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LESSONS FROM THE FIELD

LINKING THEORY AND PRACTICE IN BIODIVERSITY CONSERVATION

MEASURING OUR SUCCESS

One Team's Experience in Monitoring the Crater Mountain Wildlife Management Area Project in Papua New Guinea

About BCN

A commonly held idea in conservation circles is that if local people can benefit from using their forests and reefs, they will take action to conserve them. This sounds good in theory, but does it work in practice?

The Biodiversity Conservation Network (BCN) is testing this enterprise-based approach to conservation by doing it. Local communities set up businesses—like ecotourism or forest product harvesting—that directly depend on biodiversity and the long-term integrity of the ecosystem in which the products are found. By funding and working with 20 such projects across Asia and the Pacific, we are trying to understand under what conditions this approach works—and under what conditions it doesn't.

Lessons from the Field shares what we are learning along the way—both our successes and our failures. We hope this series will serve conservation practitioners as a catalyst for further discussion, learning, and action so that biodiversity is conserved.

Preface

In this issue, a team of conservation practitioners from Papua New Guinea describe their experience in setting up a monitoring plan for their project. Over the past few years, the team members have developed an impressive system for collecting data about their site. In the following pages, they talk about how they set up this system. In addition, they present the tools and data collection forms that they developed. These forms are now available on the web at www.BCNet.org. It is their hope—and ours—that you will be able to benefit from their experience and expertise.

—Nick Salafsky

Who Are We and What is This Story About?

We are from a national NGO in Papua New Guinea (PNG) called the Research and Conservation Foundation (RCF). With technical support from the Wildlife Conservation Society (WCS), we have been working with the local communities in the highlands of PNG to set up a national protected area called the Crater Mountain Wildlife Management Area (WMA). Four years ago, our organizations received a grant from the Biodiversity Conservation Network (BCN). BCN agreed to provide support for the small research-based tourism and non-timber forest product handicrafts businesses that we had started with local communities in the WMA. But they also wanted us to find out if the businesses they supported would really have an impact on the conservation of the biodiversity in the protected area. In order to answer this question, we had to come up with a monitoring plan for our project. Today, four years later, we have a monitoring program in place. This plan is summarized in the *Crater Mountain Monitoring Program Manual*.

FREE INSIDE!! Web Links to Our Actual Data Forms & Instructions

ARLYNE JOHNSON

The Crater Mountain Project Team (July 1998)

The monitoring program outlined in our Manual is the product of a great deal of hard work and learning through experience. We realized that when we were developing our program, it would have been VERY helpful to have examples of monitoring programs from other groups to look at. As a result, we would like to share our work with you. The purpose of this document is to briefly describe our experience in developing the Crater Mountain monitoring program and to provide an introduction to the monitoring tools that we developed. A complete list of the data sheets and instruction sheets that we developed can be seen at the end of this document. Copies of these sheets are available at the BCN Web site at www.BCNet.org. It is our hope that you can learn from our experiences and that some of the process or the products that we developed may be of use to you in designing monitoring procedures for your protected area.

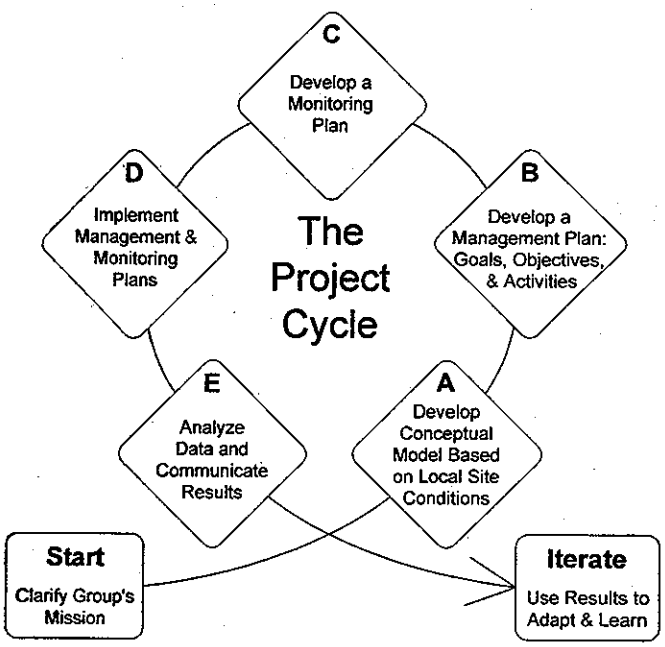


Figure 1. The Project Cycle. Source: Margoluis and Salafsky (1998).

In both developing our monitoring plan and laying out this document, we followed the steps for designing and monitoring conservation and development projects which are shown in Figure 1 and described in detail in the book *Measures of Success* (Margolius and Salafsky 1998). Our story describes how we applied these steps to an actual conservation project. For us, it took a couple of years to go through the process of designing and setting up the monitoring program (Figure 2). Your experience may vary considerably depending on the size and complexity of your project, and the number and experience of staff and community members who are involved. To find out more about the conditions that we work in, see the organization and project profile on the following pages.

Before Starting . . . Why Go to All the Trouble of Monitoring?

Today, there is shared concern among practitioners, donors and scientists about the need for biodiversity conservation, but there is also a great deal of debate about what methods will be most effective for establishing viable protected areas. We found that it was important for us to monitor in order to:

- Learn for ourselves if the activities that we were doing in our protected area were achieving biodiversity conservation or not. After all, this is the goal, right?
- Find out if some activity that our organization is doing is especially effective for achieving biodiversity conservation, so that we can share it with you and other practitioners.
- Demonstrate to our supporters that our project could conduct self-assessment of its activities, learn from our successes and failures, and, most importantly, adapt our project management to do an even better job!

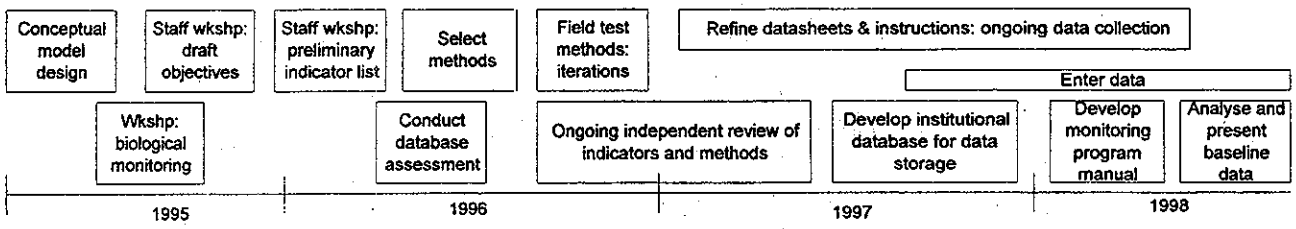


Figure 2. Timeline for Developing the Crater Mountain Monitoring Program.

Step A: Developing a Conceptual Model . . . Why Bother?

What We Did

Once we decided that we needed to develop a monitoring plan for our protected area, we had to take a step back and create a conceptual model of our project. This process is described in Step A of *Measures of Success*. Our model was constructed by our project staff. The first draft was prepared by our two most experienced field staff who had spent the most time working with the communities in the protected area. The draft was reviewed and modified in two consecutive workshops with input from all project staff. The resulting model is shown in Figure 3 (Ericho et al. 1999). This model outlines the components of biodiversity that we were concerned with at the site under the category of "biological needs." All the direct threats to site biodiversity were listed under "land use." Indirect threats, the factors which we thought were driving the land use, were listed under the various headings of "human needs, conditions, services and policies." The team thought that the project could have the greatest impact on achieving the goal of biodiversity conservation at the site by conducting interventions which addressed three factors: the need for 1) cash income, 2) education, and 3) institutions to make policy and enforce rules.

What We Learned

- It was initially tempting to skip this step, especially because our project had been in existence for some time. We found, however, that this step was an essential activity for the project team to do in order to clarify what our collective "picture" was of the factors influencing conservation in the WMA. Once the model was complete, it was then relatively easy for our staff to move to the next step of identifying the areas for intervention, and to select and design appropriate project activities to lead towards the conservation goal.

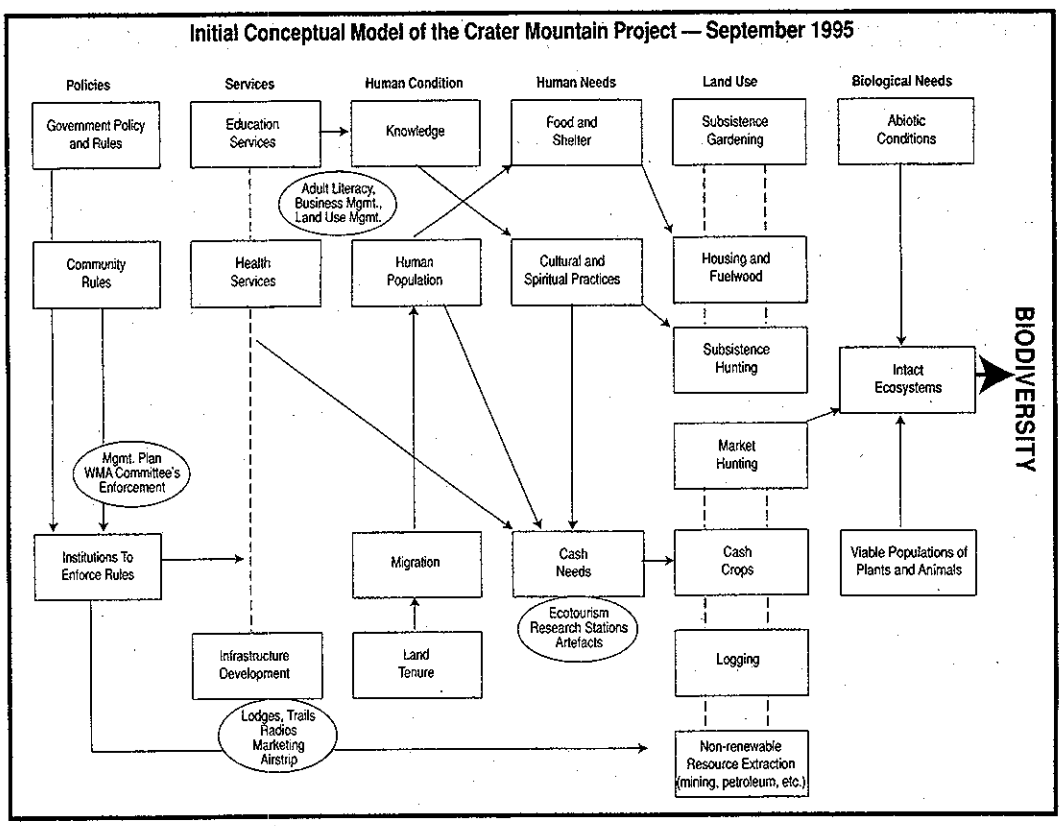
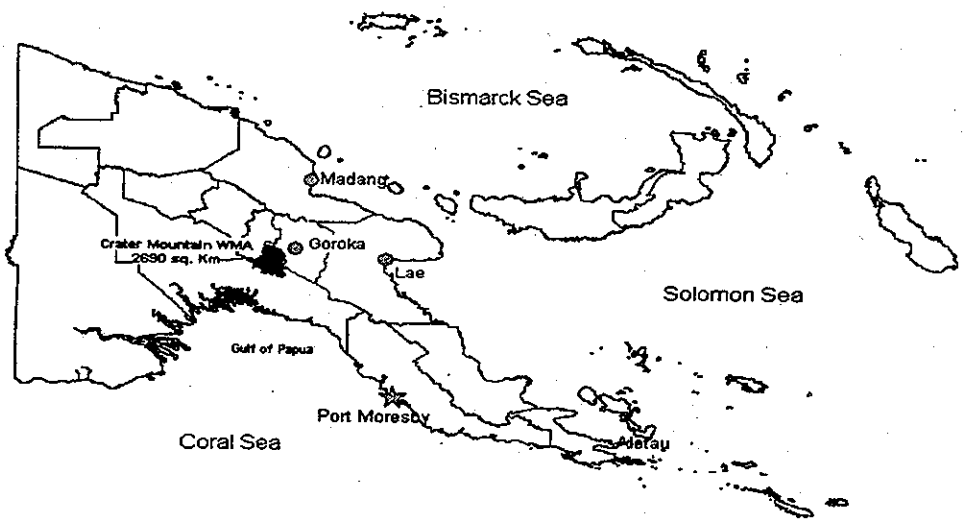


Figure 3. Crater Mountain Project Conceptual Model: Sept. 1995. Source: Ericho et al. (1999).

Overview of the Research and Conservation Foundation of Papua New Guinea

The Research and Conservation Foundation (RCF) of Papua New Guinea evolved out of shared concerns between researchers from the Wildlife Conservation Society and landowners in the Crater Mountain area of PNG over a decade ago. All involved were concerned about the declining populations of the unique and unusual birds of paradise that lived in the Crater Mountain forests. The birds were not only important because they were found nowhere else in the world, but also because they were significant in the cultural traditions of the New Guinea Highlands communities. RCF was incorporated as a national non-governmental organization to work with Papua New Guinea landowners, the national government and the global community to conserve the unique biodiversity and related cultural history of this fascinating area.



Location of the Crater Mountain Wildlife Management Area

Institutional Beginnings

RCF was officially incorporated in 1986, with support from the Wildlife Conservation Society in New York and the PNG Department of Environment and Conservation, as a national non-profit non-governmental organization, governed by a 10-member board of directors.

Location

RCF is based in Goroka, Eastern Highland Province, Papua New Guinea.

Mission Statement

RCF was established to:

- Promote and preserve for the benefit of the people of Papua New Guinea and the world the unique flora and fauna of Papua New Guinea.
- Encourage, finance, assist in, and undertake research into flora and fauna of Papua New Guinea and to cooperate with institutions and persons with similar aims.

Major Activities (numbers in parenthesis are staff devoted to each activity)

- The Crater Mountain Integrated Conservation and Development Project

  –Research and Natural Resource Management (6)

  –Small Business and Community Development (7)

- Conservation Education Program (2)
- RCF Administration (5)

Location

Crater Mountain is the second largest national Wildlife Management Area (WMA) in Papua New Guinea. It covers 2,700 square kilometers, approximately the same size as the U.S. state of Rhode Island. The boundaries of the WMA overlap three provincial political districts.

Legislation

The Crater Mountain area was gazetted in 1993 as a national Wildlife Management Area by the PNG Department of Environment and Conservation upon request from the customary owners of the land. The WMA law requires that landowners submit 1) a legal description of the boundaries of their area to be gazetted as the WMA, 2) a list of the clan leaders who will sit on local Wildlife Management Committees, and 3) a list of the rules by which the Management Committees will govern the use of natural resources in the area. Through the management committees, communities create the policies that provide incentives to practice sustainable resource use and can prosecute individuals who violate the rules.

Biodiversity

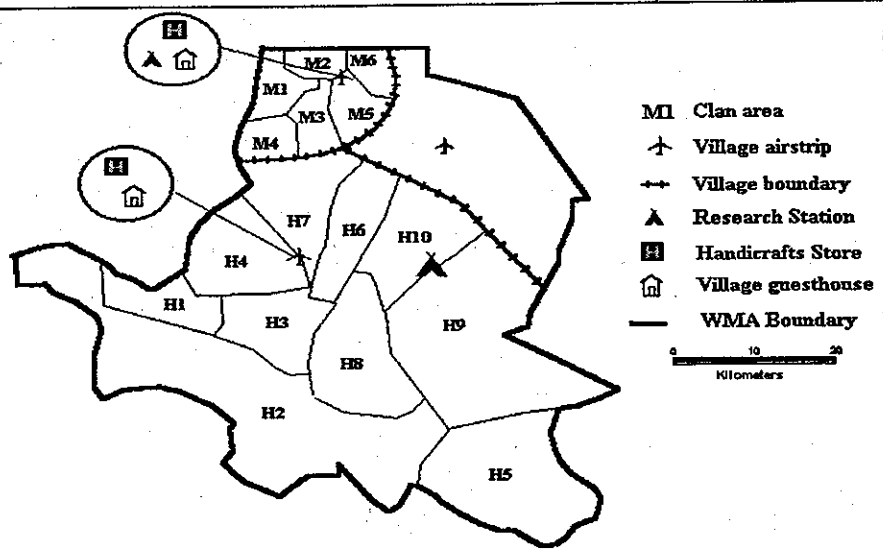
Ninety-seven percent of the WMA is still forested, ranging from lowland rain forest at sea level to montane cloud forest on upper parts of the 3,100 meter Crater Mountain. The WMA harbors 221 bird species, 84 mammal species, and plant species in 5 major vegetation types (Beechler 1993). Many of these animal and plant species are endemic and are of global conservation significance.

People and Land Use

The WMA is owned, through customary land tenure, by 22 family clans (see clan map) of 2 language groups, the Gimi in the north and the Pawaiian in the south. Each clan manages its land independently of the others. Human population density is approximately 1 person per 100 hectares. Forest is cleared for conversion to sago palm, sweet potato and coffee gardens. Selected species of wildlife are harvested for subsistence consumption, market sales, and cultural ceremonies. In recent years, landowners have received offers for potential royalties from large-scale gold mining and logging operations.

Cash Economy

Cash income has been historically generated through the sale of cash crops, primarily coffee, and wildlife. Since the 1980s, RCF and WCS have worked with local communities to develop small businesses which are dependent on the local biodiversity including the development of research-based tourism and the production of non-timber forest product handicrafts.



The Crater Mountain WMA: landownership and eco-enterprises in the villages of Maimafu and Haia (Herowana village features not shown)

Research-based tourism in the Crater Mountain WMA (June 1996)

- In developing our model, we relied more on the project staff than on community members. Although this focus was important to get the project team to agree on what to do, in retrospect it might have been interesting to get more active comments on the model from the community members to see how staff perspectives on the site conditions compared to theirs.
- Over the years, some staff changed and new project partners joined the team. During this time, the model turned out to be essential for holding the team and the project together as we weathered the "storms" of the debate over the balance between conservation and development. During these debates, it was tempting to change course and hastily discard activities that didn't seem to be working. The model helped us maintain consistency over time, providing a framework from which to objectively analyze the effectiveness of project activities, and then systematically adapt them over time.

Step B: Drafting the Goal, Objectives, and Activities

What We Did

Our entire project team held a staff retreat for two days to review the conceptual model and the interventions we had selected and then draft an objective that described the intent of each intervention. Since the Crater Mountain WMA was established under the PNG protected areas legislation, it was quite clear that the goal of our project was the "conservation of biodiversity in the Crater Mountain WMA."

In our project model, we had selected four areas of intervention. Project staff divided into four working groups and each group selected one of the intervention areas and discussed the rational and assumptions of the intervention. Specific questions that each group addressed included:

- Why had we selected to intervene in this area of the model?
- What were we exactly hoping to accomplish by implementing this intervention?
- How would implementing the intervention assist us in reaching our conservation goal?

Based on this discussion, each group crafted a written objective to express the intent of the intervention. The resulting objectives were written on a white board and presented to the entire project team. The wording of each objective was further discussed and we systematically checked each objective to see if it was impact-oriented, measurable, time limited, specific, and practical (see *Measures of Success*, page 64). The objectives were then modified until the entire group reached consensus. Our final goal and objectives are shown in Figure 4. Objective #4, which represented a fundamental operating principle for our entire project, was added during the process. Finally, we organized the pre-existing activities of our project under the appropriate objective. For example, we had been providing training to clan members who worked at the Crater Mountain Biological Research Station for the last five years. It was clear that this activity would now fall under Objective #2.

Crater Mountain Biological Research Station in the Crater Mountain WMA (April 1998)

Project Goal:

Conservation of biodiversity in the Crater Mountain Wildlife Management Area.

Project Objectives:

1. Increase the average annual per capita income of clans (landowning groups) over the next three years by establishing locally owned research and ecotourism enterprises in the WMA
2. Over the next three years, increase the level and range of understanding and skills of community residents who work in the research and ecotourism enterprises in the WMA
3. Over the next three years, increase the number of decisions and actions that integrate the results of the enterprise, biological, and socioeconomic monitoring programs into the working management plan
4. Over the next three years, increase national involvement and human resource exchange within the WMA as teachers, trainers, and consultants working towards conserving natural resources in the WMA

Figure 4. Crater project goal and objectives.

What We Learned

Our "project" had been active for almost 10 years before we received donor support from BCN. We thought all project staff knew, and agreed on the rationale for the project activities. When we created the conceptual model and drafted the objectives, we found out that we were actually not all thinking the same things. For example, some of our staff thought that local community development was the most important priority while others thought biological research was the key. The process of creating the model and objectives was thus essential as a means to reach consensus about exactly what factors we thought where influencing our goal and how our project activities fit into that picture.

It was worthwhile taking the time to carefully craft the wording of our objectives with the project team. As with the conceptual model, we found that there were lots of varying thoughts among the team about how to best achieve the conservation goal of the project. Our project team is multidisciplinary and made up of people from various ethnic backgrounds and languages. Our project site is large and remote, and staff must often work on their own for extended periods. There is a lot of potential for miscommunication and misunderstanding. The discussion of the intent of each intervention, and the wording of the objective, was an important step as it really made us work together to clarify what we intended to do and why, once we all returned to our work sites.

It turned out to be especially worthwhile to make sure that the words in our objectives were quite "specific" and "measurable." We could have even improved our objectives

DAVID GILLISON

NTFP handicraft sales in the Crater Mountain WMA (June 1996)

further by having them be a bit more specific in their targets—e.g., raise income by 20% or 200 kina per household. At the time, we were unsure how to select these targets, but in retrospect, we could have considered comparing the current socioeconomic conditions of the project site with established standards at the national or international level. Without the degree of detail that we did provide, we could not have detected and compared change in our objectives to any change in the target condition in the WMA. As such, the wording of the objective (and the goal) formed the foundation for determining what kind of data we needed to collect in our monitoring program.

Step C: Developing Our Monitoring Plan

What We Did

As we held the staff retreat to define the project goal and objectives in Step B, one of the project team members was in charge of maintaining our draft monitoring plan. This draft plan listed suggestions for indicators and the methods that we might use to detect and measure relative change for each objective and the goal. In our case, we used an Excel spreadsheet to maintain the list. That way, we could add and make changes easily. For example, Figure 5 shows an excerpt of the draft plan that includes some of the indicators and

Goal: The conservation of biodiversity in the WMA					
What (indicator)	**How (method)**	**Where**	**When**	**Who**	**Materials**
Wildlife exported from WMA	Plane survey	Village airstrip	Each plane	Village airstrip agent	Clipboard, datasheet, watch
Hectares of cleared forest in WMA	Aerial photos	Around each village	1 x every 3 years	Project staff	Aerial photos, area grid
Bird sp. Richness	Point counts	Core and managed areas of the WMA	2 x per year	Staff and community member	Binoculars, datasheet, clipboard, watch, marked transect

Figure 5. Excerpt from draft monitoring plan: a running list of possible indicators and methods for measuring changes in the target condition.

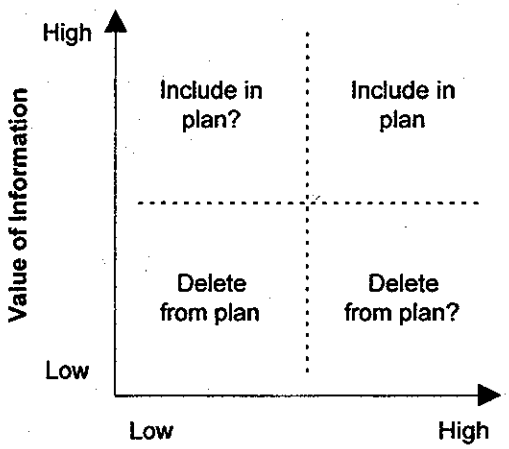


Figure 6. Exercise used to rank potential indicators for inclusion in Crater Mountain Monitoring Plan.

methods that we considered for monitoring the change in our target condition of biodiversity conservation in the WMA.

After the staff retreat, members of the project team continued to submit suggestions to the possible list of indicators and methods. Practitioners and experts working in PNG who had experience in measuring biological and socioeconomic indicators relative to our project site, were asked to comment and contribute to the draft monitoring plan. For example, in considering biological indicators to measure change in our target condition, we hosted a two-day workshop for our natural resource staff, other PNG biologists, and natural resource managers. On the first day, we asked participants to identify relevant biological indicators and methods which could be used to measure the target condition of biodiversity at our project site. On the second day, the participants were asked to further refine their list by limiting the indicators and methods to those that could be conducted with the existing expertise of, or easily taught to, the staff and community members at the project site. These recommendations were added to the draft monitoring plan.

With the assistance from BCN staff, the draft plan was then reviewed again by the project team. We ranked the possible indicators and methods by two criteria: 1) the relative importance of the information that they could provide to the management and evaluation of the project, and 2) the feasibility of successfully implementing the method in order to collect the

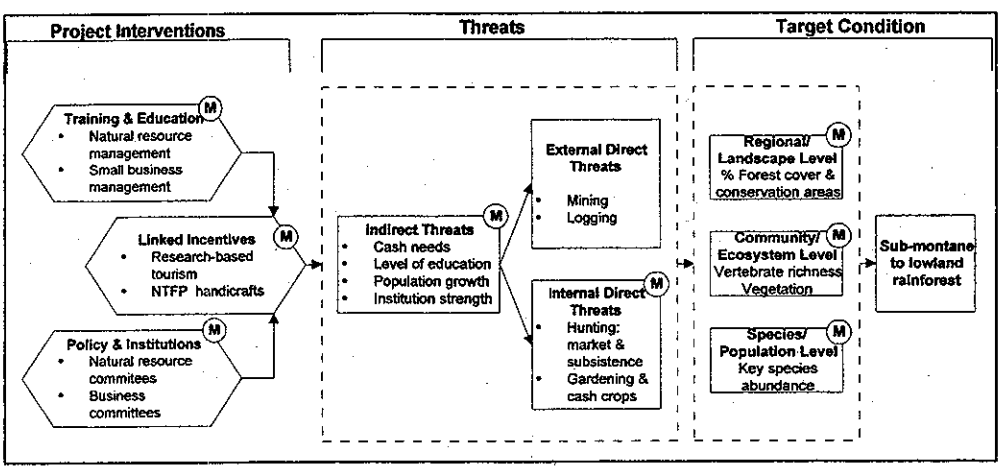


Figure 7. Simplified model of the Crater Mountain ICDP which could be used for designing the monitoring plan. "M" indicates areas of the model where monitoring is currently conducted by the Crater Mountain team. Source: Adapted from Salafsky & Margoluis 1999.

desired information. Under feasibility, we considered the financial cost, and the time and logistics required for training and implementation. We conducted this exercise by writing each indicator on a separate index card and then physically placing each in position on a graph as shown in Figure 6. Indicators which ranked high in value and feasibility were included in the monitoring plan. Those that ranked high on one scale but low on the other were considered individually. All others were deleted from the plan.

What We Learned

- **Overall Monitoring:** Our initial monitoring plan for our project goal included assessing the somewhat fuzzy concepts of "in situ" biodiversity and changes in human use of biodiversity. Over time, however, we found that it made more sense to break down the monitoring of the goal into assessing the 1) target condition, 2) threats to the target condition, and 3) interventions (see Figure 7). Unfortunately, we only discovered this after our monitoring plan had been developed.
- **Target Condition Monitoring:** We found the selection of biological indicators to monitor changes in the target condition to be a nebulous task without some further guidelines. As we have indicated in Figure 7, it would have been helpful for us to conceptualize the target condition into three distinct levels suggested by Noss (1990): regional/landscape, community/ecosystem, and species/population. We could have then selected indicators for each level.
- We also found that it took a lot of time and biological expertise to select and implement protocols for measuring changes in our target condition. We were fortunate in that we had independent scientists working in the research enterprise at our project site who could train project staff and community members in the protocols for monitoring selected flora and fauna. Even with this training, however, our project team members found it hard to collect the necessary biological data given all their other duties. We also found that it was sometimes challenging to work with the researchers to develop realistic monitoring plans that could be used for assessing project management options.

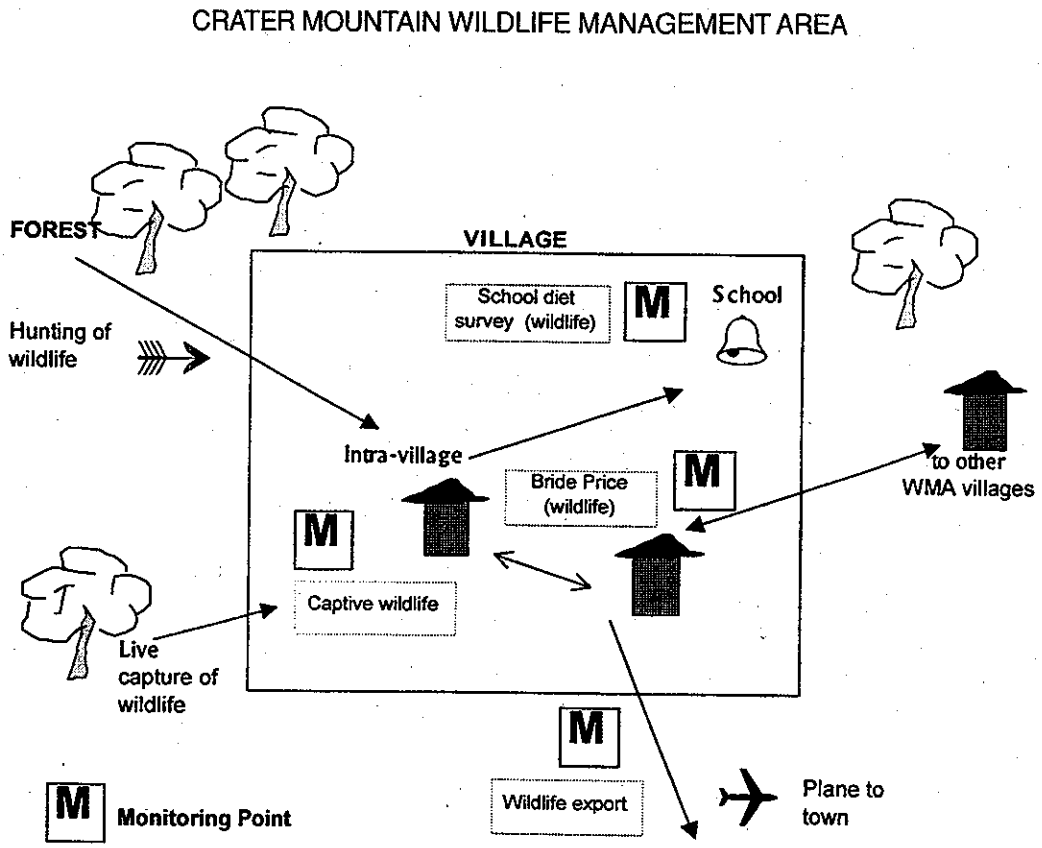


Figure 8. Local use and movement of wildlife in the Crater Mountain Wildlife Management Area.

- Finally, because of the natural fluctuations in biological systems, we found that it takes a long time to get results from target condition monitoring that would clearly indicate the potential impacts of our project interventions.
- **Threat Monitoring:** By contrast, we found the threat monitoring was much more feasible for our project team to design and implement with just a little bit of technical assistance (see Salafsky and Margolius 1999 for a discussion of how to do this). A good example of this can be seen in the monitoring of wildlife exports and cash crop sales that we discuss on the next pages (Step D). The threat monitoring also provided lots of useful information quite quickly. But we needed to be selective by monitoring only the threats which were likely to have the greatest impact on our protected area.

ARLYNE JOHNSON

Project staff and TLOs (Trained Local Observers) review monitoring data sheet (February 1997)

- **Intervention Monitoring:** This was the easiest type of monitoring for our team to design and conduct. We found that it could be built right into the day-to-day project activities. For example, if project staff were conducting a training activity, it was relatively easy to complete a training records form (SE-6) to monitor what was taught and who participated.

Crater Mountain Wildlife Management Area

WILDLIFE EXPORTED (BALUS)

Date: _____ Location: Haia / Hero / Maim Time:

Recorder: _____ Carrier: _____ Pilot: _____ Signature: _____

Clan	Species	Sex (m/f)	Age (ad/juv)	Alive	Collection			Reason			
					Gun	Other	Unknown	Bride price	Gift	Sold	Other

Crater Mountain Wildlife Management Area

CASH CROP SALES

Crop	Quantity (Kg)	Price /Kg (if known)	Clan

Figure 9. BIO-5: Wildlife Exported (front of form) and SE-4:Cash Crop Sales (back of form).

PLANE CARD

Wildlife Export (BIO-5) and and Cash Crop Sales (SE-4)

Instructions for Use

Airstrip Managers, usually village MAF agents, are asked to record details of all wildlife and cash crops that are flown out of the WMA. If possible, the Airstrip Manager, should meet all planes landing in the village. A Plane Card should be completed for each plane, *even if no animals or cash crops are sent out*. The Airstrip Manager will be paid 50 toea for every plane card which is filled out. This may mean that there is no other information on the card except for the General Information box at the top of the front page of the form. In order for the Airstrip Manager to be paid, it is essential that the pilot has put his/her name and signature on the top of the card. This is to assure verification of the data collected.

GENERAL INFORMATION

Date: Date that the plane landed in the village
Location: Name of village or airstrip where data is collected.
Time: Time of day when plane was on the airstrip
Recorder: Name of person recording the data.
Carrier: Name of airline company (MAF, SDA, Highlands, Pacific, etc)
Pilot: Written name of pilot
Signature: Signature of the pilot (IMPORTANT to get this in order to receive payment!)

WILDLIFE EXPORT

Form Bio-5 deals with the export of wildlife from CMWMA communities. In addition to the work of the recorder, it is important that the community is aware of the work so that they "declare" any animals that they are transporting. It is also important that the community be aware that this is NOT a policing activity. It does not matter how many animals they want to export. The monitoring is simply a tool to understand the quantity and type of wildlife used to assist communities in planning for sustainable resource harvest.

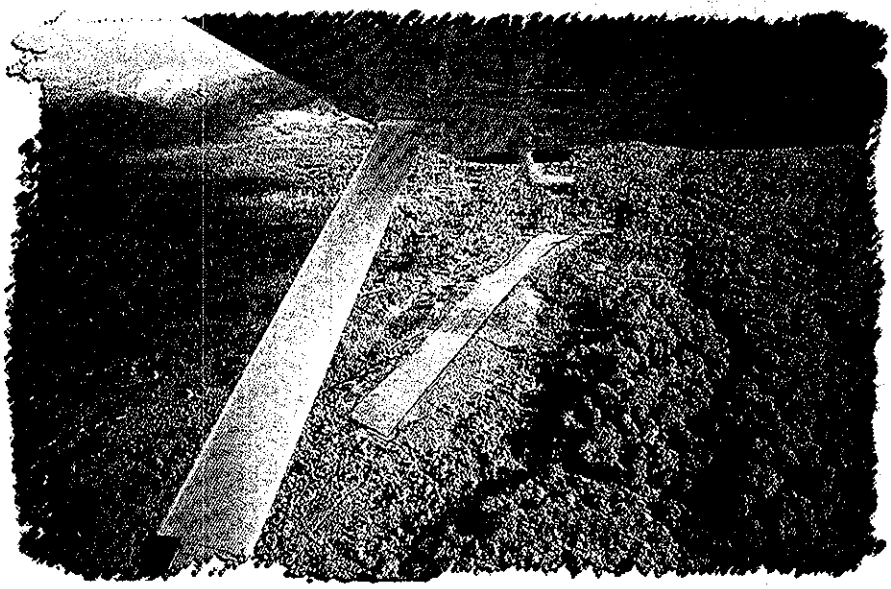
Clan: Clan of the person who is exporting the animal
Species: Write name of species here (Use the Crater Mountain field guide if necessary to get the correct name)
Sex: Male (M) or female (F).
Age: Adult (Ad) or juvenile (Juv).
Alive: Tick for Yes if animal is being exported alive. Leave blank if it is dead.
Collection: Method of capture: gun, other method or unknown
Reason: The reason the animal is being exported: bride price, gift, sold or other .

CASH CROP SALES

Form SE-4, on the back side of the Balus Card, is used to collect data on cash crop sales from CMWMA communities. This is primarily coffee but may also include peanuts, betel nut, chilies, etc. This form can also be used to record sale to coffee buyers who come to the community during coffee season. In that case, a TLO is paid 5.50 per day to complete this form with the coffee buyer as it will include a long list of sellers who work with the coffee buyer throughout the day. The purpose of this form is to understand the significance of income from eco-enterprises as compared to that of traditional cash crop sales in CMWMA communities.

Crop: Type of cash crop being sold by the person
Quantity (Kg): Number of kilos being sold
Price/Kg: The price per kilogram that the cash crop is being sold for (if known)
Clan: The clan of the person who is selling the cash crop

Figure 10. Instruction sheet for completing the plane survey card which is used to monitor wildlife export and cash crop sales in the Crater Mountain WMA.



Aerial view of Herowana village airstrip in the Crater Mountain WMA

Step D: Implementing Our Monitoring Plan

D1. Designing Data Sheets and Instructions

What We Did

To "institutionalize" our monitoring plan, we wanted to develop a monitoring program manual with data sheets and accompanying instructions that could be used by our project staff over a period of years. We thought it was necessary to set up a system that could withstand the expected transitions of project staff and partners and still serve as a consistent measure of change in project effectiveness over time. Our system included two parts: Data Sheets and Instruction Sheets.

These two tools can best be understood by considering a specific example. One management issue that we were concerned about was that wildlife in the WMA are harvested for both subsistence use and for market sale. As depicted in Figure 8, animals are either captured alive or hunted and killed. These animals are then consumed locally, traded or given as cultural gifts to other villages, or exported to Goroka. Another management issue is the clearing of forest for cash cropping. Since there are no roads in the WMA, the main conduit for sales of both wildlife and various cash is via the village airstrip where goods are sent and received on small fixed wing airplanes. The logical method for monitoring these two indicators was to work with the village airstrip agent, who coordinated freight and passengers for every plane, to collect essential information on both of them.

WMA Monitoring Guidelines

Data sheet	What	Who collects the data: HAIA supervisor	Haia TLO	MMF supervisor	MMF TLO	HERO supervisor	HERO TLO	Pay rate per site	Annual budget (K) all sites	Frequency of data collection	Location	Materials needed
BIO-5 and SE-4	Wildlife export, cash crop sales and lamb flap spending	P. Hukahu	MAF agent	R. Bino	MAF agent and TLO	L. Ikivari	MAF agent and TLO	50 / plane card or 5.50/day for TLO working with coffee buyer	400	Every plane that lands on the airstrip	Village airstrip	Watch, Clipboard, Pencil, Crater Mountain abus poster, datasheets

Figure 11 a. Sample Guidelines Sheet.

WMA Monitoring Program Deadlines

DATA SHEETS DUE	Data sheet	What	Who collects the data: HAIA supervisor	Haia TLO	MMF supervisor	MMF TLO	HERO supervisor	HERO TLO	ENTER DATA INTO
EACH MONTH									
1 for each plane landing	BIO-5 / SE-4	Wildlife export, cash crop sales and lamb flap spending	P. Hukahu	MAF agent	R. Bino	MAF agent and TLO	L. Ikivari	MAF agent and TLO	Project Database-Wildlife and Cash Crops

Figure 11b. Sample Deadlines Sheet.

ARLYNE JOHNSON

Community member monitors sale of handicrafts (1996)

The *Data Sheet* is the form that is used to record data. With the agent in mind, we drafted a data sheet that we hoped would be straightforward enough to allow the agent to quickly and systematically collect key pieces of information about wildlife export on the front of the form and about cash crop sales on the back (Figure 9). The box at the top of the front page served to collect general information that was relevant to both indicators such as the date, location, and time.

Figure 9 shows the final draft of our data sheet for this example. This final draft of the sheet was developed by pre-testing a number of earlier versions of this sheet. Examples of changes that we made based on this pre-testing include:

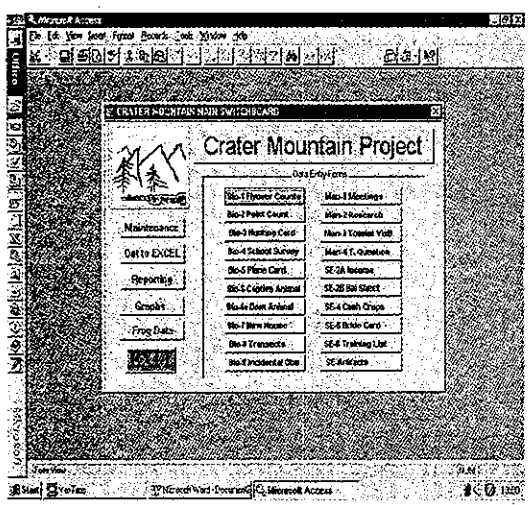


Figure 12. Entry screen for the Crater Mountain Project Database.

- **Location:** At first this was left blank, but we found that recorders were using a variety of place names to describe one geographic location, for example a village name, a district name, or even the name of clan who owned the land. So, we limited the choice to a selection of just one of three possible village names so we had consistent geographic records of where the data was collected.
- **Species:** Agents spoke different languages and used different common names to describe the same animal, or used the same common name to describe closely related species. Obviously, all recorders needed to consistently use the same name to describe a distinct species. To address this, we developed a small standardized "field guide" to accompany the data sheet. The field guide showed a picture of the animal with the recommended name, and could be used to limit the type of animals for which data were collected.
- **Other "Interesting" Information:** At first, we included blanks to indicate where the animal had been harvested in the WMA, how much it weighed, how much it was being sold for, and a number of other facts. Although all of these bits of information were "interesting," we found out that they were logistically difficult to collect, took too much extra time for the recorder to write down, or were sensitive subjects and thus usually not accurately recorded. We thus had to critically review each question on the data sheet and decide if we really could justify the effort required in order to obtain reliable data, and if the information was essential to measuring changes in our project goal or objectives.

The *Instruction Sheet* was designed to accompany the Data Sheet. It is designed to help a new staff person, who may be providing training for a new airline agent, administer the data form for the first few times. The instruction sheet for our example is shown in Figure 10. We found that although a new staff person went through an orientation when starting work, when it came time to implement the protocol on his/her own, it was hard to remember all the instructions without some written guidelines to refer to. These guidelines also helped our staff person to administer the form correctly and collect data in a manner which was consistent with that of their predecessor.

D2. Setting Guidelines and Deadlines

What We Did

The staff, and communities, who are involved in our project, as in most conservation and development projects, are very busy with implementation of the project activities. Monitoring of the project is only one of those many activities. To help the project team maintain a consistent schedule of data collection, and for each of us to remember who was supposed to do what and when, we developed a schedule of monitoring guidelines and deadlines. The schedule was maintained by one staff member who was responsible for coordinating the monitoring program for our project. We collected data at three village sites. Project field staff facilitated data collection with assistance from a community member called a TLO (trained local observer). Our system again included two parts: Guidelines and Deadlines.

The *Guidelines Sheet* is used to summarize details on who is collecting what data and where and when they are doing this collection. There is an entry for each data sheet. It also describes the materials needed and the pay rate for assistants to help us in estimating the annual budget required for the monitoring program. The guidelines sheet for our example is shown in Figure 11a.

The *Deadlines Sheet* is used to summarize what data sheets we should complete each month and where the data should be compiled for storage and analysis. There is an entry for each data sheet. The deadlines sheet for our example is shown in Figure 11b.

D3. Organizing and Storing Monitoring Data

What We Did

Once the monitoring program got under way, we started to accumulate quite a lot of data which needed to be organized and compiled, if it was to be useful. We developed a system for data transport, storage and entry to do this. Once the data sheets were completed in the field, they were stored in a special transport file at the field site. Whenever one of the project staff from the field site traveled to the project office, the original data sheets were then hand-carried to the office to assure that data sheets were not lost in transport. One copy was made and returned for filing at the field site. The original data sheet was filed for computer entry in the project office. This was to assure that we always had at least one other hard copy in case something happened to the originals. In the office, the datasheets were organized and stored by field site name. We had three field sites, so we had three separate sets of files.

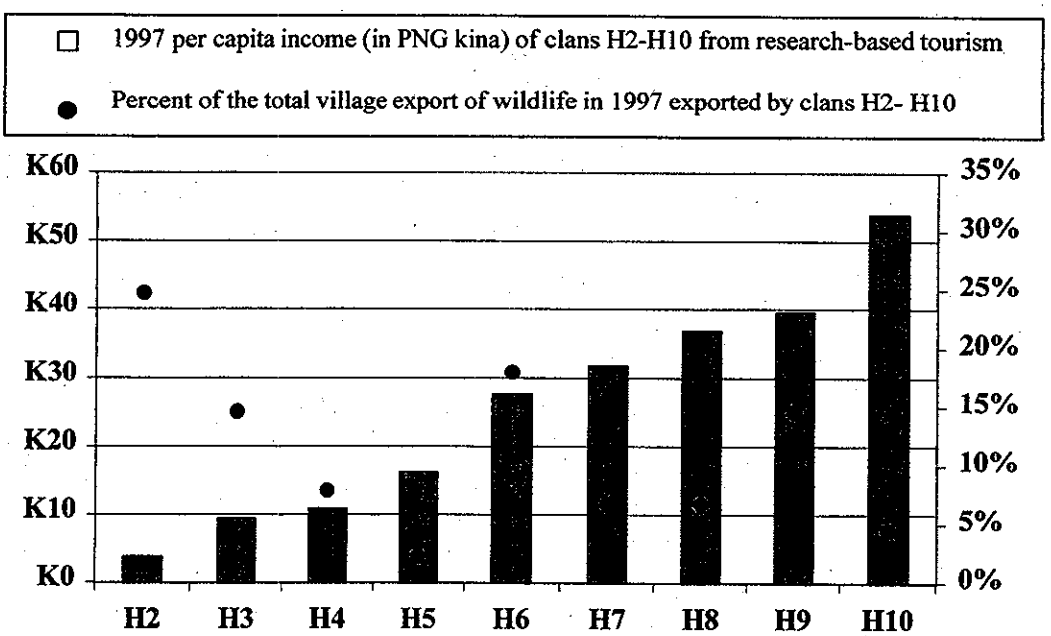
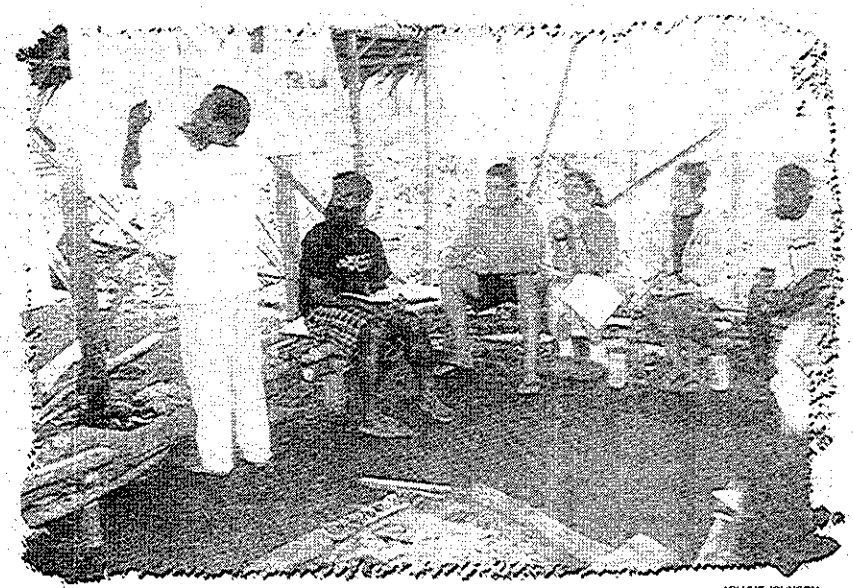


Figure 13. Comparison of 1997 per capita income (in PNG kina) of clans H2-H10 from research-based tourism to the percent of the total village export of wildlife in 1997 which was exported by clans H2-H10.

To assist us in our analysis, we chose to enter most of the information on the data sheets into a computerized database or spreadsheet. In our case, we used Access and Excel software to do this. Because we wanted to make sure that our data would be available for long-term monitoring, we secured the services of a specialist to build the database for our project monitoring program (Figure 12). Data were periodically entered into the computer storage system by the specific project field staff member who had facilitated collection of the data at the field sites.

What We Learned

- The fundamental lesson that we learned with regard to this step is that implementing a conservation and development project while also trying to monitor it requires very careful time budgeting if your team is not to become overwhelmed.
- When creating the first draft of our data sheets, we tended to ask too many questions and, by this, were making unnecessary work for ourselves in data collection and processing. We had to step back and review each question on the data sheet and ask if this particular piece of information about the indicator was really necessary in terms of improving the management of our project.
- Some of our proposed indicators made it through the priority-setting exercises of Step C, but had to be suspended during Step D because we found out that we really didn't have the time to implement the method as we had anticipated. We initially selected the indicator and method because we had the expertise on staff to do the work. But, as we came to trying to collectively set up all components of our monitoring plan, we were overwhelmed. To aid in this process, we could have ranked the indicators and methods within each segment of the monitoring program (the interventions, threats and target condition) by priority for implementation. Again, this required us asking which were the critical pieces of information we needed and what could be dropped, if time was short.
- It was very helpful to circulate iterations of our data and instruction sheets for independent review to other scientists and managers. When doing that, we needed to remind them to review the method for scientific integrity and for feasibility. The appropriate method from a scientific perspective was not helpful if implementing it required more expertise and time than we had.
- It was necessary during this step to identify one person on the project team to be responsible for coordinating the monitoring program, as the majority of project staff were busy working with communities on other project activities. Our monitoring coordinator was responsible for assisting staff with set up of monitoring protocols (materials and preparation at the site), providing on-site training for new staff to assure accuracy and consistency of data collection, maintaining guidelines and deadlines, and facilitating the process of data entry, storage and analysis.



ARLYNE JOHNSON

Staff planning meeting of the Crater Mountain project team (December 1996)

Step E: Analyzing, Communicating, and Using Results

What We Did

Because our project site is large and remote, our entire project can only get together to plan once each year. We now set aside one day at our annual meeting to review the results of the monitoring program. In order to get ready for this meeting, our monitoring coordinator works with the project staff in the months leading up to the meeting to ensure that data are analyzed and ready for the team review. In doing this analysis, we try to focus on the data that are most important to our management decisions.

For example, one of the hypotheses of our project was that by increasing cash benefits from research-based tourism, which depends on site biodiversity, that clans would have an incentive to reduce biodiversity threats such as capture of wildlife for market sale. One of our project objectives was thus to raise the cash income of family clans through research-based tourism in the WMA. So, prior to our last meeting, we summarized all of the economic data that we collected over the past year to see how income changed. We also wanted to know if some clans have benefited more than others and if so, how the amount of income compares to their respective use of natural resources.

At one of our sites, when we compared the 1997 annual per capita income for clans from research-based tourism to their capture and export of wildlife (Figure13), we found there may be some evidence which supported our hypothesis. From these results, we decided that it was worthwhile to continue to support the research-based enterprise activity (Objective 1) at this site, as it may be reducing the threat of market sales of wildlife (Project Goal). Clearly, this is only one year of data and it is important that we continue to monitor this site to see if this trend continues.

What We Learned

- It was tempting to get very busy with the implementation of project activities, and never get around to analyzing the results of the project monitoring. This temptation, however, defeats the whole purpose of the monitoring program. To avoid this pitfall, it was important to have at least one team member who was assigned this task who was free from some of the other duties of project implementation, and could work with other team members to assure that the needed analysis was conducted. In our case, staff from the Wildlife Conservation Society provided this technical assistance at the start of the project and continue to provide training for RCF staff as the project matures.
- It is essential to make time for all of the project team to review and discuss the monitoring results, and to consider the implications for future project planning and implementation. Although that sounds obvious, projects seem to gain a habitual momentum of implementation. Perhaps an activity was in the work plan of the original project proposal when it was written three years ago but monitoring results now indicate that that activity may no longer be advisable. It can be hard for team members to adjust and change direction. Or the staff meetings at which monitoring results are discussed may be busy with a full agenda of items to cover. It takes some practice to get used to utilizing monitoring results as a project planning tool.
- Once we had analyzed our monitoring results, we had many more audiences for the results than we originally anticipated. For example, our donors, project partners, and board of directors were interested because they could now better understand the rationale behind our funding requests for selected project activities. The government and other conservation practitioners wanted to find out what had worked and what hadn't because they were testing similar interventions at other protected areas in the country. The economic data from businesses was posted each month by the community business committees because community members wanted see how their earnings were distributed.
- This final step was exciting! After all the planning and implementing in Steps A-D, we finally had some results to review and consider. It was extremely rewarding for the entire project team to view what we had collectively worked to achieve. We began to glimpse the areas in the project where our activities had potentially been effective in achieving some degree of biodiversity conservation, and other areas where they had not. Most importantly, this step provided us with an objective systematic mechanism to use to review our progress and to chart our path for the next year. Yes, it took some time and hard work to get to this point, but it was worth it when we could finally see and apply the results.

ARLYNE JOHNSON

Project staff and WMA Management Committee members at annual meeting of Crater Mountain WMA (July 1997)

The Crater Mountain Monitoring Program Manual

In the process of implementing the steps described in this publication, we generated a number of products that helped us to guide and implement the monitoring program for the Crater Mountain WMA. We knew from the outset that we wanted to institutionalize the monitoring program so that it would consistently function at our three field sites for many years even though the project staff and independent researchers affiliated with the project would change over time. To this end, we compiled all of our products into a binder that serves as a reference manual to all project collaborators, called the *Crater Mountain Monitoring Program Manual.* The manual includes:

- Conceptual model of the project site (Figure 3)
- Project goal and objectives (Figure 4)
- Monitoring program guidelines (Figure 11a)
- Monitoring program deadlines (Figure 11b)
- Instructions for how to enter data into the project database (partial example in Figure 12)
- TLO (trained local observer) work record and payment request
- Lists of standardized names which are used for recording and entry of monitoring data (such as clan and place names and indicator species)
- Instruction sheets for completing data sheets (example in Figure 10)
- Data sheets (like Figure 9)
- Documents which we have produced which summarize results from analysis of our monitoring data (like Figure 13)

We hope that these tools that we have developed may be useful to other conservation projects. We have thus placed copies of some of these tools on the BCN Web site at www.BCNet.org. The specific tools that we have included are outlined in the table on page 19. While these data and instruction sheets may not be directly useable by your project, we hope they may serve as a source of ideas for consideration when designing your own monitoring program.

We wish you luck in your work and hope that you will let us know how your work goes. We can be reached via e-mail at RCF@dg.com.pg or via regular mail at The Research and Conservation Foundation, Box 1261, Goroka, EHP, Papua New Guinea.

List of Tools Available on the Web at www.BCNet.org

Data Sheet Title	Instruction Sheet	Indicator	Data Collection Protocol	Indicator of... (based on Fig. 2)	Indicator of... (based on Fig. 7)
BIO-1	yes	Relative abundance and direction of regional movements of avian frugivores and nectivores	Flyover counts	Goal	Target condition
BIO-2	no	Species richness of understory birds in core and managed areas	Point counts	Goal	Target condition
BIO-4	yes	Local consumption of wildlife	Village school survey	Goal	Threats
BIO-5	yes	Wildlife exported from WMA on planes	Plane survey	Goal	Threats
BIO-6	yes	Captive wildlife in WMA villages	Household survey	Goal	Threats
BIO-8	no	Wildlife signs in core and managed areas	Line transects	Goal	Target condition
BIO-9	no	Occurrences of wildlife	Incidental observation	Goal	Target condition
SE-1	yes	# of businesses in WMA	Business register	Objective 1	Interventions
SE-2A	yes	Income of WMA businesses	Income statement	Objective 1	Interventions & Threats
SE-2B	yes	Liabilities & assets of WMA businesses	Balance sheet	Objective 1	Interventions
SE-3	yes	Standard of WMA business practices	Performance checklist	Objective 1	Interventions
SE-4	yes	Amount of cash crop sales	Freight records	Objective 1	Threats
SE-5	yes	Diversity and abundance of wildlife in bride price	Wedding checklist	Objective 1	Threats
SE-6	yes	Skills, education & training of WMA participants in eco-enterprises	Event and worker records	Objectives 2 & 4	Interventions & Threats
SE-ART	yes	Clan income from handicraft sales	Sales records	Objective1 and Goal	Interventions & Threats
MAN-1	yes	Creation and enforcement of natural resource policy by WMA management committees	Minute keeping	Objective 3	Interventions & Threats
MAN-2A	yes	Clan income as research assistants in the research enterprise	Event and worker records	Objectives 1 & 4	Interventions & Threats
MAN-2B	yes	Clan income as laborers in the research enterprise	Event and worker records	Objectives 1 & 4	Interventions & Threats
MAN-2C	yes	Clan income from research station fees	Payment records	Objective 1	Interventions & Threats
MAN-3	yes	Clan income from tourists	Event and worker records	Objectives 1 & 4	Interventions & Threats
MAN-4	no	Feedback from research and tourism clients	Questionnaire	Objective 2	Interventions & Threats
MAN-5	yes	Location, size and characteristics of WMA conservation areas	GPS and site checklist	Goal	Target condition

About This Issue

This issue was written by Arlyne Johnson of the Wildlife Conservation Society with input from John Ericho, Robert Bino, Paul Hukahu, Paul Igag, and other staff of the Research and Conservation Foundation of PNG. Arlyne worked for four years as the technical advisor to the Crater Mountain Project in Goroka. John is the general manager of RCF. Robert, Paul, and Paul work as field coordinators for the Crater Mountain Project.

About This Series

This article is part of the Biodiversity Support Program's *Lessons from the Field* series. This series features topics that shed light on the conditions for conservation success, based on what we are learning from our partners in the field. The BCN Issues in this series focus on results from the Biodiversity Conservation Network.

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About BCN and BSP

The Biodiversity Conservation Network (BCN) seeks to 1) support site-specific efforts to conserve biodiversity at sites across the Asia and Pacific, and 2) evaluate the effectiveness of enterprise-based approaches to conservation.

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BSP's mission is to promote conservation of the world's biological diversity and to maximize the impact of U.S. government resources directed toward international biodiversity conservation. We believe that a healthy and secure living resource base is essential to the needs and aspirations of present and future generations.

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