions cool. Or the entire group could take training in effective communication skills or decisionmaking processes. Ongoing evaluation, feedback, and reality checks can be useful techniques. The bottom line is that if clear communication or the conduct of meetings is a problem for the group, help is readily available.

Checklist—
- ☐ What are the plans and methods for building mutual understanding and trust among participants?
- ☐ How do communication styles differ among participants in the project?
- ☐ How do perspectives differ among participants?
- ☐ What differences exist among participants in their languages, terminology, or use of words?
- ☐ How will different communication styles, perspectives, and languages among participants be addressed during meetings and other communications?
- ☐ How will meetings be planned and conducted to facilitate or enhance clear communication?

Sources—
Adler and Birkhoff, n.d.; Ballard 2004; Behar 1996; Christoffersen 2003; Collaborative Forest Restoration Program 2003; Coughlin and others 1999; Daly, n.d.a; Dukes and Firehock 2001; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; Justice and Jamieson 1999; Kaner and others 1996; Krishnaswamy 2004; Lynch and others 2004; Moote and Becker 2003; Sirmon and others 2002a, 2002b; Sithole 2002; Stockdale and Corbet 1999; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; Voluntary Sector Initiative 2001; Wondolleck and Yaffee 2000.

Incentives: Understanding Motivations, Concerns, and Anticipated Benefits

Stakeholder motivations and concerns—
Stakeholders typically anticipate benefits and express concerns about participation, as do individuals. Although both stakeholder groups and individuals share some motivations, we discuss stakeholders and individuals separately because incentives often differ too. The tabulation below lists the major goals and concerns that motivate stakeholder groups with respect to participating in monitoring projects.

Major goals of participation that motivate stakeholder groups	Major concerns with respect to participation on the part of stakeholder groups
• Stretching limited resources, sharing work, working more effectively. • Reducing conflict and litigation. • Influencing policy or management decisions. • Improving land stewardship. • Shared accountability and responsibility. • Simultaneously meeting local and larger-scale needs for information. • Ensuring access to a resource for economic or traditional use. • Community development, capacity, building and employment opportunities. • Market-based incentives. • Public education. • Ensuring social and economic justice. • Improving community relations.	• Freedom to complain or object might be coopted by the collaborative process. • Too expensive or time consuming. • Risk of failure. • Data might lead to unwelcome consequences. • Data might not be trusted or used. • Others might have unrealistic expectations or lack willingness to commit to common action. • Fear that others might sabotage or misuse the process. • Collaborative decisions might counter vested interests.

Personal incentives and concerns—
Individuals can share the same motivations and concerns as stakeholder groups and still have their own set of incentives or concerns about being involved in a participatory project (see the following tabulation).

Examples of personal incentives	Examples of personal concerns
• Increased ability to influence others or policy. • Ensuring access to a commercial resource. • Contributing to a valuable cause. • Improving one's resume. • As an extension of one's job. • Contrast to paid work. • Testing leadership skills. • Learning, gaining experience, and acquiring self-confidence. • Using knowledge, skills, or abilities. • A sense of power, success, and personal achievement. • Gaining recognition or impressing others. • Affiliation with a project or feeling a part of a team. • Expressing concerns or ideas. • Exploring job opportunities or testing a career change. • Keeping track of what is happening "on the land." • Maintaining family or cultural traditions. • Enhancing one's quality of life. • Meeting new people. • Setting an example for children. • Mutual involvement with family or friends. • Getting compensated to visit nice places. • Keeping physically active by getting outdoors or enjoying nature.	• Fear of change. • Shyness or lack of self-confidence. • Lack of time. • Being exploited. • Lack of training. • Exposing one's ignorance. • Embarrassment, appearing foolish, or ridicule. • Insufficient support from family, friends, community, or employer. • Lack of trust in others. • Working hard on a project only to see it fail or be ignored.

Finding common ground—

Because participants bring such diverse incentives and concerns to the collaborative process, it behooves all involved to understand what is motivating the other participants. In many cases, incentives overlap or at least are complementary. Motivations also can diverge or conflict. For instance, an individual who is motivated by a strong sense of self-importance and a need to demonstrate their worth can intimidate other participants who are shy or hesitant to become involved. Or, for example, a person who is motivated predominantly by the need to find new employment might not be willing to make a long-term commitment to the group. Stakeholders interested in a particular outcome might not be willing to fully participate in an objective group process if they suspect it could result in decisions they consider onerous. Because motivations are so varied, and because they often change, clear understanding of each other's motivations improves communication and allows collaborators to craft inventive ways to ensure all participants find the project rewarding.

Ensuring all benefit—
"Win-win" or mutually beneficial outcomes can occur fortuitously, but often require intention and focused effort. The simple process of listing each participant's incentives, hopes, visions, and concerns, then sharing and discussing them, can go a long way toward building mutual appreciation, rapport, and understanding. Of course, honesty aids the process. Where incentives are divergent or potentially in conflict, or where serious concerns are expressed, participants might wish to follow a more formal process of reconciliation or remedies. If participants have conflicting motivations and feel disparity in their ability to influence outcomes, the less powerful among the group might need more support or attention to ensure an equitable collaborative process. If the group considers the exercise useful, participants might document explicit understandings of each other's needs and expected benefits or outcomes. Periodic review of how well expectations are being fulfilled can forestall conflicts or disappointment.

Periodic review of how well expectations are being fulfilled can forestall conflicts or disappointment.

Checklist—

- ☐ What are the motivations (incentives and concerns) of each stakeholder group?
- ☐ What process will be used to identify and share these motivations?
- ☐ What are each individual's motivations for participating (or not) in the project?
- ☐ How will personal motivations be identified and shared?
- ☐ To what extent do different stakeholder group's incentives and concerns overlap, diverge, or conflict?
- ☐ To what extent do different participant incentives and concerns overlap, diverge, or conflict?
- ☐ How best can the expectations and incentives of stakeholder groups be fulfilled or rewarded?
- ☐ How best can the expectations and incentives of participants be fulfilled or rewarded?
- ☐ How will each group's concerns be addressed?
- ☐ How will participants' concerns be addressed?
- ☐ How will conflicting motivations be kept to a minimum or resolved?
- ☐ How will participant motivation and enthusiasm be sustained over time?
- ☐ How will any explicit understandings or agreements be documented? How often will they be reevaluated?

Sources—
Christoffersen 2003; Collaborative Stewardship Team 2000; Daly, n.d.a; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; Guijt and others 1998; Kusel and others 2000; Lawrence and Ambrose-Oji 2001; Lynch and others 2004; Moote and Becker 2003; Moote and Loucks 2003; Sirmon and others 2002b; Sithole 2002; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; U.S. Department of Agriculture, Forest Service 2004; Voluntary Sector Initiative 2002a; Wondolleck and Yaffee 2000.

Design:
Involving Participants in Project Design

Matching roles to expertise—
Participants can be usefully involved in any phase of designing a participatory monitoring project as long as their level of knowledge and expertise is matched to the role they will play. An important consideration is the concern that resultant data be viewed as credible by the users of the information. If monitoring data are not trusted, then the collaborative effort has been wasted and all parties involved in, or familiar with, the project will be discouraged. Discussing, during the design phase, how data will be analyzed and how results will be distributed can help ensure the information is both credible and useful to all. Details are discussed in the "Quality," "Analysis," and "Reporting" modules.

Individuals without formal education in a topic can contribute to the most complex project design.

That said, even individuals without formal education in a topic can contribute to the most complex project design if they have unique knowledge, information, or perspectives that might otherwise not have been considered. For instance, local participants often have a familiarity with locations, local habitat, forest conditions, specific organisms, or practical considerations that managers, specialists, or scientists do not. All of these types of information can be exceedingly useful in developing efficient sampling designs, avoiding mistakes, planning logistics, efficiently using time and resources, and maintaining safe work conditions.

Determining appropriate roles for participants in planning sampling protocols, fieldwork procedures, data analysis and management, record keeping, equipment care, and other aspects of the project design and management depends not only on factors such as project complexity, sophistication, need for long-term support, but also on the qualifications of the individuals involved. For instance, perhaps a retired statistician or taxonomic specialist volunteers to assist the project, thus obviating the need for outside technical expertise on that topic. Such experts can, however, threaten the job security of hired staff (if they are not already too busy), so sensitivity to this possibility can prevent problems. Other participants might come to projects with previous leadership experience or show aptitude or interest in leadership during the course of a project. The greater the number of participants in a project, the more likely there will be a need for some participants to assume extra responsibilities as leaders. Ways to promote leadership are discussed in the "Participants" module. Matching participants to the roles they play in project design is best done on a case-by-case basis. Issues of efficient sampling designs and statistical validity will be discussed further in the modules on "Sampling" and "Quality."

Matching indicators and measures to goals—
As discussed more thoroughly in the "Indicators" module, most participants can certainly participate in determining what indicators will best serve to meet project monitoring goals, and often they can help identify and select the particular measures that would best reflect trends in the indicators. Sometimes such indicators are not biological, but rather geophysical, social, economic, cultural, or other.

Feasibility, practicality, affordability, and continuity—
The practical experience of local participants can also serve as a reality check on the enthusiasm of specialists or novices who have less experience with the logistical implications or expense of planned activities. Individuals or stakeholder groups that are familiar with local resources and conditions often make more accurate estimates of the time, effort, resources, and labor needed to attain a particular goal. This practical knowledge qualifies them to better match available resources to long-term plans, and thus help the project avoid overcommitment or participant fatigue. Involving participants in appropriate aspects of project design improves the likelihood that expended time, resources, and labor will be efficiently used to achieve project goals. Maintaining long-term commitment to a project can be challenging, so engaging participants in planning or designing incremental results and rewards, while striving for long-term goals, will help sustain project continuity.

One way to involve participants in project design is to evaluate the utility, propriety, suitability, efficacy, and feasibility of the proposed project. Evaluating the utility of the project might include questions such as: "How widely will the results of this project be used? Is it only applicable to the monitored area or can the results be extrapolated over a broader region? Could project activities help managers meet information and participation requirements associated with the National Environmental Policy Act? Propriety issues could include: Is the proposed project legal and ethical? Is it consistent with other formal agreements and compliant with the Federal Advisory Committee Act? To evaluate suitability, questions might include: Will it benefit stewardship objectives? Are the selected indicators appropriate for answering questions posed by project goals? Regarding efficacy: Is the project designed to be scientifically defensible? Will the collected data provide reliable information about the actual state of the indicator or detect meaningful change? Is the project cost-effective? Does project design take advantage of opportunities for partnerships with other organizations or agencies? To evaluate feasibility: Are the project activities and objectives realistic, prudent, and frugal? Can goals be accomplished in the allotted time and within the proposed budget? Involving participants in this preproject evaluation process can increase the likelihood of success as well as contribute to trust between monitoring coordinators and participants.

Checklist—

- ☐ If appropriate, how will a collaborative design process be conducted?
- ☐ Who will participate in designing each aspect of the monitoring project and why?
- ☐ What skills or qualifications can each participant apply to project design? How will such contributions be documented?
- ☐ Which aspects of the project design would benefit from the advice or skills of experts or specialists that are not represented among the participants?
- ☐ Who will participate in selecting indicators and measures? Why?
- ☐ How will traditional or local ecological knowledge be incorporated into the design process?
- ☐ How will practical considerations be incorporated into the design process?
- ☐ How can the project be designed to enhance continuity?
- ☐ How will the project be evaluated for feasibility?

Sources—

Bliss and others 2001; Herman and others 1997; Daly, n.d.a; Dukes and Firehock 2001; Everett 2001; Godfrey 1994; Herron and others 2004b; Krishnaswamy 2004; Lengeler, n.d.; Ottke and others 2000; Stockdale and Corbet 1999; Whitman and Hagan 2004; Wong and others 2002; Wright, n.d.

Resources:
Obtaining and Allocating Funds, Resources, and Support

Budgeting—

Available resources (such as money, equipment, facilities, services, supplies, and labor) are among the most important constraints on what a participatory monitoring project can accomplish. Obtaining sufficient quantities to meet project goals, using the resources wisely, and keeping track of progress also are important tasks collaborators will undertake.

An especially salient issue is the relative allocation of resources among participants, especially if some are struggling financially or are donating their time while others have dedicated budgets or are getting paid for their work. If participants start keeping track of the time they contribute to a project from the very beginning (see the "In-kind support" section in this module's discussion), this information could prove useful in subsequent discussions of fair compensation.

Budgeting must begin with an analysis of what is needed to achieve project goals. To do so, participants must start with a relatively clear picture of the entire project and the process of meeting goals. This can be difficult with participatory projects because the group often does not know how much time and effort will be required in advance to build trust, develop clear communication, develop succinct goals, and figure out methods for achieving those goals. A conservative assumption is that it will likely take more time and effort than anticipated.

Once the participants have a clear idea of project goals and how they want to achieve those goals, then careful consideration must be paid to matching available resources to every phase of the project (including the "Evaluation" and "Celebrations" modules) if satisfactory results are to be achieved, resources wisely spent, and participants rewarded for their efforts. Frequently overlooked steps (that are particularly crucial if participants are involved) are data analysis, and the reporting and disseminating of the results. Planning these steps in advance and discussing their place in the budget can help to solidify long-term commitment to the project and avoid misunderstandings later. Details are discussed in the "Analysis" and "Reporting" modules. Matching resources to goals usually entails setting priorities and attempting to acquire additional resources. Addressing the considerations that are listed in many of the modules in this handbook will help provide a comprehensive picture of needed resources, but wise planners also allow some allocation for miscellaneous needs, unforeseen expenditures, and emergencies.

Fundraising—

Because collaborative projects are becoming more popular, the spectrum of potential funding sources is surprisingly broad. That is not to say that acquiring funds is necessarily easy or quick, simply that a range of opportunities exist. Federal land management agencies have a variety of funding mechanisms including challenge grants and stewardship contracting, as well as budgets for existing monitoring programs that could be modified to include participatory ventures.

Various government agencies provide grants for innovative and collaborative resource management enterprises. Private foundations are especially keen to support multistakeholder participatory projects in order to improve the probability that their money will be well spent. Nongovernmental organizations can be particularly well-positioned to raise project funds that agencies cannot access. Mentioning the use of participatory guides such as this one might increase the chances of obtaining funds from both private and public sources. Two strategies for enhancing fund-raising achievements are diversity of effort and leveraging success. This entails approaching a variety of potential funding sources and emphasizing how further contributions will supplement an already productive enterprise. Individual and corporate giving are additional possibilities. Whoever is approached for funding, well-documented project plans improve the likelihood of success because they demonstrate to grantors that project supporters are serious and the project is carefully conceived. Lastly, funding organizations typically focus their giving on discrete, short-term projects that can demonstrate quick results, but participatory monitoring projects are often long-term in nature. This discrepancy can be addressed by designing participatory projects that have interim goals and accomplishments, and by educating funding organizations about the need for long-term support. Endowments are particularly appropriate for long-term projects.

Accounting—
Keeping track of resource expenditures is important in any enterprise, but assumes heightened significance when participants are still developing mutual trust. For this reason, accounting for funds and other resource use in a multistakeholder, collaborative project should be especially accurate, understandable, transparent, widely shared, frequently updated, carefully reviewed, and independently verified. Selecting individuals who are widely trusted and competent contributes greatly to building trust that resources will be expended sensibly and ethically.

In-kind support—
Participatory projects, by their very nature, entail a great deal of individual time and effort that is not commonly tracked by measures such as work hours or wages. Other participants can easily overlook these contributions if they are not explicitly documented. Such oversights can lead to misunderstanding and disputes about fairness or commitment. Avoiding these troubles is a good reason to have all participants document their time commitments to the project. Doing so also demonstrates to outside contributors the level of commitment on the part of participants.

Other types of in-kind support also should be assigned monetary value and explicitly included in budgets. Examples include donations of office space, equipment, vehicles, supplies, meals, lodging, or transportation. Where project sponsors require matching contributions, in-kind contributions are often considered acceptable. Thus, for individuals or community groups with few financial resources, documentation and acknowledgment of in-kind contributions can be an effective strategy for securing their participation and funding a project.

Community support—
Some forms of support for a project are difficult to appraise monetarily. Nonetheless, they can be critical to a project's chances of success. Community support is valuable because awareness of, and appreciation for, collaborative efforts in a community can lead to other more quantifiable resource contributions. For this reason, it often behooves participants to engage in outreach activities that acquaint the local community with the goals, methods, and resource needs of the project. Outreach can consist of activities like presentations to community or interest groups, booths at fairs or festivals, nature walks, field trips, invited speakers, slide shows, photo opportunities, newspaper articles, radio or television programs, seminars, special classes, retreats, conferences, pamphlets, Web sites, or other methods only limited by the imagination of project participants or community supporters. Public award ceremonies and celebrations of work accomplished by the participants can also generate community support, as well as help participants feel good about their work on the project (see "Celebrations" module). Engaged volunteers or participants also can benefit communities by partaking in other community development activities. Examples include planting trees or beautification projects.

Community support can be gained by involving participants to engage in outreach activities that acquaint the local community with the goals, methods, and resource needs of the project.

Checklist—
- ☐ What process will be used to create a budget that addresses all pertinent aspects of a monitoring project? Who will do it?
- ☐ With whom will the budget be shared?
- ☐ How will it be documented, updated, and shared?
- ☐ What financial resources or other assets already exist?
- ☐ How will additional funds, resources, or in-kind support be acquired?
- ☐ How will the contributions of all participants be evaluated and documented, especially time and other in-kind support.
- ☐ If appropriate, how will financial compensation for participants be arranged?
- ☐ How will decisions about changes in resource allocations be documented?
- ☐ Who will be the responsible individual for the project budget?

Sources—
Behar 1996; Christoffersen 2003; Collaborative Forest Restoration Program 2003, 2004c; Daly, n.d.a; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; Godfrey 1994; Lindenmayer 1999; Moote and Becker 2003; National Forest Foundation; U.S. Department of Agriculture, Forest Service, National Partnership Office 2005; North-South Environmental, Inc. 2004; Resolve, n.d.; The Volunteer Monitor, n.d.; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; Voluntary Sector Initiative 2002a; Wright, n.d.

Implementation Stage

Training:

Providing Participants With Requisite Training

Training topics—
Some monitoring project coordinators might find it most manageable to start with a small project that capitalizes on skills participants already have. In other cases, official training is an effective means of quickly providing or enhancing needed skills. Not only do participants find such learning to be a rewarding experience, but training enables them to plan and implement the project more effectively and safely.

High-priority training topics include:

- Safety and emergency plans and procedures.
- First aid and CPR (cardiopulmonary resuscitation techniques).
- Sampling protocols.
- Quality-control protocols for data.

As needed, collaborators might wish to consider formal training in the following topics:

- Effective communication skills.
- Systematic and collaborative decisionmaking processes.
- Conducting meetings effectively.
- Facilitation, negotiation, mediation, and dispute resolution.
- Leadership skills.
- Dealing with difficult individuals.
- Budgeting and accounting.
- Use of computers or computer programs.
- Benefits and limitations of the scientific method or traditional and local ecological knowledge.
- Species identification.
- Field equipment use.
- Scientific, inventory, or monitoring methods.

Tailoring training to needs, opportunities, and resources—
The expense and time needed for training will depend on the goals and objectives of the project in relation to the existing skills and knowledge of the participants. Careful assessments of needed training helps project planners allocate limited resources where they will produce the greatest benefit. Innovative approaches to training can also save time and money. For instance, certain participants might already have the skills to train others on particular topics. Outside experts might be convinced to volunteer their time. Training resources could be freely available in books or on Web sites, and by using these materials the participants could train themselves as a group process. Larger participating organizations might already have such training experts on their staff. Many companies and nonprofit organizations offer various training programs, often for a fee.

Developing a training program—
Developing, documenting, and implementing an official training program is a good way to convince outside reviewers that the project is being taken seriously by the participants. Benefits include enhancing enthusiasm for the project, increasing financial support, avoiding liabilities, and improving the credibility of the data and results. The training needs of volunteers and participants might be somewhat greater than that of employees, because participants are often selected on the basis of their willingness to help rather than on their knowledge, skills, and abilities.

Learning works best when the subject matter of a training program is clearly organized and the information is either frequently used, or the training is periodically repeated. When skills learned in training programs are first applied, immediate feedback is very useful for reinforcing correctly learned behavior and for catching errors before they become habits. Hence, training programs are better viewed as ongoing processes rather than discrete events. Part of this process is evaluating the efficacy of the training and incorporating needed revisions. Often training occurs in groups, but when a new individual joins the project, repeating the training for the entire group might not be feasible or cost-effective. Orientation programs or mentors can help new participants more quickly become familiar with the project and needed skills. Because training takes time and can soon be forgotten, it is best scheduled when participants are not busy with other tasks and shortly before the learned skills will be put to use. Lastly, formal recognition, documentation, or certification of training accomplishments or acquired skills is rewarding to the participants and useful for demonstrating their new competencies to others. For instance, requiring first aid certification can be important for mitigating liability for accidents, and formal testing and documentation of sampling or quality control skills can enhance the credibility of collected data. Certifying progressive levels of skills can reward participants incrementally as they continue to train, and such documentation provides a logical means for matching individuals with increasingly difficult tasks.

Checklist—

- ☐ How will the knowledge and skills that participants bring to the project be evaluated and documented?
- ☐ What training should be provided to all participants?
- ☐ How will individual training needs be determined?
- ☐ What training resources are available?
- ☐ What innovative means exist to meet expensive training needs?
- ☐ How will the importance, urgency, and resources available for each training topic be weighed to prioritize training?
- ☐ Who will be responsible for each topic of training?
- ☐ How and when will training be reiterated, evaluated, and revised?
- ☐ Under what circumstances would orientation programs and mentors be useful for bringing new participants up to speed with needed skills?
- ☐ What are the ways to test, document, and certify training accomplishments?
- ☐ How will all training programs be documented?

Sources—

Coughlin and others 1999; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Herron and others 2004a, 2004b; Hunt and others 1996; Lengeler, n.d.; McNamara, n.d.; North-South Environmental, Inc. 2004; Sirmon and others 2002a, 2002b.

Safety:
Ensuring Safety and Planning for Emergencies

Safety plan—
A safety plan is designed to prevent harm, injury, or death to individuals participating in the monitoring project. In almost all respects, such a plan for volunteers would differ little from a plan for employees. Safety cannot be overemphasized. An equivalent commitment of resources, training, planning, and assumption of liability should be implicit if all participants are to be equally valued. Safety plans should include a job hazard analysis, including steps to mitigate risks. For field personnel, the job hazard analysis should include use of unfamiliar vehicles, driving on secondary roads, negotiating difficult terrain, dealing with extreme weather, avoiding harm from dangerous plants and wildlife, protecting care providers from bloodborne diseases, and treating allergies. Safety plans should also cover needed safety equipment and use; appropriate clothing; personal medical conditions pertinent to safety or emergencies; appropriate safety procedures; first aid/CPR training and certification; periodic scheduled sessions to acquaint participants with the safety and emergency plans; provisions for medical coverage; contact information for whom to notify in the case of an emergency or death, and appropriate or required liability forms. Acquiring project liability insurance is wise, and insurance providers might have their own forms for participants to complete.

Emergency plan—
When safety plans fail to prevent an accident, emergency plans are designed to keep injuries to a minimum, facilitate the arrival of help, ensure important considerations are not overlooked during the crisis, and provide the means to learn from past mistakes. Elements of an emergency plan should include all field personnel carrying the emergency plan with them in the field, adequate proximity of team members trained in first aid and CPR, availability of appropriate first aid equipment and supplies, knowledge of medical conditions that could complicate or worsen injuries, functional communications equipment, periodic check-in times, a plan for handling encounters with threatening individuals, contact information for emergency assistance, evacuation routes, maps and descriptions of rendezvous points for ambulances or helicopters, checklists and forms for documenting the incident, accident forms for vehicles, and evaluation procedures to learn from mistakes.

Checklist—
☐ What is the safety plan for the project? Include in this plan:
- Ways to mitigate for field hazards such as difficult terrain, extreme weather, dangerous plants and wildlife, hazardous interactions with other people or activities, bloodborne diseases, and allergies.
- Document provisions for needed safety clothing, equipment, and supplies.
- Create standards for periodic first aid-CPR training.

- Evaluate potential need for driver's education regarding unfamiliar vehicles or secondary road hazards.
- Identify medical conditions that might need special attention.
- Ensure all personnel are officially covered by adequate medical insurance if possible.
- Ensure all personnel are officially covered by adequate liability protection.
- Ensure all personnel have provided information about who to contact in an emergency.

☐ What is the emergency plan for this project? Ideally this plan should:

- Provide all field personnel with a copy of the emergency plan to keep available constantly.
- Create standards for all field personnel to be in proximity to individuals trained in first aid and CPR.
- Create procedures to ensure that all field personnel have access to emergency first aid equipment and supplies in good condition.
- Ensure that all first aid providers are familiar with the medical conditions of others that could require special attention.
- Ensure that all personnel have access to functional communications equipment needed to summon emergency help.
- Set regular schedules for field personnel to report their location and status.
- Provide training in how to deal with threatening or dangerous wildlife.
- Provide training in how to deal with threatening or dangerous people.
- Document complete emergency contact information for emergency responders.
- Document evacuation routes and rendezvous points for ambulances or helicopters.
- Create checklists of things to consider and document in an emergency.
- Provide accident forms.
- Stipulate reporting criteria, forms, and procedures so that accidents are evaluated for means to improve safety.

☐ How often and when will training be conducted to periodically acquaint all personnel with the safety and emergency plans?

Sources—
San Bernardino National Forest 2002; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; U.S. Department of Agriculture, Forest Service 2004.

Fieldwork:
Planning Field Activities

Scheduling field activities—
Managers usually have experience with planning field activities, but participants might or might not have such experience. Often travel, safety procedures, or support activities take longer than anticipated so planning extra time for unforeseen circumstances can help keep fieldwork on schedule. A variety of factors can influence or determine when fieldwork needs to occur, such as lifecycles of the organisms being sampled, weather, hunting seasons, or logging activities. Time needed to get to and from the work site, travel conditions, traffic patterns, how much can safely be accomplished in a day, the number of field personnel available, time needed to prepare for field visits and wrap-up afterwards, or coordinating with visitors can all affect the schedules of field activities. Ideally a field crew leader or supervisor coordinates these factors.

Field travel, logistics, equipment, and safety—
Traveling in motor vehicles is one of the most dangerous things that people do, so adequate time should be allocated to travel safely, especially on hazardous remote roads. If distances are great, overnight lodging, campsites, or remote field stations might be necessary for efficiency and safety. Insurance, agency, or organization policies often limit the amount of time any one person may drive in a day or without rest, so it is important to determine these requirements and plan accordingly. Personnel should be informed about sanitation practices in the field and be provided garden trowels, both for personal comfort and to avoid polluting bodies of water or leaving unsightly messes. Other considerations include maps, traversing difficult terrain, adequate food and water, appropriate safety clothing and equipment, communication devices, and data collection equipment. Two safety considerations are especially important. Accidents can be reduced by designing work hours and breaks to avoid fatigue and to eliminate the need to work hastily to complete a task. Also, working in teams is always safer than working alone, because in the event of an accident, immediate care is available. Working in teams can be more efficient too. For instance, one individual can make measurements while the other records them. Team members also can check each other's work for accuracy.

Support activities—
Most fieldwork involves support activities both before and after a day in the field. Whereas these activities might not be as appealing to participants as the actual fieldwork, they are essential to ensuring data quality and reliable results. Therefore, explaining and training participants in the handling, storing, and backing-up of data can be as important as training for fieldwork. Examples include vehicle and tool maintenance, food preparation, cleanup, record keeping, laboratory work, or the identification, processing, and storage of specimens. Allocating adequate time

Explaining and training participants in the handling, storing, and backing-up of data can be as important as training for fieldwork.

to these activities improves safety, reduces fatigue, and ensures important tasks are not overlooked or slighted. Lastly, individuals who plan the fieldwork might wish to allocate time and resources to acquiring a photographic record of all activities. Although this can be time-consuming, many participants find it very rewarding. The images can be shown in celebratory gatherings or used for promoting the project. Pictures with people in them are usually of greater interest to audiences than pictures without people, so make sure your field personnel are prominently highlighted performing their various tasks. Some individuals prefer not to be photographed, so it is polite and respectful to ask first.

Checklist—

- ☐ What tasks need to be done before, during, and after field visits?
- ☐ For each task, who will be responsible for ensuring the work is completed in a timely manner?
- ☐ Who can take responsibility for a task if the lead individual is unable to be present or participate?
- ☐ How will each task be scheduled (including time for breaks to reduce fatigue)?
- ☐ What equipment is needed for each task?
- ☐ What maps, instruction for traversing difficult terrain, appropriate clothing and equipment, communication devices, and data collection equipment will field personnel need?
- ☐ What arrangements will be made for transportation, food, and lodging?
- ☐ How will vehicle use, trip preparation, fuel purchasing, maintenance, storage, care, security, repair, record-keeping, and accident procedures be documented?
- ☐ How will equipment handling, maintenance, storage, care, security, and replacement procedures be documented?
- ☐ What information (sampling protocols, emergency procedures) should personnel carry in the field?
- ☐ How will daily events in the field be documented?
- ☐ Who should be informed about needed revisions to sampling protocols or such noteworthy incidents such as accidents, threats, or illegal activities? How and how soon should they be informed?
- ☐ What contingency plans should exist for both anticipated and unforeseen events that could interfere with timely and complete field sampling?
- ☐ What plans are appropriate for making, handling, and archiving a photographic record of activities?

Sources—

Collaborative Forest Restoration Program 2004d; Stockdale and Corbet 1999.

Sampling:
Developing Sampling Designs and Data-Collection Procedures

Choosing valid, appropriate, and effective sampling designs and methods—Although any participant can be included in the process of developing sampling designs and methods, creating ones that are feasible, efficient, statistically valid, and trusted to produce credible data requires a great deal of specialized knowledge and experience. Valid and appropriate sampling designs and methods must match project goals, available resources, participant skills, logistical and practical considerations, quality standards, criteria for statistical rigor, and intended analyses. If data will be combined with other monitoring projects, development of standardized measures, common formats, comparable units, and uniform sampling protocols greatly facilitate the process. Some preliminary research into similar projects could provide ideas for addressing these issues. If the expertise to balance all these considerations is not available among the participants, then outside help should be acquired. This issue is so important that even the work of experts is improved by peer review. For this reason, project coordinators might consider review of the sampling design and measurement protocols by technical panels, advisory groups, other specialists, or program managers.

The "Design" module discusses the benefits of involving participants in all stages of project design, including technical aspects such as sampling. Although participants might not make decisions about complex sampling considerations, their insights can be valuable, and their understanding of the choices provides them with confidence and ownership in the project. Participants can be involved in development of sampling design and data collection procedures in several ways:

- If participants are unfamiliar with the concepts, they could benefit from question and answer discussions or readings.
- Some participants might be comfortable with phone conferences and email, whereas others might prefer one-on-one interactions or small focus groups where they can take sufficient time to clarify complex ideas and better engage in the process.
- A site visit can engage participants in thinking about the project in the context of what they know about the local environment.
- Specific questions can stimulate thinking about sampling. For example, if the participants are gatherers of a medicinal plant root, asking them if they know of areas where plots could be located could help avoid potential conflict between their traditional activities and data collection.

Sampling protocols—
We define sampling protocols as planned and systematic sets of methods and procedures for collecting data. Such protocols depend not only upon the chosen statistical design for sampling in a nonbiased manner, but also the targeted organisms, field conditions, and other practical considerations. Protocols must match worker knowledge, skills, or training if they are to be effectively applied. Standardized protocols that are used consistently by all data collectors are integral to obtaining uniform data that can be validly compiled or compared. Examples include determining how and where to locate plots or orient transects, criteria for what to sample, precisely how to measure an attribute, or how to identify an organism. All aspects of how, what, where, and when to sample must be carefully considered, meticulously documented, and thoroughly taught if requisite consistency is to be achieved and maintained. Our references include several comprehensive manuals discussing these details for various organisms and for nontimber forest products. Deciding how to actually record the data depends on factors like equipment availability, the skills and training of field personnel, ease of checking for errors or making corrections, and anticipated weather conditions. Both manual and electronic data recording methods and procedures have advantages and disadvantages. Careful design of data forms or electronic data entry programs can reduce errors of omission by reminding the crew of information that needs to be collected. Following common systematic protocols, attention to detail, and double-checking for accuracy are essential components of quality control. Thorough training is necessary to implement the protocols consistently and properly. If data are not considered credible, then the efforts of the participants, and the resources expended, will be largely wasted, hence we address this critical issue separately in the following "Quality" module.

Training, oversight, evaluation, and revisions—
Many of the aforementioned considerations will be obvious to managers and employees who routinely engage in monitoring activities or field research, but additional attention to detail, oversight, and training might be necessary if participants conducting the fieldwork are unfamiliar with why things are done the way they are instructed to do them. Careful oversight and immediate feedback are especially helpful at correcting mistakes and encouraging good habits when participants first start collecting data. Additionally, those who designed and documented the sampling protocols are unlikely to have anticipated all the exceptions and contingencies that will be encountered in the field. Knowledgeable supervisors who regularly accompany field crews in the early stages of sampling can quickly incorporate needed changes to the protocols. Once sampling methods and procedures are running smoothly, the project might wish to consider creating a training video for new personnel that join a field season already in progress. If field crews understand the goals of the project, the reasons for the sampling design, and why particular data collection methods are used, they will be more likely to make appropriate impromptu decisions when encountering unforeseen field or data collection circumstances.

Careful oversight and immediate feedback are especially helpful at correcting mistakes and encouraging good habits when participants first start collecting data.

Checklist—

- ☐ How will both participants and specialists (especially statisticians) be engaged in planning and documenting the sampling design and protocols?
- ☐ Is it worthwhile to have independent specialists, advisors, or program managers review the sampling design and procedures?
- ☐ Does the resulting design match project goals, participant skills, and intended analyses?
- ☐ How will uniform data formats, units of measure, and sampling protocols be developed if data are combined with other projects?
- ☐ Who will document sampling protocols for training, for use as a field reference, and for ensuring consistent sampling methods are used by all data collectors?
- ☐ What training will be provided to explain the purpose for, the reasoning behind, and proper implementation of the sampling protocols?
- ☐ What provisions will be made for oversight, review, and revision of sampling protocols, especially early in their implementation, but also periodically thereafter?

Sources—

Baker 2001; Collaborative Forest Restoration Program 2004d; Elzinga and others 2001; Engel and Voshell 2002; Herron and others 2004b; Hunt and others 1996; Lawrence and Hawthorne 2006; Lund 1998; Mueller and others 2004; North-South Environmental, Inc. 2004; Ottke and others 2000; Schreuder and others 2004; Stockdale and Corbet 1999; Wong 2000; Wong and others 2001.

Quality:
Ensuring the Quality and Credibility of Collected Data

In almost all instances, obtaining high-quality data that is widely trusted is the central goal of monitoring.

Rationale—
Although it is possible that the dominant goal of a participatory monitoring project is simply to improve relationships among stakeholders, in almost all instances obtaining high-quality data that is widely trusted is the central goal of monitoring. Differences do exist in how important data credibility is to the users of the data. For instance, local commercial resource users who are collecting data predominantly for themselves might have less concern for outside validation of their data than would a major federal monitoring program that has to make contentious environmental decisions based on data collected by volunteer groups scattered around the country. Scientific credibility, legal liability, fear of regulatory reprisals, and defensibility in court litigation can also be factors for deciding how much emphasis to put on data quality. Federal agencies are mandated by law to meet certain quality requirements for data that are shared with the public, and most agencies have their own guidelines and quality assurance plans. Examples can be found in the "Annotated References" section.

Data credibility plan—
The process of assuring others that data are trustworthy can be divided into three components that all improve credibility: quality assurance, quality control, and quality assessment (discussed in the following sections). Data credibility can be defined as everything that is done to convince others that the collection of data was done in a thoughtful, systematic, unbiased, and careful manner. Documenting a detailed monitoring project plan through use of the workbook forms (app. 3) assures the reviewer that all aspects of the monitoring project were given due consideration. Documenting the plan's implementation assures reviewers that the monitoring methods that were selected actually addressed project goals, participants communicated well with each other, all parties were motivated to make the project work well, adequate resources were allocated to training, and that data were collected, analyzed, and interpreted in a nonbiased and collaborative manner. A well-documented project plan and records detailing its implementation are an important context for the more specific quality assurance plan that focuses on sampling design, sampling protocols, and quality control methods.

Quality assurance plan—
Quality assurance plans are commonplace in business and industry as well as in established federal monitoring programs. Many examples exist, and elements differ according to the specific context and purpose of the monitoring. A particularly effective way to ensure credibility in a participatory monitoring project is third-party verification or auditing. Common elements include:

- Documenting a data quality control plan (see below).
- Employing experts to design sampling plans and peer-reviewing their recommendations.
- Developing standard operation procedures (SOPs) such as documented sampling protocols.
- Writing reference manuals for the SOPs.
- Designing and conducting training programs for implementing SOPs, including manuals, curricula, or teaching aids.
- Deciding on procedures for periodically evaluating the efficacy and appropriateness of the SOPs.
- Documenting changes in the SOPs and providing training to implement the changes.
- Evaluating, documenting, and certifying training accomplishments and learned skills.
- Conducting continuous oversight or supervision of data gathering.
- Periodic third party or independent field checks of data accuracy.
- Developing a process for evaluating the efficacy of quality assurance plans and revising them as necessary (see quality assessment below).
- Ensuring that the data are analyzed properly and interpreted objectively (see "Analysis" module).

Quality control—
A critical element of any quality assurance plan is quality control. Quality control is a set of standard procedures for ensuring useable and reliable data. Fundamental elements of all quality control plans include ascertaining these characteristics of your data:

- Accuracy—Confidence that the measurement reflects the actual value, that is, both nonbiased and precise.
- Lack of bias—The measurements are not systematically skewed.
- Precision—Degree of agreement between repeated measurements of the same sample.
- Completeness—Sufficient samples are acquired to provide useful information.
- Representativeness—Extent to which the measurements you take actually reflect the state of the indicator that you wish to monitor.

Other factors such as detection limits, instrument sensitivity, or sampling at appropriate scales, places, and times can also be pertinent to quality control depending on what is being measured and how. A variety of methods exist for calibrating measurements and preventing data errors. Standard reference materials can be used to calibrate instruments. If field measurements seem to be interpreted differently by each crew member, then field personnel should compare their methods until everyone agrees upon useful criteria to reduce variability or bias in their measurements. Those criteria should then be documented in the sampling protocols

and uniformly applied. Data errors can be reduced by double entry, checking for reasonableness, and by having team members review the data for correctness and completeness as it is entered in the field. Quality checks can be conducted by other teams that resample the same plots. Regardless of the actual techniques and processes for confirming data validity, methods can always be improved; therefore, convincing outsiders that project participants are sincerely committed to data quality also involves periodic evaluation and review of the quality assurance plan. This is sometimes called a quality assessment plan.

Quality assessment plan—
Are the selected indicators the most appropriate monitoring targets to meet the goals of the project? Do the collected data reflect meaningful changes in the status of the indicators that are being monitored? What components of the quality assurance plan merit improvement? Is the sampling design achieving monitoring objectives in the most effective or efficient manner? Are sampling protocols appropriate, sufficiently documented, adequately taught, and consistently applied? Do users of the data have any concerns about its credibility, and how could those concerns be addressed? These and related questions are all relevant concerns for assuring end users that sufficient attention is being paid to the issue of data quality; thus developing a written plan to periodically review these topics also demonstrates foresight and commitment.

Checklist—
- ☐ How important is data credibility to the participants in the project, and why?
- ☐ In what manner do participants plan to address the issue of data credibility?
- ☐ If a quality assurance plan is deemed useful, what elements should it include?
- ☐ If a quality control plan is deemed useful, what elements should it include?
- ☐ If a quality assessment plan is deemed useful, what elements should it include and how often should it be reviewed?
- ☐ How and when will intended or potential data users review each plan? Should experts review the plans?

Sources—
Bliss and others 2001; Dukes and Firehock 2001; Engel and Voshell 2002; Federal Data Quality Legislation 2001; Forest Inventory and Ananlysis, n.d.; Godfrey 1994; Hanson n.d.; Herron and others 2004b; Hunt and others 1996; Office of Management and Budget 2002; Ottke and others 2000; Pollard and others 1999; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; U.S. Department of Agriculture, n.d.; U.S. Environmental Protection Agency 2001a, 2001b, 2002; Wright, n.d.

Data:
Making Arrangements for Handling, Storing, and Using Data

Data handling, storage, and backup—
Acquiring high-quality data is a major step in the monitoring process but is of little use unless the data are stored, handled, summarized, analyzed, interpreted, and reported properly. Handling involves such activities as transferring raw data to formatted databases, compiling new and old data, doing checks for reasonableness, and preparing data for analysis. Storing data involves categorizing types of data, labeling files with names that are easy to understand, and organizing files in logical folders. It also entails collecting information about the type of information in each file (see Metadata below). All of this is a great deal of work, and if data are not likely to be used, this work is wasted effort. For instance, one common form of overcommitment is the natural inclination to collect as much information as possible while in the field. If the effort expended to collect miscellaneous or non-essential data is not commensurate with the effort needed to store, manage, analyze, and interpret this additional information, then such data becomes superfluous and participants could become discouraged by not seeing the results of their labor. Such unfocused or misguided endeavors can also detract from more important activities.

Data are of little use unless they are stored, handled, summarized, analyzed, interpreted, and reported properly.

The effort put into routines to regularly back up data should be tailored to the risk of losing data and the consequences of squandering the effort to collect it. All computer hard drives eventually fail and new hardware technologies constantly replace older ones. Other catastrophes such as fire, floods, hurricanes, earthquakes, theft, or vandalism can destroy data too. Reducing the risk of losing data entails not only keeping multiple copies and updating each on a regularly scheduled basis, but in keeping copies in separate locations in the event of unforeseen physical destruction in any one location. Organizations such as schools, universities, businesses, or government agencies virtually always have such mechanisms and policies for data protection already implemented; hence they are obvious choices as data repositories. Another effective method of backing up data is to routinely distribute copies to all the participants in the project. Sharing data, however, brings up the issue of who owns it and controls its use.

Data ownership and use—
Although participants in a collaborative monitoring project would naturally expect to have a right to share the data collected, some information could be sensitive or proprietary. For instance, if a rare or endangered species is being monitored, it might be in the best interest of all concerned not to release information about the location of threatened populations. Similarly, private landowners or timber companies concerned about restrictive regulations that could be imposed on their property if data are misinterpreted by advocacy groups might wish to ensure that the collaboratively collected information is first analyzed and interpreted in an objective and peer-reviewed manner. Tribes also might be concerned that the data include culturally sensitive information or they might wish to be recognized for contributing

traditional knowledge to the project. Prior discussions about the ownership and use of local participants' ecological knowledge (especially if they consider it specialized or valuable) can be important for acknowledging their contributions or establishing intellectual property rights. Issues of ownership could also arise in the case of bioprospecting when, for example, pharmaceutical companies wish to capitalize on discoveries of organisms with unique and useful medicinal properties. Even if data are not particularly sensitive, some participants might wish to recuperate expenses by selling it. Regardless of the specific circumstances, all these concerns are best addressed when the participants are delineating and examining their motivations and concerns for joining a participatory monitoring project ("Communication" and "Incentives" modules). At that stage, mutual agreements such as policy accords or contractual stipulations can be arranged in advance for determining how data will be shared, used, or sold ("Organization" module). If these issues arise as an afterthought, then involving all participants in resolving the issue as quickly as possible will prevent subsequent conflicts and controversies and allow the data to be applied to the original goals of the project. If data are sensitive or proprietary, forethought given to methods for safeguarding data against unauthorized access will contribute to data security. Passwords and locked rooms are simple strategies.

Data distribution—
If the data are not controversial or proprietary, and if summaries or simple analyses can be arranged in advance, then prompt distribution of results can be very rewarding for both participants and other users of the data. Routinely updated Web sites are an excellent means of distributing such information, although some participants or stakeholders might not have Internet access. More organized networks or clearinghouses for information can provide the service of combining current data from multiple projects or sources so managers or policymakers have the most recent facts for informed decisions.

Data syntheses—
Meta-analysis refers to combining disparate data from numerous sources to reach conclusions that data or analyses from individual sources would not be sufficient to justify. Typically such analyses are conducted at larger geographical scales than are feasible to address by any one project. The process of drawing valid conclusions from different kinds and sources of data is complex, but similarity in data formats, measurement methods, or sampling protocols facilitate the process. Therefore, examining other similar projects and anticipating this potential use of the data is a useful consideration during the stage of sampling design and sampling protocol development (see the "Sampling" module for further discussion). Incorporating common data elements from other similar projects also is useful. Likely the best example is ensuring that data are spatially explicit. With the advent of inexpensive

geographical information system recorders, this process is now easy and cheap. Interpretation of biodiversity information is invariably linked to location and habitat, so recording coordinates of sample locations provides a common ground for many types of metadata analysis.

Metadata—

Meta-analyses are greatly facilitated by the collecting of metadata. Metadata is literally data about data and refers to information that describes attributes of data such as information content and format, data quality, the history of the project, contact information, database condition, and more. The National Biological Information Infrastructure Web site provides authoritative information about standardized types of metadata. In their words, "Metadata records preserve the usefulness of data over time by detailing methods for data collection and data set creation…. Metadata makes it possible for data users to search, retrieve, and evaluate data set information." Perusal of this Web site will give users a detailed understanding of the types of information that are useful to record. Although recording metadata might seem like yet another time-consuming documentation task, doing so can truly guarantee the data remain useful for a long time and also provides additional credence to claims of data credibility. Most institutions that expend the resources to maintain multiple databases also require the collection of metadata, so it behooves the project coordinators to become familiar with the particular requirements of the organization that might act as a repository of their project's data.

Checklist—

- ☐ How will data be processed and compiled?
- ☐ How will data be backed up and secured?
- ☐ If information is sensitive, proprietary, cultural, traditional, or commercially valuable, how will issues of ownership and distribution be resolved?
- ☐ If data can be shared freely, what methods can be used for prompt, equitable, and wide distribution?
- ☐ How will data be made compatible with related projects?
- ☐ What metadata will be compiled and why?

Sources—

Bliss and others 2001; Canadian Information System for the Environment 2001; Coughlin and others 1999; Kusel and others 2000; Lawrence 2003; North-South Environmental, Inc. 2004; Ottke and others 2000; The Volunteer Monitor, n.d.; Voluntary Sector Initiative 2002a; Wright, n.d.

Followthrough Stage

Analysis:

Arranging for Periodic Data Analysis

Planning analyses—

Data are of little value if they are not used. Because participatory monitoring takes a lot of time and effort, all participants have a stake in the analysis and reporting of the data they have collected. Not doing so is a sure way to discourage participation in subsequent projects. Careful budgeting and foresight is required to ensure that sufficient resources exist in advance to complete analyses and report the results. Cost estimates can be obtained through consultation with a statistician. Having the analysis planned in advance will also ensure the sampling and project design will produce usable results. Hoping that support will come along later, if the data are simply collected now, is a risky strategy.

The interpretation of results is typically more informed and objective if approached from the multiple perspectives of participants.

Data analyses should be planned at the stage of sampling design so the intended use of the data is consistent with the statistical design of the sampling procedures, the measurements taken, and the format of the databases. Advance planning of the analysis not only speeds the process when the data are ready, it also averts the natural, but bias-inducing, inclination to simply explore the data for any meaningful results that might be found. For instance, searching for any significant correlations that might be found among multiple factors in a large data set might seem to yield meaningful insights when, if enough combinations of factors are compared, some percentage of these factors are likely to seem statistically correlated simply by chance.

Analyses can range in complexity from simply charting the data to the application of sophisticated statistical techniques. Any combination of valid methods that meet project goals and user needs is appropriate. Regardless of the selected analyses, it is essential that the individuals designing and conducting the analyses have an adequate understanding of the statistical methods involved. Even experienced scientists routinely consult with statisticians, and a participatory monitoring project should be no different in this regard.

Reviewing and interpreting results—

Once data have been analyzed, results are usually subject to interpretation. Such interpretation typically is more informed and objective if approached from the multiple perspectives that participants impart. Collaborative interpretation of results also contributes to the ongoing process of enhancing mutual trust. Involving participants in the interpretation of results need not be a difficult process, if for example, the findings are presented graphically as well as numerically and discussed in a group setting. Reaching collaborative interpretations, especially if consensus can be attained, does much to prevent disagreements or controversy that might arise from the way managers or policymakers use the results. If criteria for reaching stipulated conclusions are agreed to in advance, then the data analysis can speak for itself, reducing the likelihood of dissention about the meaning of the results.

Checklist—

- ☐ How will data be analyzed? Who will conduct the analyses?
- ☐ Will analyses be planned and documented during the sampling design phase and in advance of data collection?
- ☐ How will appropriate statistical expertise be retained to conduct the analyses? Will a professional statistician review them?
- ☐ How will all participants be included in the review and interpretation of results?
- ☐ If useful, what advance criteria will be used to interpret results? How will these criteria be collaboratively developed and applied?
- ☐ If any of the participants have concerns about the means of analysis, potential results, interpretation of the results, or use of the information, how will these concerns be addressed?
- ☐ If consensus cannot be reached about interpretation of the results, how will results be reported? Can alternate interpretations be included for comparison?

Sources—

Canadian Information System for the Environment 2001; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Wright, n.d.

Reporting:
Arranging for Reporting Results

Planning—
Just as collected data are of little value if not used, analyzed and interpreted data are of little value to anyone outside the collaborative project if results are not disseminated. As with data analysis, the means of reporting results are ideally planned and budgeted for in the project design and budgeting phases ("Design" and "Resources" modules). Reports in any format are invariably improved by review, both informally and through a systematic peer-review process. Allowing time for review is an integral part of producing high-quality reports, hence it also should be planned and scheduled as part of the reporting process.

Few things in life are as reinforcing to an individual or group as the sense that their opinions are appreciated and can influence others. "Making a difference" with collaborative efforts not only leads to these rewards, but also creates a sense of group ownership in the accomplishment. If one of the goals of the participatory monitoring project is to influence policy or management decisions, then results should be reported in a timely manner, to the appropriate audiences, and through credible and readily accessible means of communication. Just making sure that information is delivered to the appropriate audience, however, does not guarantee they will make use of it. Participants might wish to consider formal arrangements, agreements, memoranda of understanding, accords, or contracts with endusers of the information to increase the chances that results are actually applied to their decisions. A less formal, but potentially very effective approach to ensure the use of results, is to discuss the project with the intended users of the data from the very beginning, in effect engaging them as participants in the collaborative project.

Concerns—
Again, as with interpreting the analyses, participants with vested interests might have concerns about how results are reported, especially if they are likely to influence policy or management decisions affecting their interests. As with all phases of the collaborative project, airing and discussing these concerns as early as possible will help prevent subsequent controversies or disagreements, especially if some resolution is reached about how to handle objectionable results (see the "Organization," "Communication," and "Design" modules).

Another concern that might crop up is the issue of acknowledgment and credit. For instance, professional relationships are too often strained by disagreements over authorship. As with any other such quarrel, having criteria that are mutually agreed upon in advance averts many disputes. Most universities and research organizations have guidelines for authorship that can serve as examples. The contributions of participants can be acknowledged in other ways, even if their effort does not merit authorship on a document (see "Celebrations" module). As mentioned earlier, a sense of worth is one of the most rewarding feelings humans can experience.

Providing participants with this powerful reinforcement entails being careful not to overlook any significant contribution, being creative about means of acknowledging help, and being as inclusive as possible in credit for accomplishments. Some participants might not be aware of the employment-related incentives for researchers to publish extensively, but the opportunity to report a project's findings can be a strong motivation for scientists to become involved. This also provides another avenue for reporting the results of the project to a wider audience.

Web sites, interim reports, and newsletters help maintain interest as more indepth analyses and interpretation of data are being prepared.

Format and timing of reports—
Results can be reported in many ways, but whatever means is chosen they should be readily accessible to all participants. Ask participants how they would like to see the results distributed to their communities and stakeholder groups. Examples include:

- Web sites
- Newsletters
- Emailed reports
- Slide shows
- Video tapes or DVD movies
- Newspaper or magazine articles
- Radio or television programs
- Pamphlets, brochures, or booklets
- Official reports
- Peer-reviewed journal articles
- Book chapters or books

Reported information is most effective at influencing policy or decisions, hence also most rewarding to participants, if it is delivered in a periodic and timely manner. Web sites, interim reports, and newsletters help maintain interest as more indepth analyses and interpretation of data are being prepared.

Archiving—
Lastly, project managers often find that a formal process of indexing and archiving written information, images, videos, and promotional materials not only provides a master copy that is always accessible, but can greatly reduce the time to find a particular item. For instance, such archiving can ease the process of subsequent grant writing, preparing presentations, or of organizing a promotional event. Often individuals involved in similar projects elsewhere will request information or materials that the project has already developed. As with data backup, keeping multiple originals in separate locations can be a useful policy if the effort is deemed warranted. Distributing copies to all participants is another effective approach. By providing each participant with multiple copies, they can be asked to store one while the other is shared or used.

Checklist—

- ☐ How much is budgeted for reporting results?
- ☐ How will reports be reviewed?
- ☐ What will be done to ensure results are actually used?
- ☐ How will any concerns about the use or dissemination of results be addressed?
- ☐ What advance criteria should be used for determining authorship?
- ☐ How will every participant's contributions be acknowledged?
- ☐ How will results be communicated and how often?
- ☐ Are informal interim reports useful?
- ☐ How much effort should be spent on archiving reports and promotional materials? How should it be done and by whom?

Sources—

Canadian Information System for the Environment 2001; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Godfrey 1994; Herman and others 1997; North-South Environmental, Inc. 2004; Ottke and others 2000; Stockdale and Corbet 1999; The Volunteer Monitor, n.d.; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; Voluntary Sector Initiative 2002a; Wright, n.d.

Evaluation:
Evaluating and Improving the Project

Evaluation plan—
Any action plan requires periodic evaluation and revision to remain relevant and effective at meeting its stated goals. Additional reasons for periodic review include:

- Updating objectives.
- Incorporating new information, contextual circumstances, funding, or participants.
- Shifting the allocation of resources or focus of efforts.
- Improving efficiencies.
- Documenting accomplishments.
- Determining what worked and what did not.
- Creating an institutional memory.
- Sustaining confidence in the credibility of the data.

To meet these evaluation objectives, participants might ask themselves the following questions:

- Is the chosen participatory approach the best way to meet identified needs for biodiversity information and other project goals?
- Should the project be discontinued at some point, and if so when or under what circumstances?
- Is the documented project plan adequate and useful?
- Do project monitoring goals or targeted indicators need to be altered?
- Were any contextual considerations overlooked?
- Is the organizational structure of the project meeting the needs of the participants and achieving the goals of the project?
- Does the project adequately represent all interested stakeholders and have a sufficient number of participating individuals?
- Are the cooperating parties communicating and making decisions well?
- Are participants' needs and expectations being met? Are there any difficulties with sustaining involvement and commitment? Is the project stagnating or becoming inflexible?
- Are the participants finding the experience personally rewarding?
- Have participant skills and expertise been appropriately matched to tasks?
- Are resources being budgeted and used efficiently? Are additional resources needed to achieve the goals?
- Is the project being conducted in a safe manner?
- Are training, field procedures, logistical arrangements, and support activities adequate?
- Are the sampling design and protocols adequate and appropriate?

- Are the data valid and of consistently high quality?
- Are data being analyzed correctly, and are results being interpreted collaboratively?
- Are results being disseminated in a manner that rewards participation and influences decisionmaking?
- Are accomplishments being achieved in a timely manner?
- How can the evaluation process itself be improved?
- How can lessons learned be communicated and applied to other projects?
- What are the plans for accomplishing needed revisions?
- How can the project be made more rewarding for all concerned?

Answers to these questions can be either quantitative (for instance, numerically scored questionnaires) or qualitative (such as group discussions). Either way, results that are recorded, summarized, and documented can be more easily incorporated into revision plans. Where controversies arise about the results of evaluation or needed changes, participants will need to use their growing communication and decisionmaking skills to achieve suitable resolutions.

Scheduling periodic reviews of the monitoring plan, and who will perform them, improves the likelihood that they will be conducted when needed. All aspects of the monitoring plan need not necessarily be reviewed at the same time, by the same individuals, or at the same intervals. Participants might wish to tailor reviews to anticipated need for periodic revision of various components of the monitoring plan. Regardless of these considerations, occasionally reviewing the whole plan provides perspective on how well the various components are interacting and whether the relative effort dedicated to each aspect of the project is appropriate. Independent reviewers who do not have a vested interest in the project can assist the review process by providing an outside perspective and by addressing issues that participants might find controversial or hard to discuss honestly. Outside reviewers also lend credibility to the project. Scientists or government researchers can recommend independent reviewers.

Action plan for revisions—
Lastly, evaluating and reviewing the monitoring plan and how well the project is functioning is inadequate unless needed changes are identified and a plan to achieve the changes is implemented. If any or all participants were not involved in developing the monitoring project plan (or portions thereof), their involvement in the evaluation process will enable them to become more familiar with the plan and gain a new or expanded interest in the project's success.

Checklist—

- ☐ What are the objectives for evaluating the monitoring plan and its implementation?
- ☐ What questions should be asked about each component of the plan?
- ☐ How will responses to these questions be recorded, summarized, and documented?
- ☐ If controversies arise regarding the results of the evaluation or needed changes, how will they be resolved?
- ☐ How often and under what circumstances will the monitoring plan, or specific parts thereof, be reviewed? Who will be responsible for coordinating each review?
- ☐ Should independent reviewers evaluate the monitoring plan or any of its parts? Why, when, and by whom?
- ☐ How will revisions or changes be implemented?

Sources—

Collaborative Forest Restoration Program 2003; Daly n.d.a; Dukes and Firehock 2001; Herman and others 1997; Kusel and others 2000; Moseley and Wilson 2002; Sirmon and others 2002b; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office n.d.; U.S. Department of Agriculture, Forest Service 2004; Wondolleck and Yaffee 2000; Wright, n.d.

Celebrations:
Ensuring the Project Is Rewarding and Appreciated

Project participants deserve to be rewarded for their contributions.

Rewarding participants—
Individuals, groups, or organizations that contribute their time, energy, and resources to collaboratively meeting common goals deserve to be rewarded for their contributions. Ensuring that their expectations are adequately met goes a long way to accomplishing this goal, regardless of whether they are financially compensated (see the "Participants" and "Incentives" modules). In many cases, the greatest reward for participants is to see that the results of their efforts are being used to improve forest management practices, even if the management changes are minor. In some cases, extra effort is needed to inform participants that their participation actually made a difference. Stakeholders who traditionally have little influence, or are seldom acknowledged, can be particularly appreciative of this courtesy. A variety of other rewards exist. Public recognition and acknowledgment is usually highly appreciated, even by shy individuals. Celebrations are both fun and rewarding. There are many ways to thank participants for their hard work and dedication. Examples include:

- Special reports about individuals in newsletters
- Field tours
- News reports about accomplishments
- Educational events
- Dedications
- Award ceremonies
- Potlucks
- Guest speakers
- Gifts
- Parties

Official acknowledgment might be provided in the form of:

- Plaques
- Certificates
- Official letters of appreciation
- Signed photographs
- Monetary awards
- Employment referrals
- Letters of reference
- Jobs

Gifts could include items with a logo of the project on them, such as:

- Hats
- T-shirts
- Bandannas
- Posters
- Pins
- Labels
- Stickers

Another approach is letting participants keep items acquired by the project, such as:

- Field equipment
- Maps
- Safety equipment or clothing
- Books
- Furniture
- Computers or software

Ensuring community appreciation and continued support—
Expressing acknowledgment and appreciation for participants in public events is an excellent way to build visibility for the project and garner public involvement and support. There is no need to wait until a project is well advanced or completed to celebrate accomplishments. Periodic public events, presentations, and gifts lend momentum and continuity to participatory projects. They are also an excellent means of educating the public about the importance of conserving biodiversity and the efforts being made to do so in their own communities.

Learning to stretch our limits, trying new approaches to old problems, and making a difference in the world are powerful rewards in their own right. Best wishes! (And let others know how it works out.)

Checklist—

☐ How will participants be acknowledged, thanked, and rewarded for their contributions?

☐ What ceremonies or gatherings can be arranged to publicly celebrate accomplishments?

☐ How can promotion and advertisement of such events be used to enhance visibility and community support for the project?

☐ What gifts are appropriate for participants?

☐ Would a project logo printed on clothing or other gifts be useful for promoting pride in the project?

☐ How can potlucks, barbeques, dances, parties, or other group celebrations be organized and sponsored?

☐ What will make the celebrations memorable and fun?

Sources—
Behar 1996; Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation 2003; Everett 2001; National Forest Foundation; U.S. Department of Agriculture, Forest Service, National Partnership Office 2005; National Resource Conservation Service, n.d.; Sithole 2002; University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office, n.d.; U.S. Department of Agriculture, Forest Service 2004; The Volunteer Monitor, n.d.; Wondolleck and Yaffee 2000.

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Annotated References

Abbot, Joanne; Guijt, Irene. 1998. Changing views on change: participatory approaches to monitoring the environment. Sustainable Agriculture and Rural Livelihoods (SARL) Discussion Paper 2. London, United Kingdom: International Institute for Environment and Development. 96 p.

This paper reviews participatory approaches to monitoring environmental change. It draws on published literature, interviews with practitioners, and the practical experiences of a research project on participatory monitoring of sustainable agriculture in Brazil. This project sought to develop a viable and relevant monitoring process with farmers, farmer unions, and nongovernmental organizations to help assess the social and environmental impacts of their efforts in developing more sustainable forms of agriculture. This publication provides practical examples that can be drawn upon to support or refute claims regarding participatory monitoring and evaluation.

Atlantic Coastal Cooperative Statistics Program [ACCSP]. 2002. Program design. Washington, DC. http://www.accsp.org/pdesign.htm. (25 August 2006).

This document provides an organizational overview of one of the most complex multistate, multistakeholder collaborative monitoring programs in the United States that relies on data collectors whose economic interest is at stake. This is one of many documents available on their Web site and provides a useful example of how to accommodate potentially conflicting interests and still obtain credible data.

Adler, Peter S.; Birkhoff, Juliana E. [N.d.]. Building trust: when knowledge from "here" meets knowledge from "away." Portland, OR: The National Policy Consensus Center. http://www.policyconsensus.org/publications/reports/index.html. (25 August 2006).

Although brief, this report is a concise, cogent overview of how to build trust among diverse participants. It addresses the perspectives, attitudes, concerns, suspicions, and communication styles of several major categories of likely collaborators, focusing especially on the role of traditional and Native American knowledge. Points are summarized in logical, easy-to-understand tables. It discusses 20 "tips, tools, and trust-building strategies."

Baker, Nell. 2001. Developing needs-based inventory methods for non-timber forest products: application and development of current research to identify practical solutions for developing countries. [Report on workshop organized by the European Tropical Forest Research Network]. London: United Kingdom, Department for International Development. 95 p. http://www.etfrn.org/etfrn/workshop/ntfp/. (25 August 2006).

This report summarizes presentations given and concerns expressed at the Food and Agriculture Organization workshop so titled. As such, it has less information than Wong (2000), but the views and opinions of the workshop presentations informed the final FAO publication (Wong and others 2001).

Balcazar, Fabricio E.; Keys, Christopher B.; Kaplan, Daniel L. [and others]. 1998. Participatory action research and people with disabilities: principles and challenges. Canadian Journal of Rehabilitation. 12(2): 105–112.

The benefits of participation are not unique to biological monitoring. This paper outlines the advantages of involving individuals with disabilities in research programs designed to help them improve their lives. Although not specific to biological monitoring, this article underscores the common benefits that can accrue from the participation of key stakeholders in any research or monitoring program.

Ballard, Heidi L. 2004. Impacts of harvesting salal (*Gaultheria shallon*) on the Olympic Peninsula, Washington: harvester knowledge, science, and participation. Berkeley, CA: University of California. 213 p. Ph.D. dissertation.

This dissertation describes a participatory experiment focused on sustainable harvesting of a nontimber forest product (salal) in Mason County, Washington. Importantly, it documents how the local ecological knowledge of the primarily immigrant Latino harvesters can be incorporated into a research project. Chapter 3 reports experimental methods and project results, including notes about how harvesters contributed to design, data collection, and interpretation of results. Chapter 4 provides a literature review of how local ecological knowledge can be integrated with conventional scientific knowledge for adaptive management and scientific research. Chapter 5 includes a more general literature review on the topic of participatory research and then compares in detail the steps, challenges, and successes of conducting participatory research with both the salal harvesters and a Native American tribe on the Olympic Peninsula, Washington.

Ballard, Heidi; Kraetsch, Ralph; Huntsinger, Lynn. 2002. Collaborative monitoring in Walnut Creek, California. In: Sandiford, R.B.; McCreary, D.; Purcell, K.L., eds. Proceedings of the fifth symposium on oak woodlands: oaks in California's changing landscape. Gen. Tech. Rep. PSW-GTR-184. San Diego, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 617–624. http://www.fs.fed.us/psw/publications/documents/gtr-184. (25 August 2006).

This case study of a collaborative monitoring project illustrates the substantial synergistic benefits that can accrue when each collaborating stakeholder group has a unique set of competencies that addresses the needs and constraints of others.

Balmford, Andrew; Bennun, Leon; Brink, Benten [and others]. 2005. The convention on biological diversity's 2010 target. Science. 307: 212–213.

This recent article discusses progress and needed action for a global approach to biodiversity conservation through the tracking of indicators.

Behar, Sharon. 1996. Building a sustainable organization. Promoting watershed stewardship, fifth national volunteer monitoring conference. EPA 841-R-97-007. Washington, DC: Environmental Protection Agency. http://www.epa.gov/OWOW/volunteer/proceedings/concur1.html#session1a.

The findings from this workshop summary conclude that what helps collaborative projects persists over time are strong programs with a clear focus, strategic and regular multiple-stakeholder planning, active people and leadership, an effective governing body, diverse fundraising efforts, transparent financial management, clear communication and a "learning" environment, and community networking and visibility.

Berg, Joy; Bradshaw, Bill; Carbone, Joe [and others]. 1998. Decision protocol: roadmap to the U.S. Forest Service Decision Protocol Version 2.0. Washington, DC: Ecosystem Management Coordination, U.S. Department of Agriculture Forest Service. http://www.fs.fed.us/emc/nepa/includes/dp2roadmap.htm. (25 August 2006).

This online document was designed by U.S. Forest Service staff to introduce teams to systematic processes for making and documenting their decisions. It is based on the principles of decisionmaking science (for instance, Schmoldt and others 2001), but compared to other systems, it results in a more structured approach for strategic, long-term decisions, and a quicker, more intuitive approach when decisions are routine or already clearly structured. It consists of sets of questions that elicit clarity, consistency, completeness, and efficiency of effort. The questions are divided into five cycles called: (1) process—agreement on the decision process; (2) problem—description of problem, goals, information available, elements of uncertainty, and needed information; (3) design—development of alternative proposals; (4) consequences—description of anticipated consequences of each alternative; and (5) action—documenting the rationale for alternative selection and an implementation plan. Adaptable to diverse stakeholders, this protocol seeks to accurately describe the problem and the criteria for solving it; use available information effectively; collect new information wisely; generate and choose from a wide range of alternatives; distinguish facts, myths, values, and unknowns; describe consequences associated with alternative problem solutions; and lead to choices that are consistent with personal, organizational, stakeholder, or other important values.

Bliss, John; Aplet, Greg; Hartzell, Cate [and others]. 2001. Community-based ecosystem monitoring. In: Gray, G.J.; Enzer, M.J.; Kusel, J., eds. Understanding community-based forest ecosystem management. New York: The Hawthorn Press: 143–167.

This book chapter provides a comprehensive overview of lessons learned regarding the challenges and benefits of multistakeholder community monitoring of local ecosystems. It is especially relevant for managers or participants who are in the process of selecting monitoring goals and evaluating the potential usefulness of a collaborative approach. A number of brief case examples are provided to illustrate monitoring goals, monitoring methods, and selection of participants.

Brechin, Steven R.; Wilshusen, Peter R.; Fortwangler, Crystal L. [and others]. 2002. Beyond the square wheel: toward a more comprehensive understanding of biodiversity conservation as social and political process. Society and Natural Resources. 15: 41–64.

This article provides a critical analysis of the importance of involving people and social justice issues in international strategies to conserve biodiversity.

Bramson, Robert M. 1981. Coping with difficult people. Garden City, NY: Anchor Press. 226 p.

This book provides suggestions for dealing effectively with aggressive, complaining, unresponsive, overly nice, negative, know-it-all, or indecisive personality types.

Brinkman, Rick. 2002. Dealing with people you can't stand: how to bring out the best in people at their worst. Revised and updated edition. New York: McGraw-Hill. 226 p.

This easy-to-read and comprehensive book begins by analyzing modes of behavior that interfere with group process. It explains typical motives and how to overcome these behavioral obstacles with skillful communication and bringing out the best in people at their worst. It concludes with a section on clear communication in the electronic age. Well illustrated with diagrams, bullet lists, and examples, it provides win-win avenues for overcoming difficulties with individuals who are interfering with group processes.

Canadian Information System for the Environment. 2001. Sharing environmental decisions: final report of the Task Force on a Canadian Information System for the Environment. Hull, Quebec. 48 p. http://www.cise-scie.ca/english/library/library_reports.cfm. (25 August 2006).

This report is similar to the Voluntary Sector Initiative accords (Voluntary Sector Initiative 2001, 2002a, 2002b) in that it is an overview of a program and agreed-upon accords, but it differs in that the focus is on a clearinghouse for environmental data. The report provides reasons for sharing information, a description of the system and its implementation, the role of multiple stakeholders (in particular Aboriginal peoples), expected benefits, and a few examples of early projects. Topics discussed include multiple stakeholder participation and benefits, feedback on priorities, integration of diverse data, credibility and neutrality of data, common standards, and identifying gaps in needed information. It also discusses mutual principles of cooperation and making the information available and useful to policymakers.

Christoffersen, Nils D. 2003. Rural community realignment with adjacent public lands: the case of Wallowa Resources. Turning natural resources into assets: strong communities—sustained livelihoods—restored environments. 13 p. Unpublished document. On file with: Wallowa Resources, P.O. Box 274, 200 W North St., Enterprise, OR 97828. http://www.wallowaresources.org/publications.htm. (25 August 2006).

This paper describes a case study in participatory resource management. It is an example of a neutral organization facilitating collaborative planning and action in a contentious management context characterized by declining resource-related

employment, critical ecological concerns, and legislative mandates. It illustrates relationship-building starting with small-scale and noncontroversial projects that lead to broader community and stakeholder involvement in solving larger, more contentious issues. Inclusiveness, a transparent process, fundraising, leadership, and organizational policies that support collaborative solutions are identified as critical components to an effective program.

Collaborative Forest Restoration Program. 2003. Multiparty monitoring and assessment guidelines for community based forest restoration in southwestern ponderosa pine forests. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwest Region, State and Private Forestry. 94 p. http://www.fs.fed.us/r3/spf/cfrp/monitoring/. (25 August 2006).

This report is a result of the joint effort of 43 individuals. They included community forest restoration practitioners and specialists from six organizations: the USDA Forest Service-Collaborative Forest Restoration Program, the National Forest Foundation, the Ecological Restoration Institute, the Four Corners Institute, the Pinchot Institute for Conservation, and Forest Trust. The team came together to address lack of monitoring guidance specific to forest restoration projects, especially in the Southwest United States. A collaborative effort itself, the manual begins with recommendations on organizing collaborative monitoring programs and then provides guidance on monitoring activities specific to both ecosystem and socioeconomic monitoring.

Collaborative Forest Restoration Program. 2004a. Handbook 1–What is multiparty monitoring? The multiparty monitoring handbook series. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwest Region, State and Private Forestry. 13 p. http://www.fs.fed.us/r3/spf/cfrp/monitoring/. (25 August 2006).

This series of handbooks (Collaborative Forest Restoration Program 2004a–2004e) was conceived during several workshops in 2003 and builds on the initial multiparty monitoring report (Collaborative Forest Restoration Program 2003). Collaborative Forest Restoration Program (2004a through 2004c) provide more extensive information on organizing a multiparty collaborative monitoring program, whereas Collaborative Forest Restoration Program (2004d and 2004e) provide additional detail on monitoring ecological and socioeconomic goals and indicators. Although the program was designed around forest restoration in the Southwest, many of the principles have broad applicability.

Collaborative Forest Restoration Program. 2004b. Handbook 2—Developing a multiparty monitoring plan. The multiparty monitoring handbook series. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwest Region, State and Private Forestry. 13 p. http://www.fs.fed.us/r3/spf/cfrp/monitoring/. (25 August 2006).

(See Collaborative Forest Restoration Program 2003, 2004a)

Collaborative Forest Restoration Program. 2004c. Handbook 3—Creative budgeting for monitoring projects. The multiparty monitoring handbook series. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwest Region, State and Private Forestry. 17 p. http://www.fs.fed.us/r3/spf/cfrp/monitoring/. (25 August 2006).

(See Collaborative Forest Restoration Program 2003, 2004a)

Collaborative Forest Restoration Program. 2004d. Handbook 4–Monitoring ecological effects. The multiparty monitoring handbook series. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwest Region, State and Private Forestry. 71 p. http://www.fs.fed.us/r3/spf/cfrp/monitoring/. (25 August 2006).

(See Collaborative Forest Restoration Program 2003, 2004a)

Collaborative Forest Restoration Program. 2004e. Handbook 5–Monitoring social and economic effects of forest restoration. The multiparty monitoring handbook series. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Southwest Region, State and Private Forestry. 35 p. http://www.fs.fed.us/r3/spf/cfrp/monitoring/. (25 August 2006).

(See Collaborative Forest Restoration Program 2003, 2004a)

Collaborative Stewardship Team. 2000. Collaborative stewardship within the Forest Service: findings and recommendations from the National Collaborative Stewardship team. Washington, DC: U.S. Department of Agriculture, Forest Service, Partnership Resource Center. 62 p. http://www.partnershipresourcecenter.org/resources/publications/index.php. (25 August 2006).

This document reflects the movement on the part of the U.S. Forest Service to expand and improve its collaborative partnerships in resource management. It reports findings and recommendations from focus group sessions held around the country to clarify its collaborative stewardship vision, identify barriers and

incentives to collaboration, report on the state of such collaborations within the Forest Service, and recommend actions to achieve the program goals. A key finding is that managers and collaborators close to the resources being managed are ready for support and encouragement for their projects. The introduction summarizes what collaboration is and is not, its basic principles, and opportunities and means for Forest Service leadership in collaborative efforts. Relevant attachments, in the form of checklists of key points, cover key attributes of successful collaborations, negative conditions or "red flags" for collaboration, a continuum of collaborative involvement by partners, lessons learned, barriers and incentives, and proposals for action.

Cornwall, Andrea; Jewkes, Rachel. 1995. What is participatory research? Social Science and Medicine. 41(12): 1667–1676.

This article provides a summary and rationale for participatory research in the fields of public health and medicine, but applies to participatory research in natural resource management as well. It is an academic analysis of participatory research as response to traditional or conventional research, involving local people in the research rather than using them as experimental subjects. It discusses the importance of power in the relationships between researchers and subjects. It also analyzes several participatory research methods and the challenges that accompany these methods.

Coughlin, Chrissy; Hoben, Merrick; Manskopf, Dirk [and others]. 1999. A systematic assessment of collaborative resource management partnerships. Ann Arbor, MI: University of Michigan. M.S. thesis. http://www.snre.umich.edu/ecomgt/pubs/crmp.htm. (25 August 2006).

This thesis is a detailed analysis of collaborative resource management partnerships. It draws extensively on published literature and provides excellent lists of bibliographic references for each topic. It also is based on a number of representative case studies around the Nation and interviews with key individuals in those partnerships. Chapters of the thesis that are pertinent to this handbook include topics such as the context and rationale for partnerships, critiques of collaboration, reasons for and alternatives to collaboration, ensuring equitable stakeholder representation, accommodating diverse interests and capabilities, and dealing with scientific issues.

Daly, Carol. [N.d.a]. The collaboration handbook. Red Lodge Clearinghouse. 40 p. http://www.redlodgeclearinghouse.org/resources/handbook.html. (25 August 2006).

This handbook is a concise and informative introduction to, and analysis of, the collaborative process as it applies to natural resource management. Its sections cover (1) evaluating whether collaboration is appropriate to one's circumstances, (2) selecting and recruiting appropriate participants, (3) how to hold effective meetings, (4) how to plan the collaborative process and organization, (5) gathering financial and nonfinancial resources, (6) organizational structures and administrative support for increasingly elaborate projects, (7) challenges and problems that could be encountered along the way, (8) and challenges that often crop up as projects mature.

Daly, Carol. [N.d.b]. The collaboration handbook outline. Helena, MT: Red Lodge Clearinghouse. 14 p. http://www.redlodgeclearinghouse.org/resources/handbook.html. (25 August 2006).

A condensed outline of *The Collaboration Handbook* (Daly, n.d.a)

Daly, Carol. [N.d.c]. Frequently asked questions about collaboration. Helena, MT: Red Lodge Clearinghouse. http://www.redlodgeclearinghouse.org/resources/faq.html#a. (25 August 2006).

This list of questions is written for someone who is new to the collaborative process and is in the early stages of judging its usefulness for their purposes. The questions cover a definition of collaboration, the usefulness of collaborative approaches, who to include, means of making decisions, whether the process can be hastened, realistic expectations, and whether the net result will matter.

Dukes, E. Franklin; Firehock, Karen. 2001. Collaboration: a guide for environmental advocates. Charlottesville, VA: University of Virginia, The Wilderness Society, and National Audubon Society. 72 p. http://www.virginia.edu/ien/publications.htm. (25 August 2006).

Well-reasoned and clearly written, this comprehensive guide is especially useful for evaluating the usefulness and appropriateness of a collaborative approach. The focus and target audience is broad, but the principles discussed are widely applicable. The authors explain how formal and disciplined the collaborative process should be to ensure success in a variety of circumstances. Additional topics include decisionmaking, facilitation, legal considerations, special considerations negotiating with tribes, power imbalance among stakeholders, group behavioral norms, dealing with difficult individuals, "good science" issues, monitoring, adaptive management, formal agreements, group process protocols, recording group memory, criteria for evaluating success, and when to end a collaboration. Appendixes provide useful checklists and resources for further information.

Dvornich, Karen M.; Tudor, Margaret; Grue, Christian E. 1995. NatureMapping: assisting management of natural resources through public education and participation. Wildlife Society Bulletin. 23(4): 609–614. http://www.fish.washington.edu/naturemapping/pubs.html. (25 August 2006).

This short article describes the University of Washington's NatureMapping program, which is designed to involve private citizens in biodiversity monitoring through the auspices of a national network.

Ecological Monitoring and Assessment Network Coordinating Office and the Canadian Nature Federation. 2003. Improving local decision-making through community based monitoring: toward a Canadian Community Monitoring Network. Ottawa, Ontario. 22 p. http://www.ccmn.ca/english/library.html. (25 August 2006).

This pamphlet provides an overview of the Canadian Community Monitoring Network, how it works, and its benefits. The chart on page 14 provides a summary of community participation, participation assessment, capacity building, and information handling. Page 19 summarizes lessons learned along the way, and page 20 lists critical success factors. It is especially useful for broad-scale participatory monitoring programs that coordinate many individual projects.

Elzinga, Caryl L.; Salzer, Daniel W.; Willoughby, John W. [and others]. 2001. Monitoring plant and animal populations. Malden, MA: Blackwell Science, Inc. 360 p.

This manual is a comprehensive and current overview of sampling design, statistical considerations, and field methods for monitoring plant and animal populations. The statistical discussion is written for practitioners facing the unique challenges of monitoring these organisms in their natural environment. It is likely to be most useful to project managers, students, or skilled participants, and less so to professional statisticians.

Engel, Sarah R.; Voshell, J. Reese, Jr. 2002. Volunteer biological monitoring: Can it accurately assess the ecological condition of streams? American Entomologist. 48(3): 164–177.

This article reports a meticulous research project to ascertain whether volunteer-collected water quality data provided information that was as good as that collected by professionals. After adjusting the standard procedures for comparability, the study demonstrated that volunteer programs can provide equally reliable information but that every sampling protocol must be validated by standard quantitative methods.

Everett, Yvonne. 2001. Participatory research for adaptive ecosystem management: a case of nontimber forest products. In: Gray, G.J.; Enzer, M.J.; Kusel, J., eds. Understanding community-based forest ecosystem management. New York: The Hawthorn Press: 335–357.

This article details one case example of participatory research and management focused on the harvesting of nontimber forest products in northern California and provides an analysis of important considerations and lessons learned. Topics related to this handbook include institutional frameworks, coordinating the participatory process with specific participants, initiating the collaborative process, identifying problems, developing goals, defining research questions, documenting and disseminating information, learning by example, and communication among collaborators and agencies. Lessons include the need to involve more stakeholders, improved relations that resulted from doing so, limits to participant resources, the effort and resources needed to build community capacity, and the foundation laid for future collaborative efforts.

Federal Data Quality Legislation. 2001. P.L. 106-554, Section 515. http://www.thecre.com/quality/PL06-554Sec515.html. (25 August 2006).

Federal legislation that requires affected agencies to issue guidelines ensuring and maximizing the quality, objectivity, utility, and integrity of the information they obtain and use, and to establish administrative mechanisms allowing affected persons to seek and obtain correction of information that affects them.

Forest Inventory and Analysis [FIA]. [N.d.]. Forest inventory and analysis: quality assurance. Program fact sheets. Washington, DC: U.S. Department of Agriculture, Forest Service, FIA National Program Office. 2 p. http://fia.fs.fed.us/library/fact-sheets/. (25 August 2006).

This short fact sheet provides an overview of how the nationwide FIA federal forest monitoring program addresses quality assurance concerns.

Godfrey, Paul J. 1994. Report on the regional conference. Shared water & common goals: enhancing partnerships in water quality monitoring and decision-making. Amherst, MA: Water Resources Research Center, University of Massachusetts. 28 p.

The conference summarized by this document entailed a broad array of stakeholder representatives convening to address the barriers that continue to confront citizen monitoring of water quality in many states. Barrier identification and ranking was conducted by the stakeholder groups—universities, federal agencies, state agencies, local governments, the private sector, and citizen monitoring

coordinators—and then the results were combined. Subsequently the participants divided into breakout groups of mixed affiliation and geographic coverage to devise recommended solutions to the most important perceived barriers: lack of standardization of methods, need for quality assurance and control, lack of clarity and focus on missions and policy, funding challenges, lack of credibility and trust, lack of community support, need for technical support and expertise, lack of long-term commitment by volunteers, and fear of regulatory reprisals from poor data or inappropriate use of results. The details documented for each working group provide a succinct overview of concerns about collaborative monitoring from a variety of perspectives.

Guijt, Irene; Arevalo, Mae; Saladores, Kiko. 1998. Tracking change together. Participatory Learning and Action (PLA Notes). Special Issue: Participatory Monitoring and Evaluation. (31): 28-36. http://www.iied.org/NR/agbioliv/pla_notes/pla_backissues/31.html. (25 August 2006).

Much of the work conducted by the International Institute for Environment and Development and reported in its newsletter series PLA Notes focuses on international development issues and case studies. This special topic issue examines the diverse motivations for participating in collaborative monitoring and the factors that enhance the probability of successful programs. Examples of factors influencing participation include perceived benefits, relevance, quick feedback, flexibility, effective organization, meeting short-term needs, and local history. Examples of factors that enhance success include decentralized and democratic decisionmaking, openness to new approaches, skills in conflict resolution, empowerment, community awareness, learning from positive examples, sufficient time, and prompt feedback.

Hanson, Steve. [N.d.]. Volunteer monitoring quality assurance project plan review checklist. Portland, OR: State of Oregon Department of Environmental Qualiity. 8 p. http://www.deq.state.or.us/lab/wqm/volunteermonitoringresources.htm. (25 August 2006).

Similar to U.S. Environmental Protection Agency's (2001b) checklist for reviewing EPA quality management plans, this also is a water quality monitoring assurance plan evaluation form. Unlike the former checklist, however, it is more focused on activity elements and details than policy and process elements. Used together, these two checklists provide good examples for designing a customized quality assurance evaluation checklist for a specific monitoring project.

Herman, Joan; Lyons Morris, Lynn; Fitz-Gibbon, Carol T. 1997. Evaluator's handbook. Los Angeles, CA: Center for the Study of Evaluation, University of California. 160 p.

This volume is the core of the Program Evaluation Kit from the Center for the Study of Evaluation, and provides a broad overview of evaluation planning as well as a guide to designing and managing programs in general (not specific to natural resource management). It describes how to design evaluations during and at the end of a project for both qualitative and quantitative approaches to evaluation. Monitoring and evaluation of ongoing projects is emphasized.

Herron, Elizabeth; Green, Linda; Stepenuck, Kris [and others]. 2004a. Factsheet V: Training volunteer water quality monitors effectively. Washington, DC: National Facilitation of Cooperative State Research Education Extension Service Volunteer Monitoring Efforts. 12 p. http://www.usawaterquality.org/volunteer/links.html#manuals. (25 August 2006).

This fact sheet provides a succinct overview of general considerations regarding training volunteers. It emphasizes that training is an ongoing process and addresses group versus individual training, elements of a conducive learning environment, tips for successful orientation of new volunteers, the importance of a monitoring manual for reference to standard procedures, and considerations pertinent to field training. It notes the importance of scheduling training carefully, avoiding information overload, using experts as instructors, and providing quick feedback when the volunteer first puts their new skills to use.

Herron, Elizabeth; Green, Linda; Stepenuck, Kris [and others]. 2004b. Factsheet VI: Building credibility, quality assurance and quality control for volunteer monitoring programs. Washington, DC: National Facilitation of Cooperative State Research Education Extension Service Volunteer Monitoring Efforts. 14 p. http://www.usawaterquality.org/volunteer/. (25 August 2006).

This fact sheet provides a succinct overview of general considerations regarding the credibility of volunteer-collected data for water quality monitoring programs. Although some of the information is specific to this monitoring purpose, it provides a cogent overview of the essential elements required to ensure the data is well documented and defensible. By dividing the process into three phases (quality assurance planning, quality control procedures, and quality assessment reviews), it documents the steps and components required to improve the probability that participatory monitoring data is trusted and used. Subtopics addressed in these three phases include (1) study design, a quality assurance plan, and training programs and materials; (2) training, monitoring manuals, standard operating procedures, documenting changes, and proficiency testing; (3) data proofing and review, independent evaluation, reconciling data with objectives, and revising procedures as needed. A continuum of rigor, depending on intended use of data, also is described.

Hilty, Jody; Merenlender, Adina. 2000. Faunal indicator taxa selection for monitoring ecosystem health. Biological Conservation. 92: 185–197.

This article reviews the scientific literature on using animal species as indicators of ecosystem health, specifically focusing on the criteria used to select species. They propose a step-wise selection process for selecting indicators. They point out that many faunal indicators suggested by scientists actually lack correlations to ecosystem changes and make recommendations for choosing appropriate indicators that could be useful for monitoring projects.

Hunt, Margo; Mayio, Alice; Brossman, Martin [and others]. 1996. The volunteer monitor's guide to quality assurance project plans. EPA 841-B-96-003. Washington, DC: Office of Wetlands, Oceans, and Watersheds, U.S. Environmental Protection Agency. 67 p. http://www.epa.gov/owow/monitoring/volunteer/qappcovr.htm. (25 August 2006).

Although this guide is written specifically for water quality monitoring by volunteers, it provides a thorough explanation of many key concepts. For instance, it defines precision, accuracy, representativeness, completeness, and comparability as they apply to data quality. It distinguishes between quality assurance and quality control. It also discusses the chain of documentation needed to ensure and demonstrate attention to quality throughout the course of a project. In general terms, it examines quality assurance teams and goals, collecting background information, project design, sampling procedures, implementation plans, standard operating procedures, and review, evaluation, and revision of the quality assurance plan. Then it more specifically lists the critical elements of a quality assurance project plan; the major categories are project management, data acquisition, oversight, and data validation and usability. Blank forms for documentation are appended.

Jones, Eric T.; McLain, Rebecca J.; Lynch, Kathryn A. 2004. The relationship between nontimber forest product management and biodiversity in the United States. Portland, OR: Institute for Culture and Ecology. 59 p. http://www.ifcae.org/projects/ncssf1/index.html. (25 August 2006).

This report, conducted for the National Commission on Science for Sustainable Forestry, details a year-long survey of nontimber forest product harvesting in several bioregions of the United States and the effect such activity has on biodiversity. Among its findings are the lack of adequate monitoring and potential usefulness of involving harvesters in participatory monitoring. This recommendation is elaborated upon in Lynch and others (2004) below.

Justice, Thomas; Jamieson, David W. 1999. The facilitator's fieldbook: step-by-step procedures, checklists and guidelines, samples and templates. Amherst, MA: [American Management Association] HRD Press, Inc. 455 p.

This book is an indepth implementation manual that is divided into four sections: preparation, working with the group, followup, and special meetings. The preparation section discusses organizing groups, setting group norms, and planning meetings. The section on working with groups covers getting started right, group memory, group databases, decision modes, handling conflicts and common problems, and evaluation and closure. The section on followup talks about meeting records, reviewing recommendations, and implementation planning. The last section, special meetings, covers meetings to plan mission or vision statements, electronic meetings, and technological tools.

Kaner, Sam; Lind, Lenny; Toldi, Catherine; Fisk, Sarah; Berger, Duane. 1996. Facilitator's guide to participatory decision-making. Gabriola Island, British Columbia: New Society Publisher. 255 p.

This is a "how-to" book for decisionmaking in small groups. Although written for helping facilitators, the information also can be used by participants in the group. The book begins by contrasting participatory and conventional decision-making processes and group dynamics, then continues with methods of facilitation and how to build inclusive and sustainable agreements. It is well illustrated with clear diagrams, case studies, and examples.

Kelly, John R.; Harwell, Mark A. 1990. Indicators of ecosystem recovery. Environmental Management. 14(5): 527–545.

This article addresses the difficulties of assessing the effects of disturbances on ecological systems, and suggests that suites of indicators, rather than single indicators, will be most useful for addressing ecosystem complexity. Specifically focused on ecosystem recovery from human-caused disturbance, the authors suggested that both functional indicators of ecosystem processes, as well as biotic indicators, should be used to assess the early stages of ecosystem recovery.

Kerns, Becky K.; Liegel, Leon; Pilz, David; Alexander, Susan J. 2002. Biological inventory and monitoring. In: Jones, E.; McLain, R.; Weigand, J., eds. Nontimber forest products in the United States. Lawrence, KS: University Press of Kansas: 237–269.

Nontimber forest product monitoring is one monitoring goal that rivals biodiversity monitoring in its complexity, not only because there are multiple species involved, but because there are many stakeholders, some with vested economic interests. This book chapter provides an overview of monitoring approaches and considerations and illustrates the point that the greater the complexity of a monitoring program, the more useful it is to invest time in selecting appropriate monitoring goals, designs, and methods, (including collaboration).

Krishnaswamy, Ajit. 2004. Participatory research: strategies and tools. Practitioner: Newsletter of the National Network of Forest Practitioners. 22: 17–22. http://www.nnfp.org/. (25 August 2006).

This article provides an overview of strategies and tools that have been integral to successful participatory research projects in developing countries where there is a longer history of such programs. It emphasizes cultural context, clarity of purpose and goals, identifying and involving key stakeholders, means of building trust and common understanding, and evaluating alternative research and management alternatives.

Kusel, Jonathan; Williams, Lee; Keith, Diana [and others]. 2000. A report on all-party monitoring and lessons learned from the pilot projects. Tech. Rep. 101-2000. Taylorsville, CA: Forest Community Research. 27 p. http://www.sierrainstitute.us/HTML/Publications.html. (25 August 2006).

This report summarizes work and lessons learned by the Lead Partnership Group, a consortium of northern California and southern Oregon community-based organizations focused on improving forest health and community well-being. It details an all-party monitoring project sponsored by the Surdna Foundation and facilitated by Forest Community Research (FCR) to examine ways to broaden the range of stakeholders in collaborative monitoring and forest management projects. By coordinating and evaluating three regional pilot projects, FCR-derived lessons learned and recommendations for enhancing such collaborations in land management contexts that are at times contentious. Lessons and recommendations address the importance of common goals; working with the varied motivations of the diverse stakeholders; issues of data consistency, ownership, and access; the larger institutional context of collaborations; agency barriers; definitions of science and knowledge; and benefits of collaboration that transcend forest management.

Lawrence, Anna. 2003. The unmeasurable whole: assessing forest biodiversity with multiple stakeholders. XII World Forestry Conference. Québec City, Quebec: Food and Agriculture Organization of the United Nations. http://www.fao.org/docrep/article/WFC/XII/0822-B1.htm. (25 August 2006).

This paper analyzes the challenges of deriving meaningful large-scale biodiversity assessments from diverse participatory monitoring projects with different goals and motivations. It examines the types of information needed at different scales and by various interest groups, how to retain flexibility in methods while combining results and interpretations, and the process of collaboration between multiple participatory projects to synthesize their results.

Lawrence, Anna; Ambrose-Oji, Bianca. 2001. Participatory assessment, monitoring and evaluation of biodiversity: the art and the science. A background paper for the ETFRN workshop on participatory monitoring and evaluation of biodiversity. Oxford, United Kingdom: Environmental Change Institute. 24 p. http://www.eci.ox.ac.uk/humaneco/etfrn.html. (25 August 2006).

This background paper approaches biodiversity assessment from a global perspective in light of the recommendations of the Convention on Biological Diversity. It focuses on the role that local participatory assessments of species diversity can play in simultaneously addressing the needs and concerns of local participants while providing information that is useful in ecosystem analyses of biodiversity. A variety of participatory methodologies and approaches are examined asking who, what, how, and why. Involving institutions in facilitating communication, meeting local needs, enhancing areas of mutual understanding and building local capacity are discussed as means to address the huge task of assessing biodiversity.

Lawrence, Anna; Hawthorne, William. 2006. Creating user-friendly field guides for biodiversity and management. People and plants conservation series. London, UK: Earthscan. 256 p.

This book describes how potential authors can use participatory processes to design user-friendly field guides to identify plants for monitoring, sustainable use, or conservation purposes. It describes pertinent issues and appropriate processes for producing the guides, and it emphasizes design methods, identification techniques, and information media that are appropriate for the context in which the guide will be used. Topics such as budgeting, illustrations, and publishing are also covered.

Lengeler, Jane Carter [N.d.]. Theme 2: participatory approaches to forest management. In: Earthwatch Institute. Local people's participation in forest resource assessment: a review of field experience. Oxford, United Kingdom: Earthwatch Institute. http://www.earthwatch.org/site/pp.asp?c=crLQK3PHLsF&b=479715. (25 August 2006).

This online document reports an analysis of seven participatory forest resource assessment projects in developing countries and lessons learned including "the need to recognise local people's strengths and weaknesses; to build on local knowledge; to take particular care in species identification; to conduct data collection in a systematic, planned manner; to apply statistical rigour; and to conduct appropriate training." It emphasizes the need for expert consultation in statistical considerations and rigor in procedures and documentation, but notes no inherent conflict between these needs and participatory approaches.

Liegel, Leon H.; Pilz, David; Love, Thomas; Jones, Eric T. 1998. Integrating biological, socioeconomic, and managerial methods and results in the MAB mushroom study. In: Liegel, Leon H., comp. The biological, socioeconomic, and managerial aspects of chanterelle mushroom harvesting: The Olympic Peninsula, Washington State, U.S.A. AMBIO, A Journal of the Human Environment. Stockholm, Sweden: Royal Swedish Academy of Science (Special Report No. 9): 26–33.

This article summarizes lessons learned from a collaborative research program involving several private and public land management organizations, several universities, commercial mushroom harvesters, and mycology club volunteers. It is an example of how involvement of diverse stakeholders can provide a more inclusive and complete analysis of a resource management issue that crosses boundaries of geographic scales, land ownerships, forest types, management philosophies, economic interests, livelihoods, cultures, and scientific disciplines.

Lindenmayer, David B. 1999. Future directions for biodiversity conservation in managed forests: indicator species, impact studies and monitoring programs. Forest Ecology and Management. 115: 277–287.

This journal article analyzes approaches to monitoring and management of biodiversity in forested landscapes. Topics include the usefulness of indicator species; studies of management impacts on forest biodiversity; stand, landscape, and regional approaches to conserving diversity; and needed changes in institutional support of long-term monitoring, research, and management. Collaboration between scientists and managers is mentioned, but not working with other stakeholders.

Lovejoy, Thomas E. 1997. Biodiversity: What is it? In: Reaka-Kudla, M.L.; Wilson, D.E.; Wilson, E.O., eds. Biodiversity II. Washington, DC: Joseph Henry Press: 7–14.

Although there are a variety of excellent books on the topic of biodiversity, this book is a good update on the general topic up to 1997. Starting with an introductory chapter by Thomas Lovejoy who coined the phrase, the book goes on to address patterns of biodiversity in the biosphere, threats to biodiversity, understanding and using biodiversity, and practical approaches to its conservation.

Lund, H. Gyde, ed. 1998. IUFRO guidelines for designing multipurpose resource inventories: a project of IUFRO research group 4.02.02. Vienna: International Union of Forestry Research Organizations. 216 p.

One approach to reducing monitoring costs is to monitor a variety of resources or attributes in the same program (or during the same field visits). Although promising in some regards, target organisms or attributes typically require different sampling strategies or methods, that might result in less efficient sampling for each particular type of information gathered. Nevertheless, multiple resource sampling is often of interest to community groups involved with collaborative monitoring. Lund discusses the advantages, disadvantages, tradeoffs, and opportunities presented by a multiple-resource monitoring approach, placing special emphasis on evaluating goals and efficacy. The information and examples are international.

Lynch, Kathryn A. 2004. Workshop guide and proceedings: harvester participation in inventory and monitoring of nontimber forest products. Portland, OR: Institute for Culture and Ecology. 151 p. http://www.ifcae.org/projects/ncssf1/index.html. (25 August 2006).

This report details the results of a series of meetings held with managers, nontimber forest harvesters, and interested organizations held as part of a project for the National Commission on Science for Sustainable Forestry (NCSSF) to examine the effects of nontimber forest products harvesting on biodiversity (Jones and others 2004). The focus of the workshops was to examine opportunities for participatory monitoring of these forest resources. Recommendations derived from the workshop, and further consultation with experts, are detailed in Lynch and others (2004). Although this document focuses mainly on the process of inclusive workshops, the results demonstrate the wide interest on the part of many stakeholders in participatory monitoring of biological resources with economic value.

Lynch, Kathryn A.; Jones, Eric T.; McLain, Rebecca J. 2004. Nontimber forest product inventorying and monitoring in the United States: rationale and recommendations for a participatory approach. Portland, OR: Institute for Culture and Ecology. 50 p. http://www.ifcae.org/projects/ncssf1/index.html. (25 August 2006).

The recommendations from this report to the NCSSF were the impetus for preparing this publication you are reading, and the companion curriculum entitled "Training Curriculum: Participatory Biological Monitoring Guidelines for Scientists and Managers." Although the Lynch and others (2004) report specifically focused on involving harvesters of nontimber forest products in monitoring the commercially valuable species they collected, many of the recommendations apply to all forms of participatory biological monitoring. Specifically with respect to monitoring biodiversity, participants can be motivated by general interest in conserving diversity or by an economic interest in continued sustainable harvest of particular biological resources. Motivation, incentives, and degrees of trust can differ depending on such incentives, but the participatory process has benefits that apply regardless. This report discusses reasons for participatory monitoring and types of participation, as well as barriers, incentives, and benefits of collaboration. Building trust, effective communication among diverse groups, matching effort and process to goals, ensuring data usefulness, and guaranteeing that collaborations are mutually worthwhile are emphasized.

McNamara, Carter. [N.d.]. Developing and managing volunteer programs. Free Management Library. Minneapolis, MN: Authenticity Consulting, LLC. http://www.managementhelp.org/staffing/outsrcng/volnteer/volnteer.htm#anchor140375. (25 August 2006).

This free information Web site provides management system guidance for both nonprofit and for profit organizations. The section on volunteers emphasizes that the appropriate management of volunteers is not much different than the appropriate management of employees and provides relevant information for designing a systematic program. Major topics include establishing or modifying volunteer management systems; an online tutorial for designing such systems; the role of volunteer managers; staffing analyses; legalities and risk; policies and procedures; jobs and task descriptions; volunteer recruitment, screening, selecting, orienting, training, and supervising; volunteer-staff relations; and assessing volunteer management practices. Numerous related resources are provided.

McNeely, Jeffrey A. 1995. Expanding partnerships in conservation. Washington, DC: Island Press. 302 p.

This book is a compilation of case examples of partnerships with local peoples and communities to enhance management of protected areas (parks, wildlife preserves, wilderness areas, etc.). It does not address participatory monitoring but does summarize some of the benefits of collaboration and strategies for making participatory management work.

Montréal Process Working Group. 1999. Criteria and indicators for the conservation and sustainable management of temperate and boreal forests. 2nd ed. Ottowa, Ontario: Montréal Process Liaison Office. http://www.mpci.org/. (25 August 2006).

The Montréal Process is a multinational working group formed in Geneva, Switzerland, in June 1994 to develop and implement internationally agreed-upon criteria and indicators for the conservation and sustainable management of temperate and boreal forests. A criterion is a category of conditions or processes for assessing sustainable forest management. These broad criteria are in turn characterized by a set of related indicators that are monitored periodically to assess change. Indicators are quantitative or qualitative variables that can be measured or described and that, when observed periodically, demonstrate trends. By applying a mutually agreed-upon set of criteria and indicators, meta-analyses of trends in forest management can reflect global trends and comparative strategies in sustainable management.

Moote, Ann; Becker, Dennis, eds. 2003. Exploring barriers to collaborative forestry: report from a workshop. Flagstaff, AZ: Ecological Restoration Institute. 24 p. https://library.eri.nau.edu:8443/handle/2019/116. (25 August 2006).

This report summarizes the findings of a workshop convened to examine the root causes of frustration and "burnout" that were plaguing some early attempts at collaborative resource management between community groups and federal land management agencies. In short, the identified barriers to successful collaboration include unrealistic expectations; government policies, procedures, and cultures; litigation obstacles; inadequate funding; lack of experience with new contracting procedures; inadequate capacity of community forestry groups; needed local economic development; and lack of resources and commitment to monitoring. Recommendations (targeted to congress, land management agencies, or collaborators as appropriate) are presented for addressing each barrier.

Moote, Ann; Loucks, Andrea Bedell 2003. Policy challenges for collaborative forestry: a summary of previous findings and suggestions. Prepared for policy dialogue on collaborative forestry. Flagstaff, AZ: Ecological Restoration Institute. 13 p. https://library.eri.nau.edu:8443/handle/2019/332. (25 August 2006).

This paper provides a summary of the workshop findings detailed in Moote and Beckner (2003), focusing more on needed federal land management policy changes. Its findings and recommendations are divided into (1) laws and policies, (2) funding issues, and (3) agency culture and practices.

Morrison, Michael L.; Marcot, Bruce G. 1995. An evaluation of resource inventory and monitoring program used in National Forest planning. Environmental Management. 19(1): 147–156.

This article addresses the issue of multiresource inventories and monitoring on national forests, evaluating the structure and use of current inventory and monitoring programs and recommending a framework for gathering data to improve forest planning. Potentially useful to monitoring coordinators is the discussion of spatial and temporal scales in the design of inventory and monitoring programs, ecological indicator selection, sampling bias, and statistical rigor in design.

Moseley, Cassandra; Wilson, Lisa J. 2002. Multiparty monitoring for sustainable natural resource management. Hayfork, CA; Watershed Research and Training Center; Eugene, OR: Ecosystem Workforce Program, University of Oregon. 13 p. http://ewp.uoregon.edu/guidebook/. (25 August 2006).

Many federal land management agencies define three types of monitoring to ascertain how well their management strategies and plans are working: implementation, effectiveness, and verification monitoring. This publication addresses effectiveness monitoring, namely, how to monitor the biophysical, social, economic, and administrative impacts of agency involvement in participatory natural resource management programs. For the categories of worker surveys, employment records, resource use, grants and cooperative agreements, and ecological impacts, it provides examples of addressing four monitoring questions: Why monitor? What information do you need? Where do you get information? and How do you calculate the results? It is a useful guide for analyzing the broader outcomes of the participatory monitoring approach we discuss.

Mueller, Gregory M.; Bills, Gerald F.; Foster, Mercedes S., eds. 2004. Biodiversity of fungi: inventory and monitoring methods. New York: Elsevier Academic Press. 777 p.

Fungi constitute a large branch on the tree of life and are of immense importance to humans and ecosystems, but they are often overlooked in surveys of biodiversity owing to their cryptic nature, the lack of monitoring methods, and limited expertise in identification. Over 90 contributors combined their knowledge to produce this first and comprehensive manual detailing inventory and monitoring methods for all types of fungi. As such, it is a unique and invaluable reference for efforts to include fungi in biodiversity surveys.

National Commission on Science for Sustainable Forestry [NCSSF]. 2005. Science, biodiversity, and sustainable forestry: a findings report of the National Commission on Science for Sustainable Forestry. Washington, DC. 52 p.

This report summarized progress to date by the NCSSF, specifically some of their key findings regarding the management of biodiversity and how the commission is contributing to this aspect of sustainable forestry in the United States. They outline findings in four areas of focus: (1) The effectiveness of biodiversity conservation is largely determined by interactions between stand- and landscape-level patterns, (2) Sustaining disturbance dynamics within appropriate ranges sustains biodiversity and ecosystem services, (3) Biodiversity indicators must be matched to land use objectives, and (4) Sustainable forestry and biodiversity conservation require management that recognizes and adapts to new information, changing environments, and shifting social priorities.

National Forest Foundation; U.S. Department of Agriculture, Forest Service, National Partnership Office. 2005. Partnership guide: the power of people working together, a living document. http://www.partnershipresourcecenter.org/resources/partnership-guide/. (24 August 2006).

This partnership guide was produced specifically for and by the USDA Forest Service to assist their employees with questions they might have about how to create partnerships with other government or nongovernmental organizations while meeting all the legal, regulatory, policy, and procedural guidelines that direct their agency and the work it does. It focuses on the organizational context of partnerships, how to obtain resources, clear and documented communication, ethical and legal conduct, and rewards for successful joint enterprises.

National Resources Conservation Service [NRCS]. [N.d.]. Title 360–Human Resources, Part 428—National NRCS Volunteer Services—Earth Team. Unpublished document. On file with: NRCS, Conservation Communications Staff, P.O. Box 2890, Washington, DC 20013. http://policy.nrcs.usda.gov/scripts/lpsiis.dll/GM/gm_360_428.htm. (25 August 2006).

This Web site (a document is also available for downloading) provides a specific example of a federal agency designing a volunteer management system for incorporating the use of volunteers (see McNamara (n.d.) for a more generic approach). Major topical headings include authorization, program responsibilities, eligibility, volunteer status, documentation and forms, security and financial disclosure, recognition of volunteer services, reporting requirements, and various pertinent exhibits (examples).

North-South Environmental, Inc. 2004. Enhancing community based monitoring in Canada: the role of Environmental Canada. Burlington, Ontario: Ecological Monitoring and Assessment Network-Coordinating Office. 30 p. http://www.eman-rese.ca/eman/reports/publications/2004/ecbm/intro.html. (25 August 2006).

This report was commissioned by the government agency Environment Canada to explore and analyze the best approaches for interfacing with the voluntary sector to manage collaborative environmental monitoring in Canada. The report is based on meetings and interviews where opinions were solicited regarding expected benefits and anticipated challenges facing such a program. Factors addressed include starting and promoting such programs, funding, monitoring protocols, stakeholder communication, data handling and networking, training needs, capacity building, and recognition of participant contributions. Concerns expressed in the discovery phase included whether long-term commitment was adequate, how to standardize monitoring protocols, whether adequate resources were available, appropriate feedback mechanisms among the participating organizations, the complexity of the issue of sustainability, and lack of trust in the government. The report also elaborates the expected benefits of collaboration and provides an overview of the structure of Canada's participatory monitoring programs including Ecological Monitoring and Assessment Network and other environmental agencies.

Noss, Reed F. 1990. Indicators for monitoring biodiversity: a hierarchical approach. Conservation Biology. 4(4): 355–364.

This article describes a holistic and comprehensive framework for choosing indicators and can be useful for helping collaborators and stakeholders understand the complexity of ecosystems and select indicators for monitoring programs. Noss suggests that indicators should be chosen from all levels of biological organization, including the regional/landscape, community-ecosystem, population-species, and genetic levels. He then suggests that for each of these levels, indicators be selected for each of the three components of an ecosystem: composition, structure, and function. These levels and components overlap to compose a nested hierarchy and matrix that can be used to specifically address the questions posed by the monitoring project.

Noss, Reed F.; Cooperrider, Allen Y. 1994. Saving nature's legacy: protecting and restoring biodiversity. Washington, DC: Island Press. [Defenders of Wildlife]. 416 p.

This book, written from the perspective of an environmental conservation organization, is a thorough overview of strategies for biodiversity conservation in various ecosystem types of the United States. It analyzes the ecosystem processes creating and changing biodiversity, past examples of conservation strategies, the usefulness of reserves and reserve networks, and the active management of forests, rangelands, and aquatic ecosystems to conserve biodiversity. It concludes with a discussion of monitoring and future directions.

Office of Management and Budget. 2002. Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies. [Notice; republication]. Federal Register. 67(36): 8452-8460. http://www.whitehouse.gov/omb/fedreg/final_information_quality_guidelines.html. (25 August 2006).

Federal legislation mandates federal agencies to arrange peer review of information they disseminate to the public.

Ottke, Christian; Kristensen, Peter; Maddox, David [and others]. 2000. Monitoring for impact: lessons on natural resources monitoring from 13 NGOs. Washington, DC: World Resources Institute. 90 p. http://biodiv.wri.org/pubs_description.cfm?PubID=3003. (25 August 2006).

This research report provides a comprehensive overview of how to monitor natural resources from the perspective of globally active nongovernment conservation organizations. It provides detail about the components of monitoring without dwelling on specific circumstances. It emphasizes the importance of focusing on the goals and reasons for monitoring, keeping the program simple and direct, deriving credible bias-free information, and communicating the information for effect. It divides the monitoring process into planning, implementation, evaluation, and communicating. In each of these categories, it elaborates on more specific steps that constitute an effective monitoring approach. Appendices include additional tools, resources, and example forms. Although oriented towards conservation advocacy, the elements of a complete monitoring program are cogently presented.

Pollard, J.E.; Smith, W.; Palmer, C.E. 1999. Forest Health Monitoring 1999 plot component quality assurance implementation plan. Research Triangle Park, NC: U.S. Department of Agriculture, Forest Service, National Forest Health Monitoring Program. 66 p. http://www.fs.fed.us/institute/about/design_qual.html (25 August 2006).

Forest Health Monitoring is a national monitoring program that seeks to obtain environmental data that are scientifically defensible and of acceptable quality to achieve the goals of the Forest Inventory and Analysis Program. This document builds on current *Quality Assurance Project Plans for Detection Monitoring* and a *Field Methods Manual* for standard sampling procedures by providing a unified national approach to quality assessment (review and evaluation of quality assurance plans and quality control methods).

Resolve. [N.d.]. U.S. Forest Service: partnership capacity assessment tool. Washington, DC: Resolve, Inc. 23 p. http://www.partnershipresourcecenter.org/resources/tools/index.php. (25 August 2006).

This U.S. Forest Service document is the product of a Partnership Task Force that in 2003 led to the creation of a new National Partnership Office and program within the agency. It is intended as a tool to help managers and local agency offices evaluate their capacity to undertake new partnerships or improve ongoing ones. It begins by summarizing the elements of successful partnerships and also what participating collaborative organizations need to ensure. The tool itself begins with fill-in forms to detail priorities and goals. Next follows a series of evaluation forms addressing time; staff; resources; attitudes; experiences and

opportunities; incentives and barriers; staff knowledge, skills, and abilities; and external relations. A process for analyzing numerical scores is described, and guidance for planning the next steps is provided. Additional resources are appended.

Russo, J. Edward; Schoemaker, Paul J.H. 1989. Decision traps: the ten barriers to brilliant decision-making and how to overcome them. New York: Simon and Schuster. 280 p.

This book is written to teach people the process of making good decisions by avoiding common mistakes. Based on a field of research entitled "behavioral decision-theory," the lessons are derived from how people actually make decisions, and then suggestions are made for improving the process.

San Bernardino National Forest. 2002. Volunteer safety program desk guide. Unpublished document. On file with: San Bernardino National Forest, 1824 S Commercenter Circle, San Bernardino, CA 92408.

This document is an example of a safety plan specifically targeted to volunteers.

Savan, Beth; Morgan, Alexis J.; Gore, Christopher. 2003. Volunteer environmental monitoring and the role of the universities: the case of Citizens' Environment Watch. Environmental Management. 31(5): 561-568.

This article discusses the usefulness of universities as stable institutions to provide support and continuity to collaborative projects and programs, especially when land management agencies do not, for whatever reason, take a lead role.

Schmoldt, Daniel L.; Peterson, David L.; Smith, Robert L. 2001. The analytic hierarchy process and participatory decision-making. In: Power, J.M.; Strome, M.; Daniel, T.C., eds. Proceedings: decision support—2001. Combined events of the 17th annual geographic information seminar and the resource technology '94 symposium. Bethesda, MA: American Society for Photogrammetry and Remote Sensing. Vol. 1.

This somewhat technical article describes a decisionmaking and support process that could be particularly useful for making systematic, explicit, rigorous, robust, and well-documented decisions in groups of users with diverse subjective opinions. As such it is highly applicable to complicated collaborative decisionmaking processes. The model itself is more complex than most users would care to learn, but a private company called Expert Choice (http://www.expertchoice.com/) provides subscription access to a Web-based, user-friendly interface with the model so that users can customize the analysis to their circumstances. The Web interface also allows multiple users to work on the same model in simultaneous sessions from any location with Web access.

Schreuder, Hans, T.; Ernst, Richard; Ramirez-Maldonado, Hugo. 2004. Statistical techniques for sampling and monitoring natural resources. Gen. Tech. Rep. RMRS-GTR-126. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 111 p. http://www.fs.fed.us/rm/main/pubs/electronic/rmrs_gtr.html. (25 August 2006).

This publication provides a thorough statistical overview of methods and considerations for monitoring natural resources. Written by individuals with extensive experience in the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis Program, its audience is inventory and monitoring personnel tasked with designing, implementing, or managing a natural resource monitoring program. As such, it covers not only rigorous statistical approaches but also practical considerations common in field applications.

The Secretariat of the Convention on Biological Diversity. 2001a. Handbook of the convention on biological diversity. London, United Kingdom: Earthscan. A 2nd edition dated 2003 is available online: http://www.biodiv.org/convention/articles.asp. (25 August 2006).

The publication details the technical agreements of the International Convention on Biodiversity.

The Secretariat of the Convention on Biological Diversity. 2001b. Sustainable management of non-timber forest resources. [CBD technical series No. 6]. Montreal, Quebec. http://www.biodiv.org/doc/publications/cbd-ts-06.pdf. (25 August 2006).

This document provides a broad overview of considerations for sustainable nontimber forest product management including developing monitoring systems that include a combination of monitoring at large spatial scales and monitoring high-value indicator species at a population level.

The Secretariat of the Convention on Biological Diversity. [N.d.]. Sustaining life on Earth. Convention on biological diversity. Montreal, Quebec. http://www.biodiv.org/programmes/outreach/awareness/publications.asp. (25 August 2006).

This publication explains in simple language the importance of biodiversity and how the international convention seeks to conserve biodiversity.

Sirmon, Jeff M.; Rana, Naureen; Kostishack, Peter. 2002a. Report to the USDA Forest Service on Phase I of the Partnership Development Program; contract 43-9138-2-3120. Washington, DC: Pinchot Institute for Conservation. 20 p. http://www.partnershipresourcecenter.org/resources/partnership_task_force/documents/PDP_Phase_I_Report.pdf. (25 August 2006).

This report summarizes Phase I of a project by the USDA Forest Service Partnership Task Force to design a program to facilitate agency partnerships. It provides brief discussions and useful checklists to "[1] define the core skill-set required of program managers and partnership specialists who are responsible for advancing solutions to natural resource management using collaboration and partnerships; [2] catalogue existing training opportunities related to the development of core skills; [3] explore the cultural, procedural, and skill-related barriers to the advancement collaborative solutions; and [4] identify some of the more promising, and perhaps necessary, approaches to developing competency in partnerships and collaborative stewardship." Written from an agency perspective, its key points and findings nevertheless reflect many of the recommendations often discussed from the perspective of collaborators. The report lists training opportunities for relationship building and understanding communities, facilitation and mediation, and the business side of partnerships, as well as experts within and outside the Forest Service who may be consulted.

Sirmon, Jeff M.; Rana, Naureen; Kostishack, Peter. 2002b. Report to the USDA Forest Service on Phase II of the partnership Development Program "Learn While Doing:" a model for working in collaboration and through partnerships; contract 43-9138-2-3120. Washington, DC: Pinchot Institute for Conservation. 35 p. http://www.partnershipresourcecenter.org/resources/partnership_task_force/documents/Learn_While_Doing_Model.pdf. (25 August 2006).

This report summarizes Phase II of a project by the USDA Forest Service Partnership Task Force to design a program to facilitate agency partnerships. It builds upon the analysis in Sirmon and others (2002a) to propose a model that Forest Service front-line managers, collaborators and the agency can use to revamp institutional barriers to including stakeholders in resource management. The model addresses six stages of collaboration: (1) assessing, (2) preparing, (3) framing issues, (4) making collaborative decisions, (5) implementing decisions, and (6) maintaining relationships. For each stage of this model it discusses desired outcomes, needed skills, and available training (including experts).

Sithole, Bevlyne. 2002. Where the power lies: multiple stakeholder politics over natural resources. Jakarta, Indonesia: Center for International Forestry Research. 87 p.

Although this guide was developed from experiences in developing nations, the principles discussed are applicable to any collaborative process and address the important issue of power relations among participants. Example of sources of disparate power include land tenure, legal authority, knowledge and skills, wealth, available time, constituency support, reputation, cultural norms, and social attitudes. All human interactions involve multilayered power relations, or what has been termed "micro-politics." Large discrepancies in actual or perceived power can be particularly important in the success or failure of collaborative efforts involving diverse stakeholders. This publication provides an indepth analysis of forms of power and how they are expressed, relations among participants with different levels of power, and how to appreciate and manage these dynamics.

Stockdale, M.C.; Corbet, J.M.S. 1999. Participatory inventory: a field manual written with special reference to Indonesia. Tropical Forestry Paper No. 38. Oxford, United Kingdom: Oxford Forestry Institute, Department of Plant Sciences, University of Oxford. 383 p.

Although this manual about participatory inventories is written specifically about involving local communities in Indonesia, it provides a good example of addressing all the field and training-related specifics of such programs. The process of developing a collaborative project with villagers is also discussed.

Sullivan, Patrick, chair. 2000. Improving the collection, management, and use of marine fisheries data. Committee on Improving the Collection and Use of Fisheries Data. Washington, DC: National Academy Press. http://www.nap.edu/books/0309070856/html/. (25 August 2006).

This online book provides a detailed example of the controversies and issues that can arise between scientists and resource users when they depend on each other's collaboration to manage a valuable resource.

University of Maine Cooperative Extension and Sea Grant Program, Maine Coastal Program of the Maine State Planning Office. [N.d.]. Environmental stewardship in the Gulf of Maine: a coordinator's manual for volunteer monitoring. 79 p. & appendixes. Unpublished document. On file with: University of Maine Cooperative Extension, Know-Lincoln County Office, 377 Manktown Road, Waldoboro, ME 04572.

This manual is well written and highly applicable to many of the modules in our manual. It is not currently published and is therefore only available by contacting the offices of the Maine Cooperative Extension agency (above). It is a manual for

how to organize specific monitoring projects within a larger marine environmental monitoring program. Chapters cover topics such as vision statements, goals, quality assurance plans, budgets and fundraising, working with volunteers, safety, data analysis and reporting, communication, leadership, conducting effective meetings, outreach activities, and project evaluation. Each topic has useful lists of pertinent considerations and references. The appendixes provide examples of brainstorming techniques; visioning processes; a goals and objectives form; sample volunteer position descriptions, applications, and timekeeping forms; a training agenda; leadership competencies; team-building activities; meeting guidelines; group member's roles and functions; group communication problems and skills; dealing with problem behaviors; conflict management styles; an agenda form, facilitation techniques, action plan record form, and evaluation tools for meetings; how to write a news release and give media interviews, and how to evaluate the monitoring project.

U.S. Department of Agriculture. [N.d.]. Quality of information guidelines. Washington, DC: Office of the Chief Information Officer. http://www.ocio.usda.gov/qi_guide/index.html. (25 August 2006).

This online resource is intended for employees of the U.S. Department of Agriculture but provides a useful perspective on the quality of information issues of concern to federal land managers. Only a portion of the information applies to participatory monitoring projects, but it is illustrative of managerial concerns. Managers in the U.S. Forest Service can benefit by perusing the topics with regard to organizing participatory projects in order to ensure the credibility and usefulness of collected data. The basic principles that are outlined are informative to any collaborators.

U.S. Department of Agriculture, Forest Service. 2004. Managing volunteers: a field guide for USDA Forest Service volunteer coordinators, R6/PNW. Unpublished document. On file with: The Volunteer Program, USDA Forest Service, Human Resources Staff, P.O. Box 3623, Portland, OR 97208. http://www.partnershipresourcecenter.org/resources/volunteers/index.php. (25 August 2006).

Intended for in-house use, this Forest Service manual provides a good overview of considerations regarding the use of volunteers from a federal land-management agency perspective. Although participatory monitoring is not covered, many of the contextual considerations are applicable. It starts with an overview of applicable federal legislation (detailed in the appendixes), and then addresses such topics as recruitment, volunteer motivation, identification of volunteers in the field, agreements, liability, insurance, safety, use of government vehicles and equipment, reimbursement, reporting accomplishments, and appropriate recognition and awards. Applicable forms are also appended.

U.S. Environmental Protection Agency [EPA]. 2001a. EPA requirements for quality assurance project plans. In: EPA QA/R-5 Quality System Series. Washington, DC: Office Of Environmental Information. 40 p. http://www.epa.gov/quality/qmps.html. (25 August 2006).

The EPA is a leading federal agency for developing quality assurance plans. This document provides an overview of their requirements for quality assurance in project plans as well as discussing the process of quality assurance at the program and policy levels. See Hunt and others (1996) for a detailed explanation of a quality assurance plan for data collected by volunteers monitoring water quality.

U.S. Environmental Protection Agency. 2001b. Checklist for reviewing EPA quality management plans. Washington, DC: Office Of Environmental Information. 13 p. http://www.epa.gov/quality/qmps.html. (25 August 2006).

This document is a short but informative checklist of the elements of a quality assurance plan. The elements listed are general and policy oriented, contrasting nicely with the more detailed approach of the other quality assurance plan checklist that we cite (Hanson, n.d.).

U.S. Environmental Protection Agency. 2002. Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by the Environmental Protection Agency. EPA/260R-02-008. Washington, DC: Office Of Environmental Information. 61 p. http://www.epa.gov/quality/informationguidelines/. (25 August 2006).

These guidelines are general in nature and apply to policy concerning information the EPA disseminates.

The Volunteer Monitor. [N.d.] The National Newsletter of the Volunteer Water Quality Monitoring Program. http://www.epa.gov/owow/monitoring/volunteer/issues.htm. (25 August 2006).

This newsletter of the Environmental Protection Agency's nationwide Volunteer Water Quality Monitoring Program covers a wide range of topics of interest to individuals who collaborate on local monitoring projects. Of particular interest are issues dedicated to themes such as "staying afloat financially" "managing and presenting your data" "program management" and "community outreach."

Voluntary Sector Initiative. 2001. An accord between the government of Canada and the voluntary sector. Ottowa, Ontario. 16 p. http://www.vsi-isbc.ca/eng/relationship/accord.cfm. (25 August 2006).

This short official document lists principles of collaboration, respect, communication, and relative responsibilities of the government and the private sector in the joint Canadian program to involve volunteers in programs to monitor the environment. In particular, this accord applies to the Canadian Ecological Monitoring and Assessment Network, Canadian Community Monitoring Network, and Canadian Information System for the Environment.

Voluntary Sector Initiative. 2002a. A code of good practice on policy dialogue. Ottawa, Ontario. 16 p. http://www.vsi-isbc.ca/eng/relationship/accord.cfm. (25 August 2006).

This short document presents a mutually agreed-upon code of practice concerning dialogue between the government and the private volunteer sector on communication about collaborative policies. It addresses values, principles, and commitments to action. In the appendix, it provides a useful diagram highlighting public policy processes and methods for involvement.

Voluntary Sector Initiative. 2002b. A code of good practice on funding. Ottawa, Ontario. 26 p. http://www.vsi-isbc.ca/eng/relationship/accord.cfm. (25 August 2006).

This short document describes principles of collaborative funding for environmental monitoring, summaries of volunteer and government funding sources and mechanisms, and an overview of how to implement mutual funding of collaborative monitoring.

Whitman and Hagan. 2004. Biodiversity indicators for sustainable forestry: final report to the National Commission on Science for Sustainable Forestry. Manomet Center for Conservation Sciences, Bruswick, ME: Manomet Center for Conservation Sciences. http://www.ncseonline.org/ewebeditpro/items/O62F3301.pdf. (25 August 2006).

This document reports Manomet Center's review and evaluation of scientific information that is available to aid forest managers on selecting biodiversity indicators. It includes recommendations for selection criteria and a Web-based decision-support tool derived from the literature and their survey of scientists and decisionmakers around the United States. It also includes useful analyses and conclusions regarding the feasibility of using biodiversity indicators in sustainable forest management and levels of understanding among foresters.

Wilson, E.O., ed., Peter, Frances M., assoc. ed. 1988. Biodiversity. Washington, DC. National Academy Press. http://books.nap.edu/books/0309037395/html/R1.html. (25 August 2006).

This book (also available online) is one of the first definitive compilations treating the issue of biodiversity from such perspectives as human importance, risks, monitoring, science, restoration, alternatives, policies, and prospects.

Wondolleck, Julia; Yaffee, Steven L. 2000. Making collaboration work: lessons from innovation in natural resource management. Washington, DC: Island Press. 277 p.

This book provides a comprehensive and cogent analysis of lessons learned from natural resource management programs regarding how to make collaborative efforts work. The authors analyze 10-years-worth of examples in the United States to present a rationale for collaboration, the various challenges and impediments that are likely to be encountered, and how to make a collaborative program succeed. It is an excellent reference for judging the pros and cons of initiating a participatory monitoring program. Both forest managers and participants will find it useful.

Wong, Jennifer L.G. 2000. The biometrics of non-timber forest product resource assessment: a review of current methodology. [Background paper for the European Tropical Forest Research Network workshop: developing needs-based inventory methods for non-timber forest products. London, United Kingdom: United Kingdom Department for International Development. 62 p. http://www.etfrn.org/etfrn/workshop/ntfp/. (25 August 2006).

This report is a comprehensive global overview of strategies and methods for monitoring nontimber forest product resources and ascertaining if their harvest is sustainable. It emphasizes statistical rigor while acknowledging a wide spectrum of monitoring goals and methods and the usefulness of incorporating traditional knowledge into monitoring project design and implementation. This background paper was presented at the Food and Agriculture Organization (FAO) conference noted in the citation and subsequently edited down to the less comprehensive and for-sale FAO publication listed immediately below (Wong and others 2001).

Wong, Jennifer L.G.; Thornber, Kirsti; Baker, Nell. 2001. Resource assessment of non-wood forest products. Rome, Italy: Food and Agriculture Organization of the United Nations. 109 p.

Although this publication provides less detail than the original report from which it was produced (see Wong 2000 above), it does provide a concise conceptual overview of monitoring approaches for nontimber forest products. As with the original report, the target audience is international, with an emphasis on developing nations in the tropics. As such, community economic development is emphasized as the context of collaborative monitoring.

Wong, J.L.G.; Healy, J.R.; Phillips, O.L. 2002. Introduction to theme 2: incorporating values into biodiversity assessment and monitoring—an introduction to some current issues. Participatory Assessment, Monitoring and Evaluation of Biodiversity. London, United Kingdom. University of Oxford: Environmental Change Institute. http://www.etfrn.org/etfrn/workshop/biodiversity/index.html. (25 August 2006).

This outline highlights many of the issues regarding the incorporation of local values into biodiversity conservation strategies through participatory programs.

Working Group on Criteria and Indicators. 2001. Scaling national criteria and indicators to the local level. Ottawa, Ontario: Science Branch, Canadian Forest Service, Natural Resources Canada. http://www.mpci.org/rep-pub/2001/2001scaling_e.pdf. (25 August 2006).

This report discusses the issue of scale and challenges inherent in the aggregation of data on indicators of sustainable forest management, looking at subnational to national levels in Canada. It then analyzes the possible application of the Montreal Process National Criteria and Indicators on the subnational level. Lastly, examples of mechanisms to develop, identify, and implement those subnational indicators are provided, as well as how they could be linked to national-level indicators.

Wright, Pam. [N.d.]. Program guidance for development of a forest/grassland monitoring and evaluation program. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Inventory and Monitoring Institute, Forest Monitoring Group. 66 p. [plus app. F]. http://www.fs.fed.us/institute/lucid/final_report/Desk_Guide.htm. (25 August 2006).

Central to any monitoring program is asking the right questions and tailoring the program to goals and needs. Although this document is written for a broad array of monitoring questions specifically pertinent to management of Forest Service lands, it provides an example of designing monitoring program components before tailoring specifics to meet the identified goals and needs. Section 2 (Design and implementation of a forest monitoring program) addresses scope, conceptual framework and approach, purposes and questions, measurable items (elements) for each question, sampling protocols for each element, selection of elements applicable to the monitoring goals, development of a monitoring plan based on budget constraints, implementation of the monitoring, evaluation of the data and results, documentation and reporting of the results, and revision of the program as needed. Appendix F provides a matrix of (columns) potential monitoring purposes and indicators cross-referenced with (rows) monitoring questions, elements to be measured, sampling protocols, units of measure, quality assurance and control procedures, data sources, spatial extent and scale, frequency of measurement, reference value, analysis approach, estimated costs, priority, data management, responsible individuals, reporting interval, and reference notes.

Yaffee, Steven L. 2002. Benefits of collaboration. Ann Arbor, MI: Ecosystem Management Initiative, School of Natural Resources and Environment, University of Michigan. 4 p. http://www.snre.umich.edu/ecomgt/lessons/why.htm. (25 August 2006).

This bulleted list of points is derived from a presentation highlighting the major benefits that can be expected from collaborative natural resource management efforts.

Yaffee, Steven L.; Wondolleck, Julia M. 2000. Making collaboration work: lessons from a comprehensive assessment of over 200 wide-ranging cases of collaboration in environmental management. Conservation Biology in Practice. 1(1): 17-25. http://www.snre.umich.edu/ecomgt/lessons/stages/getting_started/Benefits_of_Collaboration.pdf. (25 August 2006).

This short article presents several key points about collaborations. Collaborations (1) consist of interdependent people, (2) produce better decisions than adversarial processes, (3) improve the chances of decisions being implemented, (4) are integral to ecosystem management, (5) focus on problems and solutions rather than positions and advocacy, and (6) epitomize an entrepreneurial approach to problemsolving.

Appendix 1—Organizations

This appendix contains contact information and Web site addresses for organizations with experience in conducting participatory monitoring projects or that have produced useful supporting materials. The list consists primarily of nationwide programs in the United States with a few local, state, and international organizations relevant to this manual.

Appalachian Forest Resource Center
Rural Action
P.O. Box 157
Trimble, OH 45782
Phone: 740.767.4938
Fax: 740.767.4957
Email: info@ruralaction.org
URL: http://www.appalachianforest.org/

Atlantic Coastal Cooperative Statistics Program
1444 Eye Street NW, Suite 410
Washington, DC 20005
Phone: 202.216.5690
Fax: 202.289.7265
Email: support@accsp.org
URL: http://www.accsp.org/

Biodiversity Virtual Resources, Inc.
[No street address]
Ottawa-Hull, ON
Canada
Phone: 613.294.9014
Email: info@bvrr.com
URL: http://www.bvrr.com/

Canadian Community Monitoring Network
Nature Canada
85 Albert St., Suite 900
Ottawa, ON K1P 6A4
Canada
Phone: 800.267.4088.
Fax: 613.562.3371
URL: http://www.ccmn.ca/english/
URL: http://www.ccmn.ca/english/tools.html (toolkit)

Canadian Information System for the Environment
Environment Canada
70 Crémazie, 7th Floor
Gatineau, QC K1A 0H3
Canada
Phone: 819.934.1004
Fax: 819.994.5738
Email: cisesec@ec.gc.ca
URL: http://www.cise-scie.ca/english/home.cfm

Center for International Forestry Research
P.O. Box 6596, JKPWB
Jakarta 10065
Indonesia
Phone: +62 251.622.622
Fax: +62 251.622.100
Email: cifor@cgiar.org
URL: http://www.cifor.cgiar.org/

Collaborative Forest Restoration Program
State and Private Forestry
U.S. Department of Agriculture, Forest Service
Southwest Region
333 Broadway SE
Albuquerque, NM 87102
Phone: 505.842.3292
URL: http://www.fs.fed.us/r3/spf/cfrp/

Community-Based Collaboratives Research Consortium
c/o University of Virginia
164 Rugby Road
Charlottesville, VA 22903
Phone: 434.924.5041
Email: cbcrc@virginia.edu
URL: http://www.cbcrc.org
URL: http://www.cbcrc.org/php-bin/resources/resourceSearch.php
(bibliographic database)

Cooperative State Research, Education, and Extension Service
Volunteer Water Quality Monitoring National Facilitation Project
U.S. Department of Agriculture
Program Leader's Office
Mail Stop 2210
1400 Independence Avenue, SW
Washington, DC 20250-2210
URL: http://www.usawaterquality.org/volunteer/

Earthwatch Institute (Europe)
267 Banbury Road
Oxford, OX2 7HT
United Kingdom
Phone: +44 (0) 1865.318.838
Fax: +44 (0) 1865.311.383
Email: info@earthwatch.org.uk
URL: http://www.earthwatch.org/europe/

Ecological Monitoring and Assessment Network (Citizen Science)
Coordinating Office
Environment Canada
Canada Centre for Inland Waters
867 Lakeshore Road
Burlington, ON L7R 4A6
Canada
Phone: 905.336.4414
Fax: 905.336.4499
Email: eman@ec.gc.ca
URL: http://www.eman-rese.ca/

Ecological Restoration Institute
P.O. Box 15017
Flagstaff, AZ 86011-5017
Phone: 928.523.7182
Fax: 928.523.0296
Email: eri-info@for.nau.edu
URL: http://www.eri.nau.edu/cms/

Ecosystem Management Initiative
c/o Steven Yaffe
School of Natural Resources and Environment
University of Michigan
Dana Building
430 E University
Ann Arbor, MI 48109-1115
Phone: 734.763.5451
Email: yaffee@umich.edu
Fax: 734.615.7100
URL: http://www.snre.umich.edu/ecomgt/

Ecosystem Workforce Program
Institute for a Sustainable Environment
130 Hendricks Hall
5247 University of Oregon
Eugene, OR 97403-5247
Phone: 541.346.0676
Fax: 541.346.2040
URL: http://ewp.uoregon.edu/guidebook/

Environmental Change Institute
Oxford University Centre for the Environment
Dyson Perrins Building, South Parks Road
Oxford OX1 3QY
United Kingdom
Phone: +44 (0) 1865.275.848
Fax: +44 (0) 1865.275.850
Email: enquiries@eci.ox.ac.uk
URL: http://www.eci.ox.ac.uk/

Environmental Protection Agency Quality System
U.S. Environmental Protection Agency
Quality Staff (2811R)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202.564.6830
Fax: 202.565.2441
Email: quality@epa.gov
URL: http://www.epa.gov/quality/

European Tropical Forest Research Network
c/o The Tropenbos Foundation
P.O. Box 232
6700 AE Wageningen
The Netherlands
Phone: +31 317.495516
Fax: +31 317.495521
Email: etfrn@etfrn.org
URL: http://www.etfrn.org/etfrn/

Food and Agriculture Organization of the United Nations
Forestry Department
Viale delle Terme di Caracalla
00100 Roma
Italy
URL: http://www.fao.org/forestry/

Forest Community Research
c/o Sierra Institute
P.O. Box 11
4438 Main Street
Taylorsville, CA 95983
Phone: 530.284.1022
Fax: 530.284.1023
Email: info@sierrainstitute.us
URL: http://www.fcresearch.org/

Forest Guild
P. O. Box 519
Santa Fe, NM 87504
Phone: 505.983.8992
Fax: 505.986.0798
Email: info@forestguild.org
URL: http://www.forestguild.org

Forest Inventory and Analysis
U.S. Department of Agriculture, Forest Service
National Office
1601 North Kent St.
Suite 400
Arlington, VA 22209
Phone: 703.605.4189
URL: http://fia.fs.fed.us/

Forest Stewardship Council
1155 30th Street NW, Suite 300
Washington, DC 20007
Phone: 202.342.0413
Fax: 202.342.6589
Email: info@fscus.org
URL: http://www.fscus.org/

Four Corners Institute
1477 1/2 Canyon Road
Santa Fe, NM
Phone: 505.983.8515
Email: forests@ucla.edu
URL: http://www.fourcornersinstitute.org/

Free Management Library
Authenticity Consulting, LLC
4008 Lake Drive Avenue North
Minneapolis, MN 55422-1508
Phone: 800.971.2250
Fax: 763.592.1661
Email: carter@authenticityconsulting.com
URL: http://www.authenticityconsulting.com/

Institute for Culture and Ecology
P.O. Box 6688
Portland, OR 97228-6688
Phone: 503.331.6681
Email: ifcae@ifcae.org
URL: http://www.ifcae.org/

Institute for Environmental Negotiation
104 Emmet St.
Charlottesville, VA 22903
Phone: 434.924.1970
Fax: 434.924.0231
Email: envneg@virginia.edu
URL: http://www.virginia.edu/ien/about.htm

Inventory and Monitoring Institute
U.S. Department of Agriculture, Forest Service
Natural Resources Research Center
2150 Centre Ave. Building A
Fort Collins, CO 80526
URL: http://www.fs.fed.us/institute/

Local Unit Criteria and Indicators Development Project
URL: http://www.fs.fed.us/institute/lucid/
c/o Pam Wright
USDA Forest Service
Inventory and Monitoring Institute
2150 Centre Ave.
Fort Collins, CO 80526-1891
Phone: 970.295.5712
Fax: 970.295.5885
Email: pwright@fs.fed.us
URL: http://www.fs.fed.us/institute/

Manomet Center for Conservation Science
81 Stage Road
P.O. Box 1770
Manomet, MA 02345
Phone: 508.224.6521
Fax: 508.224.9220
URL: http://www.manomet.org/

Montréal Process Liaison Office
8th Floor, Sir William Logan Building,
580 Booth Street
Ottawa, ON K1A 0E4
Canada
Phone: 613.947.9061
Fax: 613.947.9033
URL: http://www.mpci.org/

National Biological Information Infrastructure
National Program Office
U.S. Geological Survey Biological Informatics Office
302 National Center
Reston, VA 20192
Phone: 703.648.6244
Fax: 703.648.4224
URL: http://www.nbii.gov/
URL: http://www.nbii.gov/issues/biodiversity/ (organizations working on biodiversity) http://www.nbii.gov/datainfo/metadata/ (concise definition of metadata)

National Commission on Science for Sustainable Forestry
1707 H Street NW, Suite 200
Washington, DC 20006-3918
Phone: 202.207.0006
Fax: 202.628.4311
URL: http://www.ncseonline.org/NCSSF/

National Council for Science and the Environment
1707 H Street NW, Suite 200
Washington, DC 20006-3918
Phone: 202.530.5810
Fax: 202.628.4311
Email: info@NCSEonline.org
URL: http://NCSEonline.org/

NatureMapping Program

University of Washington, Washington Cooperative Fish & Wildlife Research Unit
Box 357980
Seattle, WA 98195
Phone: 206.543.6475

Washington Department of Fish and Wildlife
600 Capitol Way N
Olympia, WA 98501
Phone: 360.586.3105
URL: http://depts.washington.edu/natmap/

National Forest Foundation
Building 27 Suite No. 3
Fort Missoula Road
Missoula, MT 59804
Phone: 406.542.2805
Fax: 406.542.2810
Email: info@natlforests.org
URL: http://www.natlforests.org/

National Forest Health Monitoring Program
USDA Forest Service
1992 Folwell Avenue
St. Paul, MN 55108
Phone: 651.649.5243
FAX: 651.649.5238
URL: http://fhm.fs.fed.us/

National Network of Forest Practitioners
305 Main Street
Providence, RI 02903
Phone: 888.252.1008
Fax: 401.273.6508
Email: info@nnfp.org
URL: http://www.nnfp.org/

National Partnership Office
Partnership Resource Center
U.S. Department of Agriculture, Forest Service
National Partnership Office
201 14th St. SW
3NE, Mailstop 1158
Washington, DC 20024-1158
Phone: 202.205.1072
URL: http://www.fs.fed.us/aboutus/partnership/
URL: http://www.partnershipresourcecenter.org/ (online resources)

National Woodland Owners Association
374 Maple Ave. E, Suite 310
Vienna, VA 22180
Phone: 800.476.8733
Fax: 703.281.9200
Email: info@woodlandowners.org
URL: http://www.woodlandowners.org/

Northwest Connections
Community Based Conservation and Education
P.O. Box 1309
Swan Valley, MT 59826
Phone: 406.754.3185
FAX: 406.754.3330
Email: nwc@montana.com
URL: http://www.northwestconnections.org/

Oregon Department of Environmental Quality
Volunteer Monitoring Resources
811 SW 6th Ave.
Portland, OR 97204-1390
Phone: 800.452.4011
Fax: 503.229.6124
Email: deq.info@deq.state.or.us
URL: http://www.deq.state.or.us/lab/wqm/volunteermonitoringresources.htm

Pacific Northwest Research Station
U.S. Department of Agriculture, Forest Service
333 SW First Avenue
Portland, OR 97204
Phone: 503.808.2592
URL: http://www.fs.fed.us/pnw/

Pacific Southwest Research Station
U.S. Department of Agriculture, Forest Service
800 Buchanan Street
West Annex Building
Albany, CA 94710-0011
Phone: 510.559.6300
URL: http://www.fs.fed.us/psw/

Participatory Learning and Action Notes
Sustainable Agriculture and Rural Livelihoods Programme
International Institute for Environment and Development
3 Endsleigh Street
London WC1H 0DD
United Kingdom
Phone: +44 (0) 20.7388.2117
Fax: +44 (0)20.7388.2826
Email: info@iied.org
URL: http://www.iied.org/NR/agbioliv/pla_notes/

Pinchot Institute for Conservation
1616 P Street
NW, Suite 100
Washington, DC 20036
Phone: 202.797.6580
URL: http://www.pinchot.org/

Policy Consensus Initiative
P.O. Box 1762
Portland, OR 97207
Phone: 503.725.9096
URL: http://www.policyconsensus.org/

Red Lodge Clearinghouse
Ross Johnson
Communications Coordinator
32 South Ewing No. 326
Helena, MT 59601
Phone: 888.495.0757
Fax: 406.495.1074
Email: contactus@redlodgeclearinghouse.org
URL: http://www.redlodgeclearinghouse.org/

Resolve, Inc.
1255 23rd Street, NW, Suite 275
Washington, DC 20037
Phone: 202.944.2300
Fax 202.338.1264
Email: info@resolv.org
URL: http://www.resolv.org/

Rocky Mountain Research Station
USDA Forest Service
Natural Resources Research Center
2150 Centre Avenue, Building A
Fort Collins, CO 80526-8121
Phone: 970.295.5926
Fax: 970.295.5927
URL: http://www.fs.fed.us/rm/main/headquarters.html

Roundtable on Sustainable Forests: Criteria and Indicators
URL: http://www.sustainableforests.net/criteria-indicators.php
c/o Shawn Walker
Meridian Institute
1920 L Street, NW, Suite 500
Washington, DC 20036
Phone: 202.354.6450
Fax: 202.354.6441
Email: shawnwalker@merid.org
URL: http://www.merid.org/

Secretariat of the Convention on Biological Diversity
United Nations Environmental Programme
World Trade Centre
413 St. Jacques Street, Suite 800
Montréal, QC H2Y 1N9
Canada
Phone: 514.288.2220
Fax: 514.288.6588
Email: secretariat@biodiv.org
URL: http://www.biodiv.org/

Southern Appalachian Volunteer Environmental Monitoring
Southern Appalachian Man and the Biosphere
314 Conference Center Building
Knoxville, TN 37996-4138
Phone: 865.974.4583
Fax: 865.974.4609
Email: samab@utk.edu
URL: http://samab.org/Focus/Monitor/monitor.html

Sustainable Forest Data Working Group
(Federal Geographic Data Committee)
URL: http://www.pwrc.usgs.gov/brd/sfd.htm

c/o Paul Geissler
U.S. Geological Survey
Patuxent Wildlife Research Center
BARC-East, Bldg. 308
10300 Baltimore Avenue
Beltsville, MD 20705
Phone: 301.497.5780
Fax: 301.497.5624
Email: Paul_Geissler@usgs.gov

or c/o Rich Guldin
U.S. Department of Agriculture, Forest Service
Forest Insect and Disease Research
National Headquarters
P.O. Box 96090
Washington, DC 20090-6090
Phone: 703.605.4177
Fax: 703.605.5131
Email: RGuldin@fs.fed.us

Voluntary Sector Initiative–Voluntary Sector Forum
130 Albert Street, Suite 1705
Ottawa, ON K1P 5G4
Canada
Phone: 800.821.8814
Fax: 613.238.9300
Email: info@vsi-isbc.org
URL: http://www.vsi-isbc.ca/eng/

Voluntary Sector Initiative (VSI)–Government of Canada Community Development and Partnerships Directorate Human Resources and Social Development Canada
Place Vanier, Tower A, 2nd Floor
333 North River Rd.
Ottawa, ON K1A 0L1
Canada
Phone: 800.821.8814
Fax: 613.238.9300
Email: info@vsi-isbc.org
URL: http://www.vsi-isbc.ca/eng/

Volunteer Monitor Project
U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds (4503T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202.566.1191
Email: ow-owow-internet-comments@epa.gov
URL: http://www.epa.gov/volunteer/

Wallowa Resources
P.O. Box 274
200 W North St.
Enterprise, OR 97828
Phone: 541.426.8053
Fax: 541.426.9053
Email: info@wallowaresources.org
URL: http://www.wallowaresources.org/

The Watershed Research and Training Center
P.O. Box 356
Hayfork, CA 96041
Phone: 530.628.4206
Fax: 530.628.5100
Email: wrtc@hayfork.net
URL: http://www.thewatershedcenter.org/

World Resources Institute
10 G Street, NE (Suite 800)
Washington, DC 20002
Phone: 202.729.7600
Fax: 202.729.7610
URL: http://www.wri.org/

World Wildlife Fund
1250 24th Street, NW
P.O. Box 97180
Washington, DC 20090-7180
Phone: 202.293.4800
URL: http://www.worldwildlife.org/

Appendix 2—Case Studies of Collaboration and Partnerships

The Web sites listed in this appendix provide a list of links or maps to search for case studies of collaborations and partnerships throughout the United States and Canada.

Appalachian Forest Resource Center Cooperators—2003
http://www.appalachianforest.org/RFP/coopsum.html.

Canadian Ecological Monitoring and Assessment Network (Citizen Science)
http://dev.stewardshipcanada.ca/communities/citizenScience/home/csnIndex.asp

Ecosystem Management Initiative
http://www.snre.umich.edu/ecomgt/cases/map.htm.

Red Lodge Clearinghouse—Collaboration Stories
http://www.redlodgeclearinghouse.org/stories/.

Appendix 3—Project Web Site and Additional Resources

The Web site **http://www.ifcae.org/projects/ncssf3/** accompanies this publication. Users of these guidelines should periodically check the Web site for revisions and for additional information and resources, including the following:

Training curriculum—
The Web site also includes a downloadable training curriculum on how to use the guidelines. The purpose of this curriculum is to provide government and nongovernment trainers with a tool for introducing participatory biological monitoring and use of the guidelines for local managers and scientists during a 1-day workshop. In addition to learning how to use the guidelines, the curriculum will help forest managers and scientists explore the reasons for a participatory approach to monitoring and the logistics of implementing such a project. Training sessions also provide an opportunity to network with nearby colleagues that have similar interests. The curriculum is divided into five units, each containing teaching objectives, a materials list, background and teaching strategies for instructors, masters for handouts and overhead transparencies, and five case studies. The five units of the curriculum are: unit 1—Introduction to participatory monitoring, unit 2—Essential considerations of a participatory biological monitoring project, unit 3—Participants and incentives, unit 4—Building skills for a participatory monitoring project, and unit 5—Peer-learning for next steps.

On the Institute for Culture and Ecology Web site, we provide forms that can be used as a template to help with the documentation process.

Web site version of guidelines—
The Web site version of these guidelines allows users an alternative access and distribution option. The Web site includes a downloadable .pdf file as well as a hyperlinked version that simplifies accessing references and additional information.

Workbook documentation forms—
As noted throughout this manual, the most effective use of the information we provide is to create a project plan and document its implementation. At the Web site address above, we provide forms that can be used as a template for this process. To that end, they can be reproduced, modified, printed, organized, filled out, and filed for quick reference and documentation. Users are encouraged to improvise as their needs dictate. The workbook contents include:

- Monitoring plan cover page
- Overview of modules
- Module checklists
- Generic documentation sheets
- Generic sheets for other sources of information

Project participant release form examples—
A project participant release form is intended to clarify legal rights of project participants and is typically used to release project organizers and sponsoring organizations from legal liabilities (for example, job injuries) associated with projects involving volunteers and other types of participants. Although the Web site provides examples of releases, it is recommended that forms be adapted to specific projects and reviewed by a lawyer before being distributed to participants.

Job hazard analysis guideline examples—
A job hazard analysis is an exercise that helps identify job hazards before they occur. It typically focuses on the relationship between the worker, the tools, and the work environment. Ideally, after uncontrolled hazards are identified, project organizers will take steps to eliminate or reduce them to an acceptable risk level. The Web site provides a link to example guidelines for assessing job hazards.

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