Monitoring the Impact of Environmental Fund Projects on Biodiversity Conservation in Protected Areas

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RedLAC Capacity Building Project for Environmental Funds

Latin American and Caribbean
Network of Environmental Funds

Scaling up Conservation Finance

The Latin America and Caribbean Network of Environmental Funds – RedLAC – was created in 1999 and currently includes 25 funds from 15 countries. Its mission is to set up an effective system of learning, capacity building and cooperation through a Network of Environmental Funds (EFs) aimed at contributing to the conservation and sustainable use of natural resources in the region.

RedLAC, with the support of the Gordon & Betty Moore Foundation and the French Fund for the Global Environment (FFEM, for its name in French), implements a capacity building project with the objective of strengthening the capacity of EFs to develop innovative financial mechanisms for biodiversity conservation, reducing their dependence on donations, and supporting the establishment of new EFs, by systematizing and sharing proven best practices in funds day-to-day operations.

This project, coordinated by the Brazilian Biodiversity Fund – Funbio - on behalf of the RedLAC membership, has the goal of promoting the implementation of new revenue streams for the Funds' portfolios, creating financially sustainable sources of funding for these institutions to invest in conservation. Having knowledge management as its core, the project will systematize the existing information on different topics of interest for EFs and build new content based on the collective experience of the Funds' community.

This manual was prepared to support the seventh workshop of the capacity building initiative, focusing on impact monitoring of biodiversity conservation by Environmental Funds in Protected Areas. This manual emerges from the work developed by the RedLAC Impact Monitoring Working Group, which debated the theme in 2012 with the support of experts and case study analysis. Funbio organized this workshop in collaboration the Profonanpe, in the city of Lima, Peru on November 09 to 11, 2012.

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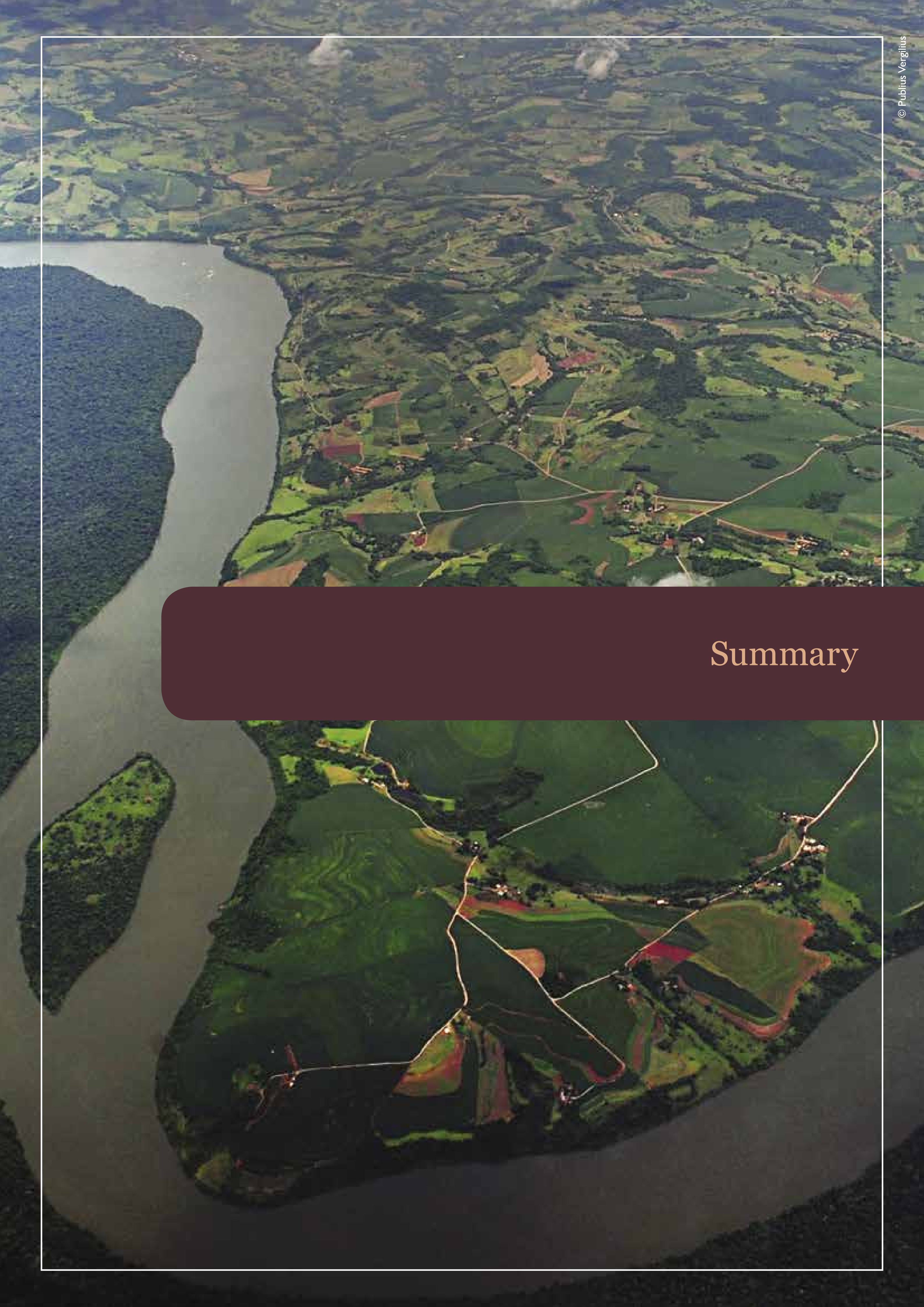


Summary

Monitoring the Impact of Environmental Fund Projects on Biodiversity Conservation in Protected Areas

Over the years, the Environmental Funds (EFs) of the Latin American and Caribbean Network of Environmental Funds (*Red de Fondos Ambientales de Latinoamérica y el Caribe* – RedLAC) have demonstrated the ability to raise and manage funds under criteria related to performance and capital security . However, the impacts of EF funding for biodiversity conservation activities in Protected Areas (PAs) implemented by other organizations remain to be tested and measured. Therefore, the training sub-project "Developing and Validating a System of Impact Indicators for Environmental Fund projects related to Biodiversity Conservation in Terrestrial and Marine Protected Areas" seeks to align impact measurement systems of projects for biodiversity conservation financed by the RedLAC EFs. This would make it easier to integrate and compare data, improve communication among EFs, donors and other stakeholders, and measure the impact of the RedLAC EFs as a whole. In addition, at the project level, monitoring is key to decision-making for the adaptive management of protected areas. This impact indicator system for EFs, developed by RedLAC, will also serve as a reference point, both for EFs from other regions and for new EFs as they are created.

Biodiversity conservation interventions are primarily formulated as 'projects', which are managed through an ongoing process called the 'project cycle'. While the purpose for this RedLAC project is "to develop and validate an impact indicator system for environmental fund projects related to biodiversity conservation in terrestrial and marine protected areas," it is worthwhile to highlight that the basic measurement units are conservation projects in protected areas financed by environmental funds.

Within the project cycle, monitoring and evaluation (M&E) systems for biodiversity conservation projects have similar components. The primary components are performance assessments and impact assessments. Performance assessments measure inputs, activity implementation and outcomes, while impact assessments measure effects and impacts.

In general, the most common approach for measuring impacts on biodiversity has been to identify biological indicators that directly measure the status of conservation targets such as ecosystem integrity, habitat quality, or environmental service preservation. However, there are other alternatives to assess a project's impact by measuring its effect on threat reduction.

RedLAC has adopted a multi-dimensional system to assess the impact of EFs on biodiversity conservation in Protected Areas supported with financing from those Funds. The system is based on measuring effect indicators (threat reduction) and impact indicators (status of conservation targets) for each PA that is funded by a RedLAC Environmental Fund. Raw data is converted into indices that can be averaged to obtain an impact measurement at the PA, EF and RedLAC levels.

It is proposed to implement participatory field measurements through PA staff, each PA's Management Committee, and local communities. Considering that EFs finance projects executed by other institutions, measurements can also be made by these entities. It is recommended that these entities be trained for the task and that their work be supervised regularly. Furthermore, it is proposed to establish a trust fund to provide long-term financing for periodic measurement of changes in PA habitat coverage and fragmentation using satellite imagery.

The process of technological change is ongoing, and there are new technologies that can contribute to monitoring and evaluating biodiversity projects. A few examples include drones – miniature remote controlled aircraft that can be operated from the ground to take photos or transmit live images; and recording and analyzing the sounds of nature that indicate the presence and abundance of specific species. EFs should be at the vanguard of studying and using new monitoring technologies.

1. Introduction

The goals of the Latin American and Caribbean Network of Environmental Funds (*Red de Fondos Ambientales de Latinoamérica y el Caribe* – RedLAC) are: (a) to help boost the effectiveness and efficiency of financial resources; and (b) to increase the impact on biodiversity conservation and environmental services in the region. To this end, RedLAC promotes learning, capacity building, and cooperation among its members.

Over the years, the RedLAC Environmental Funds (EFs) have shown their ability to raise funds and manage them under criteria regarding performance and capital security. However, the impacts of EF funding for biodiversity conservation activities in Protected Areas (PAs) that are implemented by other organizations remain to be tested and measured. Therefore, this sub-project seeks to align impact measurement systems for biodiversity conservation projects in protected areas that are financed by RedLAC EFs. This will make it easier to integrate and compare data; enhance communication among funds, with donors and other stakeholders; and measure the impact of RedLAC as a whole. Furthermore, monitoring serves to inform managerial decisions. For example, it can be used to compare the efficacy of different interventions for conservation, and to provide critical information for adapting projects to take advantage of lessons learned and improve management.

One of RedLAC's members, Funbio – the Brazilian Biodiversity Fund, coordinates the RedLAC Capacity Building Project for Environmental Funds. The present initiative, called "Developing and Validating a System of Impact Indicators for Environmental Fund Projects related to Biodiversity Conservation in Terrestrial and Aquatic Protected Areas", is a sub-project of the larger Capacity Building Project. The sub-project is directed by a task force made up of representatives from selected RedLAC members, and is supported by an international

consultants, Allen Putney and Paquita Bath. This document is the fruit of their labors, which includes the development of preliminary discussion papers and workshops.

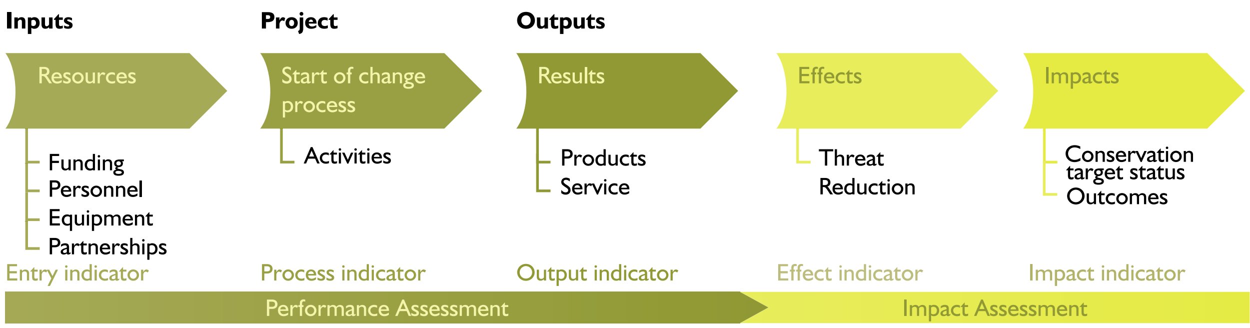
1.1 General Framework

Biodiversity conservation interventions are formulated primarily as 'projects' – a set of activities implemented by a defined group of implementers, including managers, researchers, community members, or other stakeholders – to meet certain goals and objectives. They are managed through an iterative process called the project cycle. While the purpose for this RedLAC project is "to develop and validate an impact indicator system for environmental fund projects related to biodiversity conservation in terrestrial and marine protected areas," it is worthwhile to highlight that basic measurement units are conservation projects in protected areas financed by EFs.

Within the project cycle, most monitoring and evaluation (M&E) systems for biodiversity conservation projects have similar components. Figure 1 helps to visualize the hierarchy and relations of the M&E system and its indicators. The primary components are performance assessments and impact assessments. Performance assessments measure inputs, activity implementation and outcomes. Impact assessments measure effects and impacts.

The overall model presented in Figure 1 is for a given project, and is especially important for project designers.

Figure 1 – Hierarchy of Indicators



Adapted from RedLAC, 2008

The role of the EFs is to finance conservation projects that are implemented by other organizations. In this regard, they have a role as intermediaries between donors and conservation organizations implementing projects in the field. Therefore, RedLAC and its member EFs have regularly been asked to measure the impacts of their biodiversity conservation activities as individual funds, and as a group, in this case specifically in protected areas (PAs). For this purpose, all impact indicators used must allow for aggregation to give an indication of the impact of each EF's project portfolio and for the projects of all RedLAC EFs.

1.2 Definitions and Types of Monitoring

The terms that different conservation organizations use vary considerably. Therefore, for clarity's sake, Annex A defines the key technical terms used in this manual.

As indicated in Figure 1, a complete M&E system for an EF should include both performance assessments (with input, process and output indicators) and impact evaluations (with effect and impact indicators). However, it is important to emphasize that this document is limited specifically to:

- Impact assessment with effect and impact indicators (the last two columns in Figure 1);
- The Protected Area (AP) focus; and,
- Using indicators that can be added together.

1.3 Incentives

While there are several incentives for an EF to adopt a biodiversity impact assessment system, the primary one is to communicate effectively with key stakeholders regarding the level of success of a given project.

This information is also very important for an adaptive management process, because it makes it possible to assess project activities and identify any necessary adjustments needed as a regular part of the project cycle. Furthermore, a good monitoring system makes it possible to compare the success of different types of interventions, those of different PAs, and each EF's project portfolio. This is the basis for all adaptive management systems. It also helps report outcomes based on reliable figures for donors, the general public, and internationally to organizations such as RedLAC, and conventions such as the Convention on Biological Diversity and the World Heritage Convention.

> **"The role of the Environmental Funds is to finance conservation projects that are implemented by other organizations. In this regard, they have a role as intermediaries between donors and conservation organizations implementing projects in the field."**

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2. Overview of Impact Assessment Approaches

There have been many efforts to develop methods to measure the impact of conservation projects, but few have turned out to be practical, useful, and inexpensive. Historically, each institution designed its own monitoring and evaluation system without much reference to existing systems. These systems have various often overlapping purposes such as knowledge generation, program enhancement, accountability, transparency, resource distribution, promotion, and impact assessment. The outcome has been that, although the systems were conceptually similar, their terminology and methodologies varied, making it hard to compare systems and communicate among institutions.

In order to face these issues, conservationist organizations collaborated in a joint effort, the Conservation Measures Partnership (CMP), to unify criteria and terminology. This is very important work for organizations such as RedLAC, which want to build conceptual bridges among their members, improve methodologies, and facilitate communications. The CMP efforts have also clarified the evolution of concepts and common denominators, so it is now easy to identify the most significant and potentially usable elements for RedLAC and its member EFs. In fact, the RedLAC initiative to measure the impacts of EFs on biodiversity could play a major role in promoting CMP's unified criteria and terminology among its members, in addition to the EFs promoting the same among their clients within their respective countries.

2.1 Most Common Methods

In general, the most common approach for measuring impacts on biodiversity has been to identify biological indicators that directly measure the status of conservation targets such as ecosystem integrity, habitat quality, or environmental service preservation. However, there are other alternatives to asses a project's impact by measuring its effect on threat reduction. For example, Margoluis and Salafsky (2001) have developed a method that they call the Threat Reduction Assessment (TRA). It was designed to be practical, low-cost, directly related to a given project's activities, change-sensitive over short periods, applicable over large extensions, and comparable among sites.

2.1.1 Biodiversity Status

In general, the most common methods for measuring biodiversity status are local ecological knowledge, sampling of transects or points, and/or satellite imagery analysis, combined with field reconnaissance (World Bank, 1998). Common biological indicators for Protected Area monitoring include:

- The area of specific habitat types (change over total area, in larger blocks, or in average sizes)
- Habitat fragmentation analysis (changes in distances between blocks or in average habitat block sizes)
- Land uses (changes in the area of uses that are incompatible with conservation; number, area, and location of land invasions)
- Vegetation structure (changes in canopy coverage)
- Habitat distribution (changes in the boundaries of specific habitats, changes in river-bank vegetation)
- Indicator or target species (changes in abundance or distribution, changes in limiting factors for key species, and changes in biomass)
- Invasive species (changes in presence, location, area, or population)
- Indicator events (changes in frequency or distribution)
- Biodiversity use (changes in different user group rates; changes in the number or percentage of individuals harvesting resources; changes in the percentage of sustainable uses)

Each method varies in terms of accuracy, cost, feasibility, and simplicity. The best indicators are easily measured, accurate, consistent, and sensitive. However, there is always a natural tension between what is scientifically ideal and practical realities. Data gathering protocols should take into account the probability of sampling bias, detection errors in sample design, minimal sample size and effort, and capacity of indicators to detect early warning signs. (Rao et. al, undated).

The specific indicators chosen for a given project will depend on its goals and objectives, and the activities proposed to reach them. For any project, it is important to select a minimum set, with a few indicators that are easy to measure, useful and pertinent to the project, and sustainable over time. For biological indicators, there needs to be a reliable baseline to which subsequent measurements can be compared (World Bank, 1998).

The beginning of a biodiversity conservation project frequently requires a comprehensive study to determine factors such as areas with high biodiversity value, threats and their locations, types and degrees of ecosystem degradation, ecological history of the area, etc. However, monitoring does not necessarily have to update all of this data, because in most cases trends are more important than absolute values, such as total number of species, exact densities, etc. (World Bank, 1998).

2.1.2 Threat Management

Using biological indicators is not the only way to assess the impacts of a project on biodiversity conservation. One alternative is to measure a project's threat-management effects. The Threat Management Index (Annex E) attempts to measure the change over time in threat status. It is adapted from work done by Margoluis and Salafsky (2001) called the Threat Reduction Assessment (TRA). These approaches are designed to be practical, low-cost, directly related to reviewing the change in threats in protected areas. This index is of special value to the EFs and RedLAC, since indicators from different sources can be added together and compared, whether for an EF's Protected Area project portfolio, or for RedLAC as a group of EFs. The adaptation was made given the need to acknowledge that threats can suddenly balloon or change for the better or worse in protected areas and that the index needed to be on a 100% improvement to a 100% deterioration scale to be comparable with the other indices.

In operational terms, biodiversity can be seen from the standpoint of a species, a habitat (area and status), or the functioning of an ecosystem (maintenance of focal systems and processes). Threats are current anthropogenic influences that negatively affect biodiversity and include direct threats from within PAs, direct threats from outside of PAs, and indirect threats (social, political and economic factors). There are also opportunities, which have a positive effect on biodiversity.

In general terms, the tools available to reduce or eliminate threats include direct protection, policy making and/or advocacy, education and awareness building, and changing incentives. The *Conservation Measures Partnership* (www.conservationmeasures.org) has developed a standardized Project Cycle model (Annex B), standardized threat lists (Annex C) and intervention tools (Annex D). By using these standardized elements, RedLAC members will promote a common language regarding M&E systems.

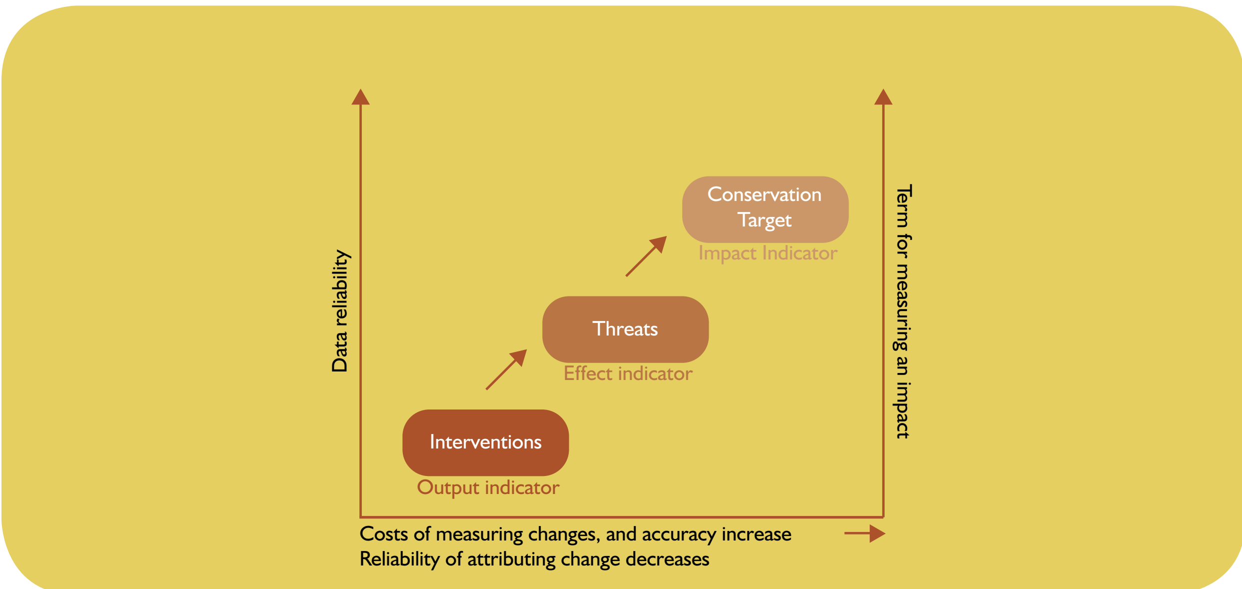
2.2 Comparisons

When an EF contemplates designing an M&E system, there are many factors to consider, such as the tradeoffs among costs, deadlines, accuracy, reliability, and attribution. Furthermore, each method responds differently to theoretical and practical considerations, and each is applied differently to marine or terrestrial protected areas.

2.2.1 Costs, Deadlines, Accuracy, Reliability, and Attribution

In order to know the level of biodiversity conservation in a PA with any degree of certainty, it is necessary to monitor changes in target status over time. Even without human pressures, there are natural variations in species populations and ecosystem integrity, and this makes it hard to detect changes that might be attributed to program or project interventions. Consequently, the way conservation targets change over time will determine the monitoring effort required to detect changes that are attributable to human threats. In many cases, measuring changes in a conservation object is a **long-term** effort.

Figure 2: Costs, Deadlines, Accuracy, Reliability, and Attribution



Given the supposed causal relation among conservation targets, specific threats, and actions designed to reduce threats, monitoring output indicators (third column of Figure 1) and effect indicators (fourth column of Figure 1) makes it possible to measure progress towards conservation in the **short and medium term**. There are pros and cons, however, and one should recognize when output and effect indicators are best used as evidence of progress towards conservation targets. The time needed to detect outcomes and the monitoring costs increase, and the reliability of attribution decreases, as one moves from monitoring intervention implementation (output indicator) to monitoring threat reduction (effect indicator) and target status (impact indicator). (See Figure 2.) Short and medium term assessments are less reliable in their ability to report on the true status of conservation targets.

A decisive factor in designing the whole M&E system is its cost. In general, obtaining accurate, reliable conclusions requires more data from more measuring points, which increases costs. The challenge, then, is to identify systems that provide the greatest accuracy at the least cost. For this purpose, these systems should involve key stakeholders in data collection, such as Park Rangers as they make their rounds, sports divers in marine PAs, hikers along official trails, organized bird watchers, PA administrative boards (such as in Costa Rica and Panama), and communities through participatory monitoring programs.

A good example of participatory monitoring is the system of Brazil's *Instituto Socioambiental* (ISA) (see Marinelli, 2011, for instance). Another advantage of using key stakeholders for data collection is that their involvement tends to raise their confidence in the legitimacy of the data collected and their interest in the findings. However, in many cases a good program is needed to train key stakeholders to carry out monitoring programs correctly.

2.2.2 Theoretical and Practical Aspects

Each system has its pros and cons. For example, Figure 3 compares threat reduction assessments and status of conservation targets. What this table shows is not only that these methods have different pros and cons, but that they also complement each other perfectly. Therefore, measuring effects and impacts together produces a fairly complete, and robust system.

Figure 3 – Comparing Effect and Impact Indicators

Criteria	Effect indicator (Threat Reduction)	Impact indicator (Status of Conservation Target)
Theoretical Aspects		
Directness of Measurement	− Indirect biodiversity indicator	+ Direct biodiversity indicator
Consistency and unambiguity	− uses qualitative indicators, which are more subjective	+ less subjective and thus less likely to be biased
Sensitivity to temporal changes	+ detects changes over relatively short periods (1-5 years)	− difficult to measure changes over short periods, especially considering natural variation
Sensitivity to spatial changes	+ sensitive to changes throughout the project area	− vulnerable to bias based on choice of sampling sites
Analytical uses	+ facilitates comparisons among different types of projects + can be added together to assess a project portfolio	− difficult to create standardized indices acrosss different project types − can only be added together to show trends
Practical Aspects		
Ease and cost of data collection	+ based on data obtained using simple techniques + data can be collected as part of routine project activities	− based on data collected using complex biological techniques − data usually gathered separately from normal project activities
Ease of data interpretation	+ readily interpreted by project staff − results not directly related to biodiversity	− can be difficult to interpret + results related directly to biodiversity
Applicable retroactively	+ can be applied retroactively	− requires a prior baseline

Adapted from Margoluis and Salafsky, 2001.

> **“Each method varies in terms of accuracy, cost, feasibility, and simplicity. The best indicators are easily measured, accurate, consistent, and sensitive.”**

2.2.3 Terrestrial and Marine Protected Areas

In general, the methodologies used to monitor terrestrial and marine PAs are similar. However, there are exceptions, such as when using satellite imagery for monitoring.

Although satellite images may be useful for detecting changes in certain tropical marine ecosystems such as coral reefs, seagrass beds and mangroves, they are less useful for detecting changes in other ecosystems, such as in deeper waters or temperate zones.

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3. EF Experiences

Technical workshops of the RedLAC Working Group on impact indicators, held in San Jose, Costa Rica (May 10, 2012), Lima, Peru (May 28, 2012) and Panama City, Panama (August 9-11, 2012) provided opportunities to share EF experiences using impact indicators. The information collected is summarized in Figure 4. The table includes a list of RedLAC EFs participating in the workshops, indicates that they all finance projects in protected areas and/or their buffer zones, and shows whether the monitoring system belongs to the EF and/or to the project implementors. The table also indicates whether the EF uses threat reduction indicators and/or indicators on the status of conservation targets.

3.1 Biodiversity Indicators often used for PAs

It is interesting to note in Figure 4 that all of these funds finance projects in Protected Areas and/or buffer zones, and that the indicators are measured by their clients, not by them directly. It is also noteworthy that only one fund uses indicators on the impact of its investments on threat reduction. Two of the bio-indicators are utilized the most: abundance of target species and changes in natural cover.

Figure 4: Biodiversity Impact Indicators used by Selected RedLAC EFs for Marine and Terrestrial Protected Areas

Fund	Fund Supports PAs	Monitoring System	Threat Reduction			Status of Conservation Targets				
	Projects in PAs and/or Buffer Zones	Carried out by the Fund or the Project implementor	Threat Reduction Index	GRILLA Method[1]	Incidence of Fires	Biodiversity Index	Changes in Natural Cover	Ecological Integrity	Abundance of Target Species[2]	Recovery of Natural systems
PACT, Belize	x	I[3]								
FUNBIO, Brazil	x	I					x		x	
FAAyN, Colombia	x	I					x		x	x
FPN, Colombia[4]	x	I					x	x	x	x
ACRxS, Costa Rica	x	F, I						x	x	
Natura, Panama[5]	x	I			x	x	x	x	x	
FCBTP, Paraguay	x						x		x	
Profonanpe, Perú[6]	x	I		x			x		x	

F – The Fund's own system;

I – The project implementor's system

[1] The GRILLA Method measures the presence of threats (loss of habitat, resources overuse, pollution, introduced species) within a grid established for each AP.
[2] Target species are indicator species, cynegetic species, or those of special importance to conservation.
[3] PACT, only assesses performance, not impact.
[4] Only for the Mosaicos Project
[5] Only for Chagres and Darién
[6] GRILLA is for all PAs of the national system; the other indicators are for administration contracts

3.2 Feasibility and Cost-Effectiveness of using Satellite Images

Satellite images are useful for monitoring the status of certain conservation targets in PAs. They provide a set of standardized, reliable indicators to measure changes in habitat coverage that are visible in satellite images, and their fragmentation. The downside is that they do not work in areas with almost permanent cloud cover or in the marine habitats of temperate zones, deep waters, or with rocky or sandy bottoms.

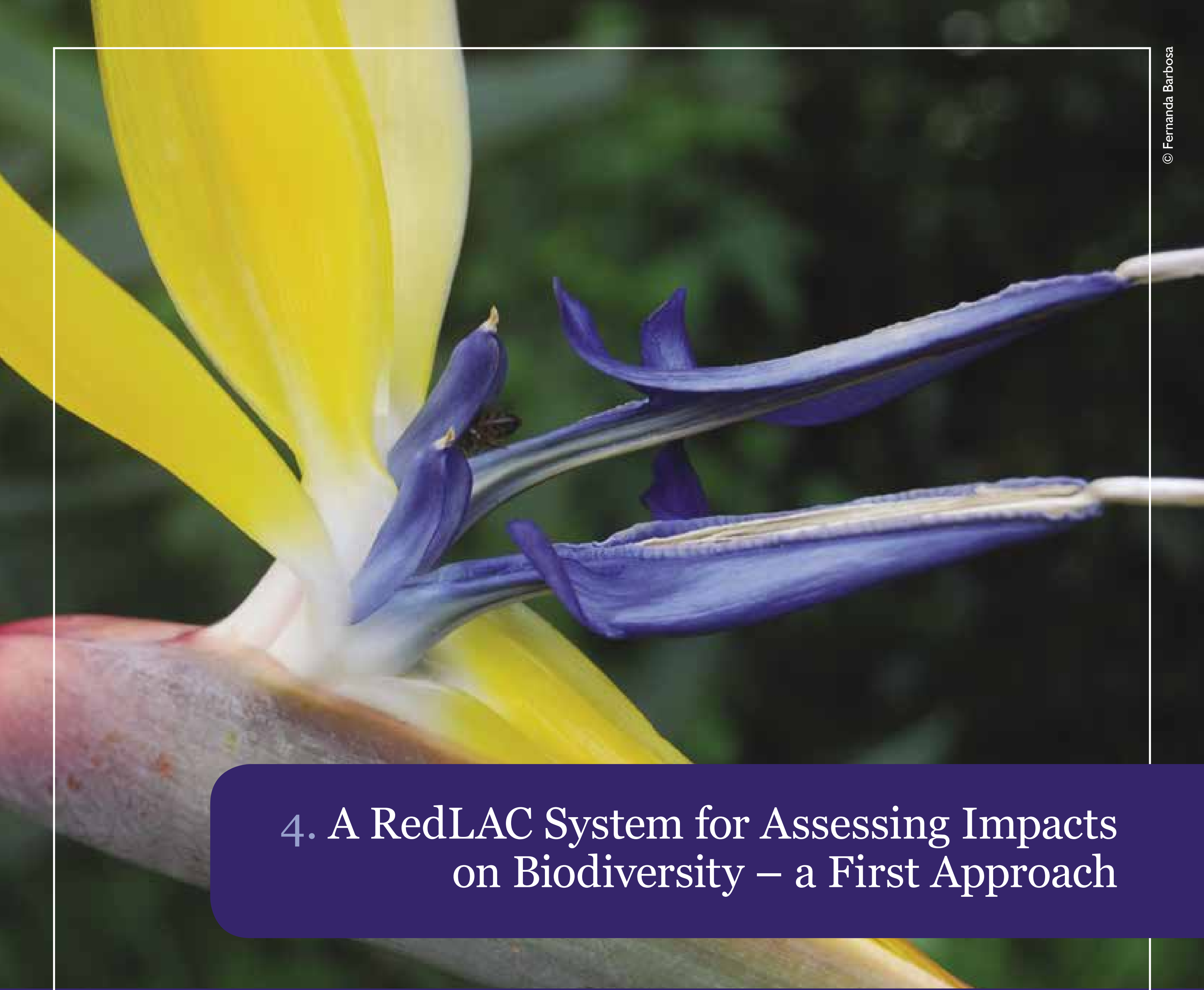
Indicators derived from satellite images can serve to supplement and cross-check other indicators, such as:

- Conservation targets derived from field measurements;
- Threat reduction assessments;
- Evaluations of management effectiveness; and/or,
- National systems of environmental indicators.

"Satellite images are useful for monitoring the status of certain conservation targets in PAs. They provide a set of standardized, reliable indicators to measure changes in habitat coverage that are visible in satellite images, and their fragmentation."

The *Global Conservation Fund* (GCF) of *Conservation International* (CI) uses satellite images as part of its monitoring system. However, it is only one component of the system, which also uses evaluations of management effectiveness systematically for the PAs that they finance. For the GCF, the value of the satellite imagery monitoring component is to have a methodology that uses common indicators interpreted by the same analysts for all of the PAs they finance in the world. The outcomes are quantifiable, comparable and can be added together or averaged, which is a plus when reporting on their investments. However, they need to present the information very carefully to avoid giving the impression that the outcomes are impacts that are produced by their investments alone.

In the experience of CI, the cost of acquiring, pre-processing, collecting field data, classifying, and validating each LandSat satellite image is approximately US$ 2,000. Each image covers 140 Km^2, so with an average of 2 images per PA, considering that they review each PA every 5 years, the **yearly cost** would therefore be about US$ 800 per PA per year. Note that the first year of work will be used to establish the baseline, and that only after 5 years can changes in habitat coverage and fragmentation be determined. Another factor to take into account is whether there is an interest in comparing the rate of vegetative cover change both within protected area and the area of influence. In this case, the cost rises significantly.



4. A RedLAC System for Assessing Impacts on Biodiversity – a First Approach

Given the complementarity of indicators for threat assessment and for the status of conservation targets, RedLAC has chosen to use these two types of indicators together in a multi-dimensional impact monitoring system. The proposed impact assessment system is for protected areas that receive funding from RedLAC members. Processing of raw data makes it possible to develop indices for integrating data from different sources into general indicators for a Protected Area. Then, by averaging indicators from different protected areas, general impact indicators are developed for individual EFs and for RedLAC, as shown graphically in Figure 5.

4.1 Overview

Figure 6 shows an overview of the overall RedLAC system. This system works for both terrestrial and marine protected areas, except for satellite imagery measurements of changes in the coverage and fragmentation of marine habitats in temperate zones, in deep waters, or even in cloud forests, where it is difficult to obtain cloud-free satellite images.

Figure 5: Relation of Indicators at the Project-Level, EF-level, and RedLAC-level

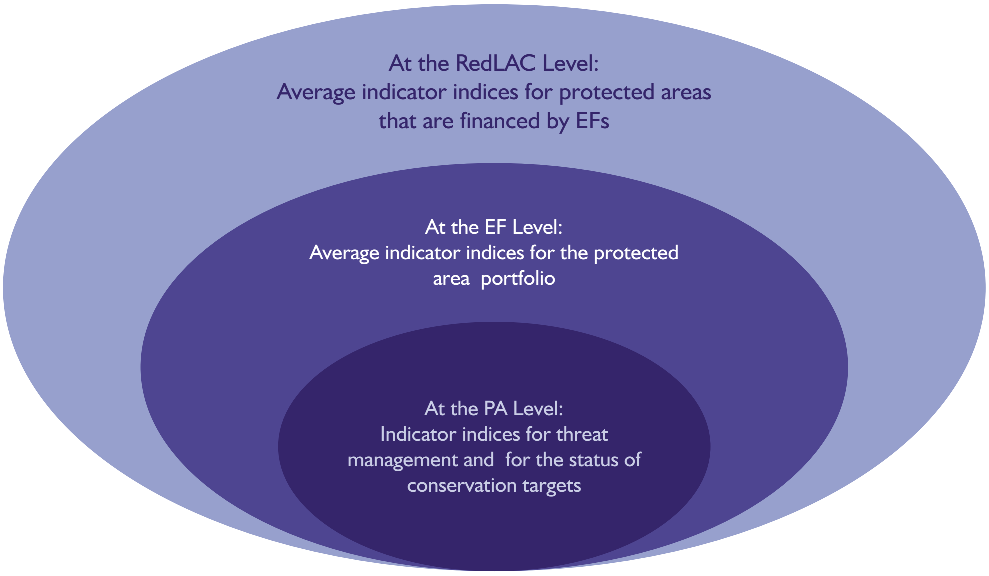


Figure 6 – Summary of the RedLAC–Recommended Multi–Dimensional System

Level	Effect Indicator	Effect Measurement	Impact Indicator	Impact Measurement
Project	Threat management rate for each PA funded by the EF.	Measurement of change in threats by staff of the PA. See Threat Management Index (Annex E).	1. Abundance index for at least two indicator species for each PA funded by the EF (Annex F). 2. Habitat coverage change rate in funded PAs (Annex G).	1. Measurement of two indicator species per park ranger, management committee and/or local community, using two transects for each indicator species (a total of 4 transects with 2 transects for each species) in 4 different sections for each PA. 2. Measured by a specialized entity using satellite imagery (Annex G).
Environ-mental Fund	Threat management index in PAs financed by the Fund.	Fund staff participate in a management committee meeting for each PA financed by the Fund, to jointly review the measurement of change threat and decide whether it coincides with the experience of committee members.	1. Target Species Conservation Index (TSCI) for target species in PAs financed by the EF. 2. Habitat area change index for PAs financed by the Fund (Annex G).	1. Biodiversity Conservation Index (Annex H) is the average of all indices for the PAs financed by the Fund. Annex I further adjusts the index for PA size. 2. Measured by a specialized entity every 5 years using satellite imaging and field verification.
RedLAC	Threat management index for PAs financed by member Funds.	The RedLAC index is the average of the indices for all member funds.	1. Target Species Conservation Index for target species in PAs financed by RedLAC member funds. 2. Habitat area change index for PAs financed by RedLAC member funds.	1. The RedLAC index is the average of the indices for all member funds. 2. Measured by a specialized entity using satellite imagery and field verification.

4.2 Field Measurement of Indicators

Threat management indicators and indicators of the status of conservation targets can be measured by protected area staff (biologists or rangers), management committees, local communities, or volunteers. Considering that Funds provide funding for executing agencies, measurements can also be made by these entities. As a principle, it is useful to include all these groups or persons in the monitoring programs, in order to increase participation in project and PA management, provided work quality can be maintained. Normally, PA staff require little training to measure indicators within an acceptable degree of variation, whereas management committees, local communities and volunteers require higher levels of training. However, this investment is often justified, because it is a way to involve communities in management and inform them directly of the threats to and status of their resources.

The abundance of target species is stated as a percentage of change in relation to an earlier figure in the Target Species Conservation Index (Annex F). Measurement figures are initially compared to a baseline, and then in subsequent years to the measurement for the previous year. However, averaging these values to obtain one figure for each PA is not easy. It requires the intervention of a biologist to establish a process for integrating the figures obtained at different measurement sites and for different indicator or target species, using statistically valid methods. It depends on many factors, such as the area covered by each species within the PA, natural fluctuations in species populations, seasonal migrations, extreme climatic events, etc. There are also variants caused by unknown effects. The challenge is to establish a statistically valid change rate to enable comparisons among sites, and to average indices to obtain figures for one PA, for all PAs financed by an EF, and finally for RedLAC.

The data processing protocols are relatively simple. Annex E presents a work sheet and instructions to guide calculations of a Threat Management Index (TMI) for a PA. The variables used for this calculation are surface area, intensity, and urgency of the threat. Based on the qualitative values assigned to each variable, one calculates the relative position (ranking), the percentage of threat reduction, the raw score, and finally the Threat Management Index. This system is proposed to focus on threats of anthropic origin.

Annex F shows a hypothetical example of calculating a Target Species Conservation Index (TSCI) for a protected area. This calculation is based on the percentage of change observed in the target species from a previous measurement period, and the percentage of the overall PA area that represented by that habitat. For now, the system will not use Ecological Integrity as an indicator, because this would require more complex and costly measurements.

Data on changes in habitat coverage and fragmentation for a PA can be obtained using satellite imagery together with field checks. Each habitat's surface area and fragmentation is measured, and change rates that are comparable to other PAs are calculated and integrated, in order to establish an indicator for each PA, for each EF, and for RedLAC.

4.3 Measurements using Satellite Images

Although there are advantages to broad participation when measuring some indicators, there are also advantages to using a single supplier to interpret satellite images when detecting changes in habitat coverage and fragmentation[7]. Some EFs currently use satellite imagery to monitor their projects, but the types of images used and protocols for their interpretation vary among countries. Therefore, the ideal for RedLAC and its members would be to hire a single, highly-qualified supplier to centralize the purchasing, pre-processing, integrating of field data, classifying, and validating of satellite imagery for all funded Protected Areas. This will give RedLAC's EFs a standardized set of reliable, powerful indicators, which could complement and check the other indicators on threat reduction and status of conservation targets (see Annex G).

[7] This includes habitats that are visible to satellite imaging, such as forests, mangroves, paramo and puna grasslands, seagrass beds, reefs, and freshwater habitats. It does not include habitats that are not interpretable on satellite images, such as marine habitats in temperate areas, deep water, rocky or sandy beds, or tropical forests where it is nearly impossible to obtain cloud-free images.

Although a project of this magnitude would be quite costly, it would be a very important component of the monitoring system, as it could provide fully objective and comparable data to validate other, more subjective indicators and to compare with management effectiveness assessments. It is estimated that RedLAC members finance projects in around 500 PAs. If each PA requires an average of 2 satellite images (each image covers 140 km^2), the cost of analyzing some 500 PAs would be in the order of US$ 2 million. Considering that it is proposed that the analysis be done every 5 years, after the first analysis that would establish the baseline, the yearly cost would be in the order of US$ 400,000.

RedLAC would gain a number of comparative advantages in setting up such a system.

1. It is a partnership of EFs in many countries of the region. If the fund were established under the name of RedLAC, it would not be directly identified with any country, and this would give it certain independence from political considerations.

2. Furthermore, a RedLAC member EFs could manage a regional project on behalf of all RedLAC members without establishing a new administrative structure. In fact, this way of working has been used on several occasions, even in the Training Project. However, in this case the fund would be identified with the host country, which could have political implications.

3. EFs have lots of experience establishing, funding and managing trust funds. In this case, a trust fund would be practically indispensible for setting up a joint monitoring system using satellite imagery, and to ensure its long-term functioning. In fact, setting up the system for one or two measurements would make no sense, since it is historical trends that provide the most useful information.

4. RedLAC could achieve economies of scale. RedLAC's EFs currently finance some 500 PAs, and were RedLAC to work with other conservation organizations, this could lower the cost for all. (For example, CI's Global Conservation Fund presently monitors some 200 sites worldwide using satellite imagery). Several conservation organizations could potentially be interested in taking advantage of a standardized monitoring system of this type, in addition to national PA authorities, which in many cases have no images.

5. RedLAC's EFs have years of experience working with donor consortia, and it is likely that a donor consortium will be needed to set up a trust fund for the system being contemplated. This trust fund would be dedicated to monitoring the impact of RedLAC member funds, and would cover not only the cost of satellite image analysis, but also other activities needed to utilize the RedLAC impact monitoring system, such as training new funds in system use, conducting assessments, developing new phases, etc.

RedLAC's satellite imaging monitoring system would have to be implemented in phases. If one or more donors shows potential interest, it will be imperative to conduct a pre-investment study to determine the number, location and size of PAs funded by RedLAC, the specific products that would be needed, the degree of precision needed, the number of satellite images required, and the entity to administer the fund. With this information, it will be possible to calculate the yearly cost of the system and the size of the trust fund that will be required. It would also be useful to determine the economies of scale that could be achieved should other conservation organizations collaborate in developing and using the system. With all of this information, RedLAC would be in a position to work with a consortium of donors to set up the trust fund, invite tenders for acquiring and analyzing the satellite images, contract the winning bidder, and commence system implementation, perhaps in collaboration with other stakeholders. Until a single satellite image interpretation system for RedLAC is in place, the other components of the proposed monitoring system could be implemented independently. EFs that do have access to satellite imagery could seek to implement evaluations of habitat change and fragmentation on their own, and integrate them into their own monitoring system and reporting.

4.4 Data Integration

The overview of the RedLAC monitoring system shows general concepts for integrating data to develop project impact indices in individual PAs, in PA project portfolios for individual EFs, and in RedLAC as a a whole. In order to facilitate data integration, data sheets have been designed to orient the collection and integration of project impact indices at the PA level (Annex H), at the EF level (Annex I), and at the RedLAC level (Annex J). At the same time, the data sheets are useful for developing, reporting and archiving monitoring system data. However, it is clear that not all funds have the information that is needed to fill in these work sheets. This sub-project has designed a first iteration of an ideal system, but implementing it will require a period of adaptation and learning. Meanwhile, the expectation is that EFs will fill out the summary sheets with the data that is available, and seek the other information to the extent possible in the future. One of the attributes of this system is the use of indices. Therefore, if an environmental fund only has data on indicator species, but not on changes in habitat coverage and fragmentation, or vice versa, this is not a problem; the EF can report the index with the available information.

RedLAC is in the process of developing an online conservation project/investment recording system called Ecofunds. In the future, this system may have a module where impact index sheets can be completed on line by each fund. This would make it easier for funds to have their sheets updated and available for query (even by stakeholders involved in each area), in addition to fuller reporting of the different aspects of each investment made by a fund in a PA.

4.5 Additional Recommendations for Best Practices

As part of the process of informing RedLAC with respect to the impacts of biodiversity conservation in PAs, it is recommended that, where possible, each fund also report on the following points:

- Wherever possible, include the percentage of the fund's investments with respect to the entire investments in the area (both governmental and from other sources);
- Provide suggestions on how to enhance the impact monitoring system.

> **“Some EFs currently use satellite imagery to monitor their projects, but the types of images used and protocols for their interpretation vary among countries.”**

4.6 Strengths and Weaknesses

Like any monitoring system, RedLAC's system has its strengths and weaknesses. On the positive side, this system is:

- **Sturdy** – being multidimensional and using indicators for both threat reduction and the status of conservation targets, especially if a single satellite imaging interpretation system can be developed.
- **Balanced** – it is the result of an intermediate solution between simplicity and reliability.
- **Standardized** – based on a single protocol for all RedLAC EFs and the protected areas they finance.
- **Capable of being added together and compared** – because it uses indices instead of raw data.
- **Reliable** – based on systems that have been tested by many conservation organizations.
- **Credible** – this is a collective proposal (developed from the bottom up) formulated by a group of EFs.
- **Comparable** – monitoring outcomes can be compared to evaluations of PA management effectiveness and with other data available in the country.
- **Reportable** – monitoring findings can be used to report to the Biodiversity Convention on EF contributions, both individually and as RedLAC, and towards meeting the Aichi goals.

However, this system has limitations that should be taken into account by those utilizing it. This system is:

- **Approximate** – it generates simple findings that are meant to serve as indicators for highly complex, little understood systems. Although threat reduction may be attributed to the project, changes in target status only show a correlation to the project but are not attributable to it.
- **Subjective** – it depends on the interpretations of those using it, since there is no single database, unless a single system for interpreting satellite images is achieved.
- **Insensitive to size** – it is generally more accurate for smaller protected areas, although this issue will be reduced by using satellite images.
- **Simplistic** – it only considers directly anthropic threats, although it is obvious that natural systems also respond to indirect anthropic threats, such as climate change, and natural, non-anthropic variations.
- **Ambitious** – it requires data that many EFs do not currently have and that they will have to develop in the future. The unified satellite image interpretation system is only a concept for now.

5. Looking Forward

Looking towards the future, the first priority is to field test the recommended system to ensure that it works in a way that is easy to implement and useful to the stakeholders. The field test will provide experiences that will make it possible to fine-tune the system. Looking beyond the current system, it is useful to consider new technologies that in the future may provide important inputs for measuring the impacts of EFs on biodiversity conservation in PAs.

5.1 Field Testing the Initial RedLAC System

Some RedLAC EFs now have data available for immediate implementation of the system. Others will have to implement the system gradually. For all, implementing the proposed system represents an additional, unbudgeted cost. Some EFs will be able to cover the cost with currently available funding, while other EFs will have to raise additional funds for this purpose. Given this reality, the implementation period probably will be long.

5.2 Improving the Initial System

When the first EFs implement the system, this experience will probably supply inputs for improving the system. Another key aspect is setting up a trust fund to cover the cost of a centralized system that will use satellite images to determine changes in habitat coverage and fragmentation. The features of this system will also depend on the needs of potential partners in the initiative. Meanwhile, this first approximation should be seen as just one step in the overall process of building a common system that is at once simple and effective.

5.3 New Technologies

There are new technologies that could be useful tools for measuring indicators to determine the conservation impacts of EFs. One very promising technology is the use of drones – small remoter controlled aircraft . Until now, their primary use has been for military purposes, but they are also starting to be used to take aerial photographs of relatively small areas such as small protected areas or transects of larger ones. For example, Thailand has adopted drones because they are economically efficient to use for environmental purposes. They have been used for environmental monitoring tasks such as photographing orangutan nests, receiving signals from elephants with radio transmitters, and locating and identifying illegal whale-hunting boats.

Another technology with potential for use in monitoring is the recording of the sounds of nature and interpreting them to determine the makeup and abundance of species at specific points. The sound analysis is compared at different times to identify changes and trends, just as is done with other observation techniques . Perhaps in the near future it will be possible to integrate these technologies into RedLAC's impact monitoring system.

[8] The book "The Great Animal Orchestra" by Bernie Krause contains many examples of biophony as an indicator of a protected area's ecological health.

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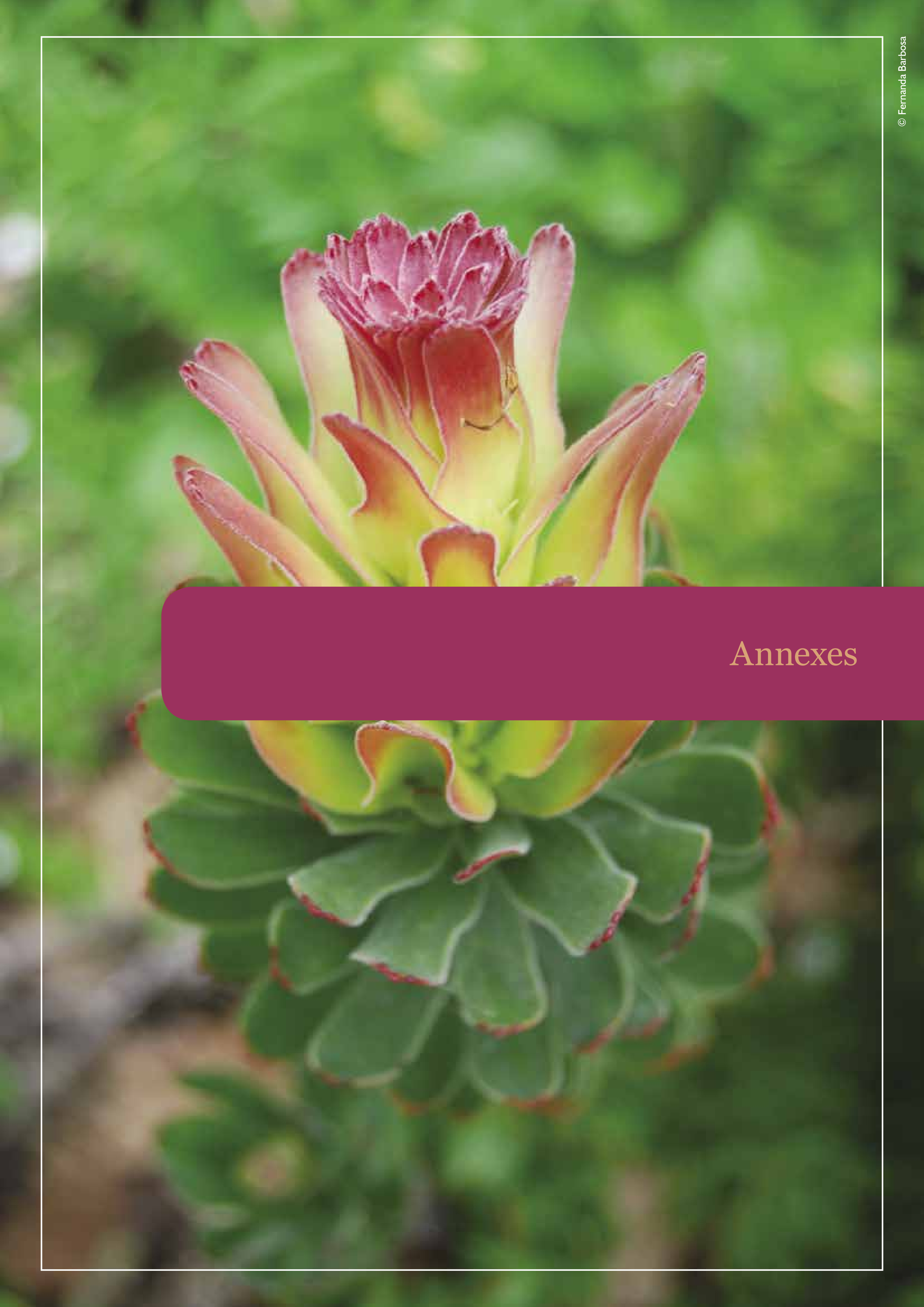


Annexes

Annex A
Key Definitions

Threats – current influences that negatively affect biodiversity and include direct anthropic threats from within PAs, direct anthropic threats from outside of PAs, and indirect anthropic threats (social, political and economic factors) (RedLAC, 2008).

Effects – threat reductions that result in changes that are generated through efforts by the project, fund, etc. (RedLAC, 2008).

Evaluation – a project or program assessment measured against its own, previously selected goals and objectives (Biodiversity Indicators Partnership, 2011).

Impact – the quality of the conditions for sustaining the abundance, viability, or distribution of conservation targets generated by EF interventions.

Indicator – a unit of measure based on verifiable data, which enables a quantitative comparison of an actual situation to a desired situation. For a project, it is a measurement of successfully achieving the proposed outcomes and conditions. (Biodiversity Indicators Partnership, 2011; RedLAC, 2008)

Index – a numerical scale used to compare variables, either with each other or against referential amounts (Biodiversity Indicators Partnership, 2011).

Measurement – a standard unit for expressing size, amount or degree. (CMP, 2007)

Monitoring – collecting and evaluating data on goals and objectives that are set.

(This process is often referred to as monitoring and evaluation or M&E) (CMP, 2007)

Multi dimensional – a system that includes more than one type of indicator.

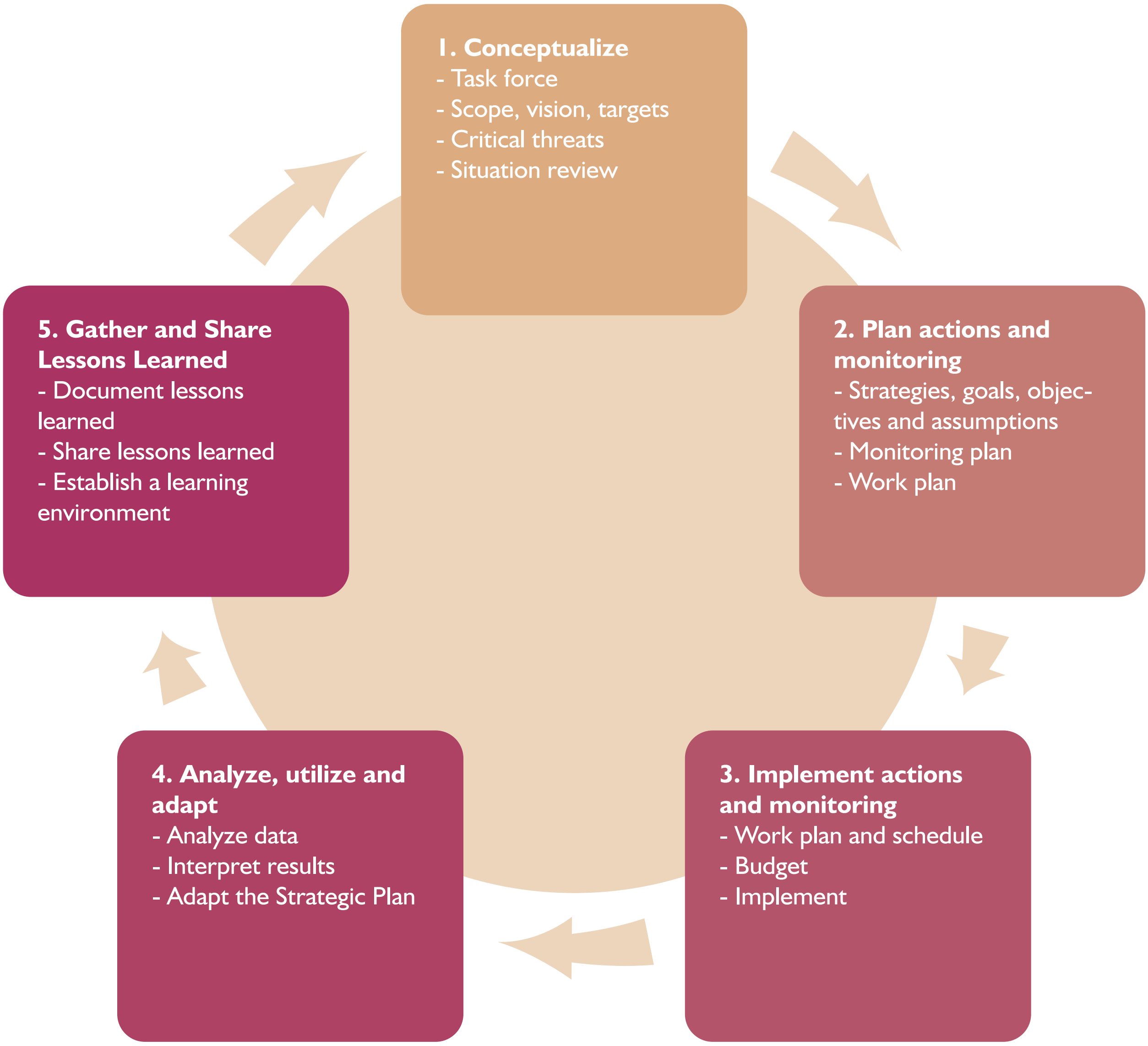
Target – an element of biodiversity at a project site – which may be a species, habitat or environmental system, or ecological process – on which the project has chosen to focus (CMP, 2007).

Project – a set of activities implemented by a defined group of practitioners – including managers, researchers, community members, or other stakeholders – to meet certain goals and objectives (CMP, 2007).

Output – the products and services that are generated by a project, measured using an output indicator.

Outcome - synonymous with the term "impact"

Appendix B
The Project Cycle



Appendix C

Standardized Classification – Threats

(adapted from Table 1 of Salafsky, et al, 2008)

Table 1. World Conservation Union–Conservation Measures Partnership (IUCN-CMP) classification of direct threats to biodiversity (version 1.1).

Threats	Definition
1. Residential and commercial development	Human settlements or other nonagricultural land uses with a substantial footprint
1.1 Housing and urban areas (urban areas, suburbs, villages, vacation homes, shopping areas, offices, schools, hospitals)	Human cities, towns, and settlements including non-housing development typically integrated with housing
1.2 Commercial and industrial areas (manufacturing plants, shopping centers, office parks, military bases, power plants, train and ship yards, airports)	Factories and other commercial centers
1.3 Tourism and recreation areas (ski areas, golf courses, beach resorts, cricket fields, county parks, campgrounds)	Tourism and recreation sites with a substantial footprint
2. Agriculture and aquaculture	Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture, and aquaculture
2.1 Annual and perennial non-timber crops (farms, household swidden plots, plantations, orchards, vineyards, mixed agroforestry systems)	Crops planted for food, fodder, fiber, fuel, or other uses
2.2 Wood and pulp plantations (teak or eucalyptus plantations, silviculture, Christmas tree farms)	Stands of trees planted for timber or fiber outside of natural forests, often with non-native species
2.3 Livestock farming and ranching (cattle feed lots, dairy farms, cattle ranching ,chicken farms, goat, camel, or yak herding)	Domestic terrestrial animals raised in one location on farmed or nonlocal resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)
2.4 Marine and freshwater aquaculture (shrimp or fin fish aquaculture, fish ponds on farms, hatchery salmon, seeded shellfish beds, artificial algal beds)	Aquatic animals raised in one location on farmed or nonlocal resources; also hatchery fish allowed to roam in the wild
3. Energy production and mining	Threats from production of non-biological resources
3.1 Oil and gas drilling (oil wells, deep sea natural gas drilling)	Exploring for, developing, and producing petroleum and other liquid hydrocarbons
3.2 Mining and quarrying (coal mines, alluvial gold panning, gold mines, rock quarries, coral mining, deep sea nodules, guano harvesting)	Exploring for, developing, and producing minerals and rocks
4. Transportation and service corridors	Threats from long, narrow transport corridors and the vehicles that use them including associated wildlife mortality
4.1 Roads and railroads (highways, secondary roads, logging roads, bridges and causeways, road kill, fencing associated with roads, railroads)	Surface transport on roadways and dedicated tracks
4.2 Utility and service lines (electrical and phone wires, aqueducts, oil and gas pipelines, electrocution of wildlife)	Transport of energy and resources

Threats	Definition
4.3 Shipping lanes (dredging, canals, shipping lanes, ships running into whales, wakes from cargo ships)	Transport on and in freshwater and ocean waterways
4.4 Flight paths (flight paths, jets impacting birds)	Air and space transport
5. Biological resource use	Threats from consumptive use of "wild" biological resources including deliberate and unintentional harvesting effects; also persecution or control of specific species
5.1 Hunting and collecting terrestrial animals (bushmeat hunting, trophy hunting, fur trapping, insect collecting, honey or bird nest hunting, predator control, pest control, persecution)	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch
5.2 Gathering terrestrial plants (wild mushrooms, forage for stall fed animals, orchids, rattan, control of host plants to combat timber diseases)	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons
5.3 Logging and wood harvesting (clear cutting of hardwoods, selective commercial logging of ironwood, pulp operations, fuel wood collection, charcoal production)	Harvesting trees and other woody vegetation for timber, fiber, or fuel
5.4 Fishing and harvesting aquatic resources (trawling, blast fishing, spear fishing, shellfish harvesting, whaling, seal hunting, turtle egg collection, live coral collection, seaweed collection)	Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch
6. Human intrusions and disturbance	Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources
6.1 Recreational activities (off-road vehicles, motorboats, jet-skis, snowmobiles, ultralight planes, dive boats, whale watching, mountain bikes, hikers, birdwatchers, skiers, pets in rec areas, temporary campsites, caving, rock-climbing)	People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons
6.2 War, civil unrest and military exercises (armed conflict, mine fields, tanks and other military vehicles, training exercises and ranges, defoliation, munitions testing)	Actions by formal or paramilitary forces without a permanent footprint
6.3 Work and other activities (law enforcement, drug smugglers, illegal immigrants, species research, vandalism)	People spending time in or traveling in natural environments for reasons other than recreation or military activities
7. Natural system modifications	Threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare
7.1 Fire and fire suppression (fire suppression to protect homes, inappropriate fire management, escaped agricultural fires, arson, campfires, fires for hunting)	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation
7.2 Dams and water management/uses (dam construction, dam operations, sediment control, change in salt regime, wetland filling for mosquito control, levees and dikes, surface water diversion, groundwater pumping, channelization, artificial lakes)	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities
7.3 Other ecosystem modifications (land reclamation projects, abandonment of managed lands, rip-rap along shoreline, mowing grass, tree thinning in parks, beach construction, removal of snags from streams)	Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare
8. Invasive and other problematic species and genes	Threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance
8.1 Invasive non-native/alien species (feral cattle, household pets, zebra mussels, Dutchelm disease or chestnut blight, Miconia tree;) introduction of species for biocontrol, Chytrid fungus affecting amphibians outside of Africa)	Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities
8.2 Problematic native species (overabundant native deer, overabundant algae due to loss of native grazing fish, native plants that hybridize with other plants, plague affecting rodents)	Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but havebecome "out of balance" or "released" directly or indirectly due to human activities

Threats	Definition
8.3 Introduced genetic material (pesticide resistant crops, hatchery salmon, restoration projects using nonlocal seed stock, genetically modified insects for biocontrol, genetically modified trees, genetically modified salmon)	Human-altered or transported organisms or genes
9. Pollution	Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources
9.1 Household sewage and urban waste water (discharge from municipal waste treatment plants, leaking septic systems, untreated sewage, outhouses, oil or sediment from roads, fertilizers and pesticides from lawns and golf-courses, road salt)	Water-borne sewage and nonpoint runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments
9.2 Industrial and military effluents (toxic chemicals from factories, illegal dumping of chemicals, mine tailings, arsenic from gold mining, leakage from fuel tanks, PCBs in river sediments)	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments
9.3 Agricultural and forestry effluents (nutrient loading from fertilizer runoff, herbicide runoff, manure from feedlots, nutrients from aquaculture, soil erosion)	Water-borne pollutants from agricultural, silivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied
9.4 Garbage and solid waste (municipal waste, litter from cars, flotsam and jetsam from recreational boats, waste that entangles wildlife, construction debris)	Rubbish and other solid materials including those that entangle wildlife
9.5 Air-borne pollutants (acid rain, smog from vehicle emissions, excess nitrogen deposition, radioactive fallout, wind dispersion of pollutants or sediments, smoke from forest fires or wood stoves)	Atmospheric pollutants from point and nonpoint sources
9.6 Excess energy (noise from highways or airplanes, sonar from submarines that disturbs whales, heated water from power plants, lamps attracting insects, beach lights disorienting turtles, atmospheric radiation from ozone holes)	Inputs of heat, sound, or light that disturb wildlife or ecosystems
10. Geological events	Threats from catastrophic geological events
10.1 Volcanoes (eruptions, emissions of volcanic gasses)	Volcanic events
10.2 Earthquakes/tsunamis (earthquakes, tsunamis)	Earthquakes and associated events
10.3 Avalanches/landslides (avalanches, landslides, mudslides)	Avalanches or landslides
11. Climate change and severe weather	Long-term climatic changes that may be linked to global warming and other severe climatic or weather events outside the natural range of variation that could wipe out a vulnerable species or habitat
11.1 Habitat shifting and alteration (sea-level rise, desertification, tundra thawing, coral bleaching)	Major changes in habitat composition and location
11.2 Droughts (severe lack of rain, loss of surface water sources)	Periods in which rainfall falls below the normal range of variation
11.3 Temperature extremes (heat waves, cold spells, oceanic temperature changes, disappearance of glaciers/sea ice)	Periods in which temperatures exceed or go below the normal range of variation
11.4 Storms and flooding (thunderstorms, tropical storms, hurricanes, cyclones, tornados, hailstorms, ice storms or blizzards, dust storms, erosion of beaches	Extreme precipitation and/or wind events or major shifts in seasonality of storms

Appendix D

Standardized Classification – Conservation Interventions

(adapted from Table 2 of Salafsky, et al, 2008)

Table 2. World Conservation Union – Conservation Measures Partnership (IUCN-CMP) classification of conservation actions (version 1.1).

Conservation Actions	Definitions
1. Land/water protection	Actions to identify, establish or expand parks and other legally protected areas, and to protect resource rights
1.1 Site/area protection (national parks, wildlife sanctuaries, private reserves, tribally owned hunting Grounds)	Establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN categories I-VI
1.2 Resource and habitat protection (easements, development rights, water rights, instream flow rights, wild and scenic river designation, securing resource rights)	Establishing protection or easements of some specific aspect of the resource on public or private lands outside of IUCN categories I-VI
2. Land/water management	Actions directed at conserving or restoring sites, habitats and the wider environment
2.1 Site/area management (site design, demarcating borders, putting up fences, training park staff, control of Poachers)	Management of protected areas and other resource lands for conservation
2.2 Invasive/problematic species control (cutting vines off trees, preventing ballast water discharge)	Eradicating, controlling and/or preventing invasive and/or other problematic plants, animals, and pathogens
2.3 Habitat and natural process restoration (creating forest corridors, prairie re-creation, riparian tree plantings, coral reef restoration, proscribed burns, breaching levees, dam removal, fish ladders, liming acid lakes, cleaning up oil spills)	Enhancing degraded or restoring missing habitats and ecosystem functions; dealing with pollution
3. Species management actions	Directed at managing or restoring species, focused on the species of concern itself
3.1 Species management (harvest management of wild mushrooms, culling buffalo to keep population size within park carrying capacity, controlling fishing effort)	Managing specific plant and animal populations of concern
3.2 Species recovery (manual pollination of trees, artificial nesting boxes, clutch manipulation, supplementary feeding, disease/parasite management)	Manipulating, enhancing or restoring specific plant and animal populations, vaccination programs
3.3 Species reintroduction (reintroduction of wolves)	Reintroducing species to places where they formally occurred or benign introductions
3.4 Ex situ conservation (captive breeding, artificial propagation, gene banking)	Protecting biodiversity outside of its native habitats
4. Education and awareness	Actions directed at people to improve understanding and skills, and influence behavior
4.1 Formal education (public schools, colleges and universities, continuing education)	Enhancing knowledge and skills of students in a formal degree program

Conservation Actions	Definitions
4.2 Training (monitoring workshops or training courses in reserve design for park managers, learning networks or writing how-to manuals for project managers, stakeholder education on specific issues)	Enhancing knowledge, skills and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs
4.3 Awareness and communications (radio soap operas, environmental publishing, Web blogs, puppet shows, door-to-door canvassing, tree sitting, protest marches)	Raising environmental awareness and providing information through various media or through civil disobedience
5. Law and policy	Actions to develop, change, influence, and help implement formal legislation, regulations, and voluntary standards
5.1 Legislation (global: promoting conventions on (biodiversity, wildlife trade laws like CITES National: work for or against government laws such as the US Endangered Species Act, influencing legislative appropriations State/Provincial: state ballot initiatives, providing data to state policy makers, developing pollution permitting systems, dam relicensing Local: developing zoning regulations, countryside laws, species protection laws, hunting bans Tribal: creating tribal laws)	Making, implementing, changing, influencing, or providing input into formal government sector legislation or polices at all levels: international, national, state/provincial, local, tribal
5.2 Policies and regulations (input into agency plans regulating certain species or resources, working with local governments or communities to implement zoning regulations, promoting sustainable harvest on state forest lands)	Making, implementing, changing, influencing, or providing input into policies and regulations affecting the implementation of laws at all levels: international, national, state/provincial, local/community, tribal
5.3 Private sector standards and codes (Marine and Forest Stewardship Councils, Conservation Measures Partnership (CMP) Open Standards, corporate adoption of forestry best management practices, sustainable grazing by a rancher)	Setting, implementing, changing, influencing, or providing input into voluntary standards and professional codes that govern private sector practice
5.4 Compliance and enforcement (water quality standard monitoring, initiating criminal and civil litigation)	Monitoring and enforcing compliance with laws, policies and regulations, and standards and codes at all levels
6. Livelihood, economic and other Incentives	Actions to use economic and other incentives to influence behavior
6.1 Linked enterprises and livelihood alternatives (ecotourism, non-timber forest product harvesting, harvesting wild salmon to create value for wild population)	Developing enterprises that directly depend on the maintenance of natural resources or provide substitute livelihoods as a means of changing behaviors and attitudes
6.2 Substitution (Viagra for rhino horn, farmed salmon as a replacement for pressure on wild populations, promoting recycling and use of recycled materials)	Promoting alternative products and services that substitute for environmentally damaging ones
6.3 Market forces (certification, positive incentives, boycotts, negative incentives, grass and forest banking, valuation of ecosystem services such as flood control)	Using market mechanisms to change behaviors and attitudes
6.4 Conservation payments (quid-pro-quo performance payments, resource tenure incentives)	Using direct or indirect payments to change behaviors and attitudes
6.5 Nonmonetary values (spiritual, cultural, links to human health)	Using intangible values to change behaviors and attitudes
7. External capacity building	Actions to build the infrastructure to do better conservation
7.1 Institutional and civil society development (creating new local land trusts, providing circuit riders to help develop organizational capacity)	Creating or providing nonfinancial support and capacity building for nonprofits, government agencies, communities, and for-profits
7.2 Alliance and partnership development (country networks, Conservation Measures Partnership (CMP)	Forming and facilitating partnerships, alliances, and networks of organizations
7.3 Conservation finance (private foundations, debt-for-nature swaps)	Raising and providing funds for conservation work

Annex E

Work Sheet – Calculating the Threat Management Index (TMI) in a Protected Area

(adapted by Putney and Bath from the Threat Reduction Index developed by Margoluis and Salfasky in 2008)

The purpose of this work sheet is to calculate the change in the level of threats affecting a specific PA. It is premised on the fact that threats can both increase and decrease over time depending on park management efforts to abate or mitigate threats as well as markets and local economies. The steps for filling out the work sheet to calculate the Threat Management Index (TMI) are as follows (see the hypothetical example below for "Buenavista Park"). Boxes on the worksheet are numbered to correlate with the steps below.

1. Develop a list of all direct threats. On the work sheet, write the titles of the threats that have been identified, utilizing the terminology in Annex C. For example, Hunting is 5.1 in Annex C's classification system.

2. Define what a 100% reduction of each threat means. Record your definition of each threat and your description of a 100% reduction (elimination of that threat). You will refer to this when working on Step 8.

3. Define what a 100% increase in each threat means. Record your definition of each threat and your description of a 100% increase of that threat. You will refer to this when working on Step 8.

4. Rank each threat for the protected area on a scale of 1 to the # of listed threats (in this example, there are 5 threats so we will use a 1 to 5 ranking system). In the column headed Area, rank the threat that occupies the most surface area within the PA, with the highest number – in this example: 5). Continue to rank the threats with #1 affecting the least amount of surface area. Sum the total of these rankings at the bottom of the column.

5. Rank each threat in terms of intensity. In the column headed Intensity, indicate the ranking that was established, based on the impact or severity of the destruction, once again with the largest number (equal to the total number of threats) assigned to the most significant threat, continuing down to #1 for the least significant threat. Sum the total of these rankings at the bottom of the column.

6. Classify each threat in terms of urgency. As with the others, do the ranking in terms of urgency, with the most urgent threat having the highest ranking and the least urgent one with the lowest ranking. Sum the total of these rankings at the bottom of the column. Before proceeding to the next step, make sure that the three totals in the column are the same, and if not, correct the numbers.

7. Add up the scores for the rankings. For each threat, add up the rankings for the numbers across the three columns: Area, Intensity, and Urgency. Write the total in the Total Ranking Column. Add up these numbers and write the total at the bottom of the column.

8. Protected Area managers then determine the change percentage for each threat using their best judgment. A positive result indicates that threats are being reduced, whereas a negative result indicates threats are increasing within the protected area. In the column headed Threat Change %, write the percentage of change achieved for each of the threats in comparison to the descriptions noted under Step 2 and 3 above. Note that there is no total for this column, since each number stands alone as a measurement of the degree to which each threat, as individually assessed, has been reduced or has increased.

9. Calculate the Raw Score. In the column headed Raw Score, write the figure calculated by multiplying the value of the Total Ranking by the percentage of Threat Change (for example, 12 x 0.15 = 1.8), Write the total for the column in the lower box.

10. Calculate the Threat Management Index (TMI) for the protected area. Use the lower part of the worksheet to calculate the TMI, dividing the Total Raw Score by the Total Ranking, and multiplying the result (in the example 0.06) by 100 to convert it to a percentage. A positive result indicates that threats are being reduced, whereas a negative result indicates threats are increasing within the protected area.

Below is an example of a worksheet for calculating the TMI Indicator for a hypothetical protected area:

PROTECTED AREA THREAT MANAGEMENT INDEX (TMI) WORK SHEET

Name of Protected Area: "Buenavista Park" | **Country:**

Date: Jan 21, 2013 | **Period covered:** **From:** January 1, 2012 **To:** Dec 31, 2012

Name (who is completing the worksheet?):

Threats (1)	100% Reduction (2)	100% Increase (3)		
Subsistence Hunting (Annex C 5.1)	Example: All neighboring communities agree to stop hunting and Park Guards report no violations.	Example: Community members openly hunting throughout park, refusing to obey park guards, and not reporting violations.		
Commercial fishing (5.4)				
Invasive species (feral cattle) (8.1)				
Fire (7.1)				
Oil drilling (3.1)				

Threats (1)	Criteria Rankings			Ranking Total (7)	Threat Reduction % (8)	Raw Score (9)
	Surface Area (4)	Intensity (5)	Urgency (6)			
Subsistence Fishing	5	3	4	12	15%	1.8
Commercial Hunting	3	2	3	8	-12%	-9.6
Invasive Species	2	5	1	8	50%	4.0
Fire	4	1	5	10	-5%	-0.5
Oil drilling	1	4	2	7	100%	7.0
Total	15	15	15	45		2.7
TMI Indicator Formula	Total Raw Score	Total Ranking			Conversion to a Percentage	TMI Indicator
Calculate the TMI Indicator (10)	2.7 ÷	45	=	0.06	100	6%

PROTECTED AREA THREAT MANAGEMENT INDEX (TMI) WORK SHEET

Name of Protected Area:		Country:
Date:	Period Covered: From:	To:
Name (who is completing the work sheet?):		

Threats (1)		100% Reduction (2)	100% Increase (3)

Threats (1)	Criteria Rankings			Total Ranking (7)	Threat Change % (8)	Raw Score (9)
	Surface Area (4)	Intensity (5)	Urgency (6)			
TMI Indicator Formula	Total Raw Score	Total Ranking			Conversion to a percentage	TMI Indicator
Calculate the TMI Indicator (10)	÷		=	x	100	

Annex F

Work Sheet - Calculating the Target Species Conservation Index (TSCI) in a Protected Area

The purpose of this work sheet is to calculate the percent change in the number of observed target species in a PA for the given year. It is used with the other two indices, the Threat Management Index and the Habitat Change Index, by providing a counterpoint for comparison – assuming that as threats decrease, populations of targeted species will increase and vice versa. See Section 4.2 in the manual for more information about this index. To ensure equal weighting of this index with the others, it needs to be held within a 100% increase or 100% decrease of the sightings of the target species. In this case, due to anomalies in observations, migrations or even a sudden surge in birth rates, there is the potential of an increase of over 100% in any given year. To manage this issue, and to insure that this index is comparable with the other indices, we have capped the increase at 100% (See Step 4 below).

The steps for filling out the worksheet to calculate the Target Species Conservation Index (TSCI) are as follows - see the hypothetical example below. Boxes on the worksheet are numbered to correlate with the steps below.

1. In consultation with biologists, select two or more target species that will best indicate the health of the PA. The best target species for this exercise have the following characteristics:
   - easily measurable in quantitative terms
   - precisely defined
   - consistent over time
   - sensitive to changes in threat levels
   - use a large percentage of the total PA

   On the work sheet, in the appropriate column, write the names of the selected species.

2. List the target species count using permanent transects. Note the number of target species observations from each transect every year and ensure that you use the same time frame and methodology. While four transects are used here – more can be added.

3. Sum the total of all individuals observed by the different groups monitoring the permanent transects in a given year.

4. Calculate the Percent of Change from the previous year. This is obtained by multiplying the difference in the number of individuals observed between the current monitoring period and the previous one (in the first example for the change between 2011 and 2012: 21-19 = 2), divided by the number of individuals observed in the earlier monitoring period (in the first example below, this would be {21 -19} ÷ 19 x 100 = 10.5%). Note that if the Percent of Change is over 100% it needs to be kept at 100% to avoid even greater impact of a potentially anomalous indicator.

5. For species with similar demographic trends this calculation may be sufficient. However, there is high potential for anomalous results in this Index and therefore l biologists' inputs into weighting the Percent of Change for each species is needed. Species populations can be highly variable year to year, a judgment must be made to render this score usable for comparison with other indices in Annex H and to avoid having one species or chance demographic/observation events skew the findings. EFs have been given the opportunity to select the target species used in developing this table. Different species have very different dynamics of population growth and decline (e.g. consider the different numbers that could emerge for a frog species vs. spectacled bear observations). In addition the dynamics of population change will vary widely with differentiated birth, death, immigration and emigration rates. The EF will need to ask biologists to help appropriately weight the results between different target species.

In this hypothetical example, two species with similar demographic trends were used (mountain tapir and giant otter) with a species with very different demographic trends (a Butterfly Dyanmine gisella). It is clear that any non-weighted comparison will be skewed by the high percent change in butterfly observations. This change could be due to better trained observers or changed climatic conditions that that led to a slightly faster metamorphosis with more adult butterflies emerging a few days earlier in the observation cycle etc. Thus, the biologists must be asked to provide a weighting of the % of change scores based on their sense of the variability factors (in both observation and demographic changes) and overall sense of population trends (considering past years and threat levels). The goal is to have a defensible rationale for developing the TSCI that can be included inthe observations box.

6. Calculate the Target Species Conservation Index for the present year from the weighted % of change, adding up the scores for each target species and dividing by the number of target species being counted, in this case 3. A positive result indicates that more target species were sighted, a negative result indicates fewer observations of the target species.

PROTECTED AREA TARGET SPECIES CONSERVATION INDEX (TSCI) WORK SHEET							
Name of Protected Area: "Buenavista Park"					**Country:**		
Date: Jan 21, 2013			**Period covered: From:** January 1, 2012 **To:** Dec 31, 2012				
Name (who is completing the work sheet?):							
Target Species (1)	**Transects**				**Total # individuals observed (3)**	**% of Change (4)**	**Weighted % of change (5)**
	Parks Ranger count in Eastern Section (2)	**Management Committee count in Eastern Section (2)**	**Park Ranger count in Western Section (2)**	**Community count in Western Section (2)**			
Mountain Tapir							
2011	4	8	3	4	19		
2012	6	12	0	3	21	10.5%	x100= 10.5%
Giant Otter							
2011	1	3	6	5	15		
2012	0	0	5	8	13	-13%	x100%=-13%
Butterfly Dynamine gisella							
2011	17	42	16	54	129		
2012	22	36	58	79	195	51%	x25%=12.75%
Average TSCI for Buenavista Park in 2012 (6)							10.25%

Observations and Weighting Rationale: (5) In this hypothetical example the 2 mammals were given 100% weight as the observers clearly knew the species and followed standard protocol. However, the butterfly was weighted at 25% given the biologists' recognition that many observers were unable to differentiate *Dyanmine gisella* from *Mesosemia mancia* in the field which commonly occurs in the Western section of the park.

<table>
<tr><th colspan="8">PROTECTED AREA TARGET SPECIES CONSERVATION INDEX (TSCI) WORK SHEET</th></tr>
<tr><td colspan="5">Name of Protected Area:</td><td colspan="3">Country:</td></tr>
<tr><td colspan="3">Date:</td><td colspan="5">Period covered: From: To:</td></tr>
<tr><td colspan="8">Name (who is completing the work sheet?):</td></tr>
<tr><td rowspan="2">Target Species (1)</td><td colspan="4">Transects</td><td rowspan="2">Total # individuals observed (3)</td><td rowspan="2">% of Change (4)</td><td rowspan="2">Weighted % of change (5)</td></tr>
<tr><td>Parks Ranger count in Eastern Section (2)</td><td>Management Committee count in Eastern Section (2)</td><td>Park Ranger count in Western Section (2)</td><td>Community count in Western Section (2)</td></tr>
<tr><td colspan="8">Species I</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="8">Species II</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Average TSCI for PA (6)</td><td></td><td></td></tr>
<tr><td colspan="8">Observations and Weighting Rationale: (5)</td></tr>
</table>

Annex G

Habitat Change Index (HCI) for a Protected Area

The Protected Area Habitat Change Index (HCI) will be used with the other two indices, the Threat Management Index and the Target Species Conservation Index, to provide an assessment that is quantitatively measured and verifiable and less affected by judgments (e.g. what % of a threat has been reduced, or how to weight an anomalous count reading on a species).

This Index is only viable in certain protected area habitats (mangroves, paramo, forests, seagrass beds etc.) There are many types of habitats that cannot be measured using satellite imagery, such as temperate marine habitats and others where consistent readings are difficult, such as cloud forests, due to the inability to obtain cloud-free images.

The steps for filling out the worksheet to calculate the Habitat Change Index (HCI) will be determined by the service provider with expertise in satellite imagery interpretation. Ultimately the goal is to have a single satellite image interpretation system for RedLAC (see Section 4.3); however many EF's can independently implement evaluations of habitat change and fragmentation. In general, the following should hold true:

1. The unit of measurement in this case is the percentage of change in hectares. So a loss of 2000 hectares between 2010 and 2011 in a 50,000 ha protected area would result in: -2000/50,000 = -4%, representing a 4% loss of this particular habitat within the park. For management purposes the various habitat types can be monitored as an essential element to determining how threat reduction strategies are performing and how well the park is maintaining natural habitat types. For the purposes of reviewing the overall protected area performance the overall hectare change data will be used in Annex H.

2. As with the other indices a range between a 100% increase and 100% decrease will be maintained. Thus the percent of change must be measured from last year's baseline. In the example above the baseline is 50,000 hectares, but the following year the baseline would be 50,000 – 2000 hectares converted (48,000 ha). Thus a 500 ha decrease in the following year would be -500/48,000 = -1%, that is, a 1% loss of this particular habitat within the Park.

3. Regeneration of native habitat is considered a positive change and would be calculated the same way. Regeneration of 1000 ha in the following year would be based on a new base of 47,500 ha (+1000/47500) to indicate a 2.1% increase in that specific habitat within the Park between 2012 and 2013.

4. It is anticipated that this information will align with Annex E Threat Management Index when threats are linked to habitat conversion (e.g. expansion of the agricultural frontier) so park managers can further ground truth the relationships when assessing the TMI (Annex E - Step 8).

PROTECTED AREA – HABITAT CHANGE INDEX WORK SHEET [1]				
Name of Protected Area: "Buenavista Park"			**Country:**	
Date: Nov 9, 2012	**Period covered:** **From:** October 12, 2011 to:		**To:** October 8, 2012	
Name of service provider:				
Images Used	**Name**			**Date of Image**
Year	PA Hectares			% Change (1)
	Montane	Paramo	Total	
2011	20,000	30,000	50,000	
Ha Changed	-500	-1500	-2000	-4%
2012	19,500	28,500	48,000 (2)	
Ha Changed	-200	-300	-500	-1.04%
2013	19,300	28,200	47,500	
Ha Changed	0	+1000	+1000	+2.1%

[1] The Service Providers will develop a more detailed work sheet.
This is merely to demonstrate how some of the key data could be recorded.

Annex H

Work Sheet - Calculating the Biodiversity Conservation Impact Index for the Protected Area (PA-BCII)

The purpose of this work sheet is to summarize and average the monitoring data collected from three different indices (Annexes E, F, and G) for a PA. These three indices provide different types of data that provide insights about the trend in threats and therefore the biodiversity conservation impact within the PA.

Index	Annex	Type of measure	Unit of measurement/Range
Threat Management Index (TMI)	Annex E	Subjective assessment	% Change in threat management 100% increase to 100% to decrease
Target Species Conservation Index (TSCI)	Annex F	Field observations	% Change in target species sightings (can be weighted) 100% increase to 100% to decrease
Habitat Change Index (HCI)	Annex G	Satellite pixels measuring hectares	% Change in Hectares of natural habitat 100% increase to 100% to decrease

The steps for filling out the worksheet to calculate the PA – Biodiversity Conservation Impact Index (PA-BCII) are as follows - see the hypothetical example below. Boxes on the worksheet are numbered to correlate with the steps below.

1. List the figures from the 3 annexes. This allows reviewers and management to understand the full set of data available. Note that in some PAs, there may not be a full set of data for all 3 indices – in which case DD (Data Deficient) is incorporated.

2. The Threat Management Index (TMI) entered here comes from the calculation shown on the work-sheet in Annex E for the given year. (In this example, 6.0%).

3. The Target Species Conservation Index (TSCI) entered here comes from the calculation shown on the Worksheet in Annex F for the given year (In this example, 10.25%).

4. The Habitat Change Index (HCI), is given by the service provider that analyzes satellite images for the EF for the given year (in this example, 2.1%).

5. Write critical observations. Observations can include such items as anomalies in climatic conditions, natural disasters, unusual results or items for management attention, etc.

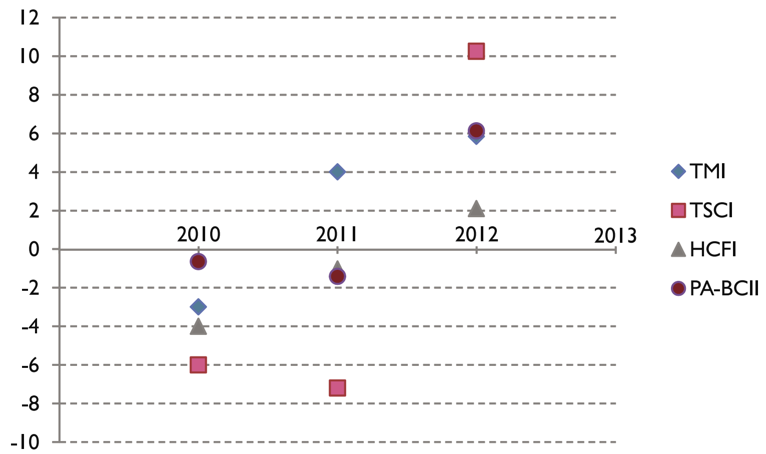
6. Total the three scores.

7. The overall PA Biodiversity Conservation Impact Index (PA-BCII) for 2012 is the average of the three indices so divide the total score by 3 (or 2 if one index is not available – e.g. Data Deficient -DD). A positive score indicates a positive impact for biodiversity conservation, while a negative score indicates a negative impact for biodiversity conservation.

8. Comparing Index figures with previous years provides a trend line for Environmental Funds and Park Managers to review changes over time. In this example, a more volatile TSCI is noted, with the PA-BCII helping to even out some of the more dramatic shifts in the other indices.

PROTECTED AREA - BIODIVERSITY CONSERVATION IMPACT INDEX (PA-BCII) WORK SHEET		
Name of Protected Area: "Buenavista Park"		**Country:**
Date: Jan 21, 2013	**Period covered: From: January 1, 2012 To: Dec 31, 2012**	
Name (who is completing the work sheet?):		
Annual investment made by the environmental fund: USD 50,000 **EF Investment as a % of the PA total yearly budget:** 18%		
Threats (use terminology and numbering classification from Annex C) that the investment seeks to mitigate or reduce: Hunting and collecting terrestrial animals (5.1); Commercial fishing (5.4); Invasive species (8.1); Fire (7.1); Oil drilling (3.1);		
Biodiversity Conservation Impact Index for this PA during this period: (7) **PA-BCII** = 6.12%		
Indices for the Protected Area: "Buenavista Park"		
Index (1)	**% Change**	**Observations** (5)
TMI (2)	6.0%	Shut down all oil drilling activity. Commercial fishing increasing.
TSCI (3)	10.25%	Eruptions of nearby Volcano and unusually dry climatic conditions
HCI (4)	2.1%	With oil drilling activity stopped roads and other habitat are slowly recovering.
Total (6)	18.35%	
PA-BCII (7)	6.12%	

PA-BCII Trend Line



PROTECTED AREA - BIODIVERSITY CONSERVATION IMPACT INDEX (PA-BCII) WORK SHEET		
Name of Protected Area:		**Country:**
Date:	**Period covered: From:**	**To:**
Name (who is completing the work sheet?):		
Annual investment made by the environmental fund: **Investment as a % of the PA total yearly budget:**		
Threats (use terminology and numbering classification from Annex C) that the investment seeks to mitigate or reduce.		
Biodiversity Conservation Impact Index for this PA during this period: (7)		
PA-BCII =		

Indices for the Protected Area:		
Index (1)	**% Change**	**Observatiosn** (5)
TMI (2)		
TSCI (3)		
HCI (4)		
Total (6)		
PA-BCII (7)		

Annex I

Work Sheet - Calculating the Adjusted Biodiversity Conservation Impact Index for an Environmental Fund (EF-ABCII)

The purpose of this work sheet is to summarize the biodiversity conservation impact across the PAs that the EF funds. The Biodiversity Conservation Impact Index is adjusted to take into account the size of each PA. In addition the work sheet asks EF's to calculate the funding contributed by the EF as a % of total funding for the PAs. These numbers are reported separately to facilitate EF review and interpretation. Both sets of numbers are reported separately in Annex J (RedLAC-ABCII).

The steps for filling out the worksheet to calculate the Environmental Fund Adjusted Biodiversity Conservation Impact Index (EF-ABCII) are as follows. The theoretical example used in this case is for a national EF that contributes to the finance of five PAs in a single country. Boxes on the worksheet are numbered to correlate with the steps below.

1. List the figures obtained from the 3 annexes (E, F, and G) for each of the Protected Areas financed by the Environmental Fund. By repeating the summarized data in Annex H, reviewers can see the full set of data available and better spot trends and anomalies. If data is not available for one or more indices, it should be noted here as Data Deficient (DD). For example, in this case it is noted that data is lacking for the TSCI for PA 4 and for the HCI for PA 5. This reduces the ability to compare the findings in each protected area. While this information is the same as in Annex H it provides a greater opportunity to compare key data across Protected Areas.

2. As in Annex H (Calculating the Biodiversity Conservation Impact Index for the Protected Area), total the three scores.

3. The overall PA Biodiversity Conservation Impact Index (PA-BCII) for 2012 is the average of the three indices so divide the total score by 3 (or in the case of PA 4 and 5 – they are divided by 2 as there are Data Deficient indices). A positive score indicates success in conserving biodiversity, while a negative score indicates biodiversity conservation in decline.

4. This row indicates the size of each PA receiving financial support from the Environmental Fund in hectares.

5. Each PA is then represented as a percentage of the total area funded by the EF. It is calculated by taking the size of each PA and dividing it by the total area of all PAs to which the EF contributes finance. (2,180,000 hectares in this case). So using the Buenavista Park example: 450,000/2,180,000 = 20.64%. This calculation is done to ensure that a very small protected area PA-BCII does not skew the overall impact of the EF in terms of the size of the areas it is working to conserve. Be sure that the total adds to 100% before moving on to the next calculation.

6. The PA's Adjusted BCII (PA-ABCII), is the PA-BCII multiplied by the percent of area that Park represents in the EF's PA portfolio. In the Buenavista Park example it is 6.12% x 20.64% = 1.26%.

7. The last column is the EF-Adjusted Biodiversity Conservation Impact Index (5.67% in this case) representing a weighted average of the biodiversity impact across all the PAs that receive funding from the EF.

ENVIRONMENTAL FUND ADJUSTED BIODIVERSITY CONSERVATION IMPACT INDEX (EF-ABCII) WORK SHEET						
Name of Environmental Fund:			**Country:**			
Date: Jan 21, 2013		**Period covered: From:** January 1, 2012 **To:** Dec 31, 2012				
Name (who is completing the work sheet?):						
EF's Adjusted Biodiversity Conservation Impact Index (EF-ABCII) for all PAs financed by the Fund (7): 5.7%						
Annual investment made by the environmental fund in full portfolio: USD 1,750,000 **EF Investment as a % of the total investment in this PA portfolio:** 22%						
Total area in hectares financed by the Environmental Fund (4): 2,180,000 hectares						
Indices for each Protected Area Financed by the Environmental Fund						
Index (1)	**Buenavista Park**	**PA 2**	**PA 3**	**PA 4**	**PA 5**	**Totals**
TMI	6%	16.23%	32.56%	5.15%	-28.05	
TSCI	10.25%	6.42%	2.07%	DD[1]	-13.75	
HCI	2.1%	-5.37%	2.45%	4.81%	DD	
TOTAL (2)	18.35%	17.28%	37.08%	9.96%	-41.8%	
PA-BCII (3)	6.12%	5.76%	12.36%	4.98%	-20.9%	
PA Area (hectares) (4)	450,000	90,000	370,000	1,200,000	70,000	2,180,000
% this PA represents of the total area funded by the EF (5)	20.64%	4.13%	16.97%	55.04%	3.22%	100%
Adjusted BCII across all PAs funded by EF (EF-ABCII) (6)	1.26%	0.24%	2.1%	2.74%	-0.67%	5.7% (7)

[1] Data Deficient

ENVIRONMENTAL FUND ADJUSTED BIODIVERSITY CONSERVATION IMPACT INDEX (EF-ABCII) WORK SHEET						
Name of Environmental Fund:				Country:		
Date:		Period covered: From:		To:		
Name (who is completing the work sheet?):						
EF's Adjusted Biodiversity Conservation Impact Index (EF-ABCII) for all PAs financed by the Fund (7):						
Annual investment made by the environmental fund in full portfolio: EF Investment as a % of the total investment in this PA portfolio:						
Total area in hectares financed by the Environmental Fund (4):						
Indices for each Protected Area Financed by the Environmental Fund						
Index (1)	PA 1	PA 2	PA 3	PA 4	PA 5	Totals
TMI						
TSCI						
HCI						
TOTAL (2)						
PA-BCII (3)						
PA Area (hectares) (4)						
% this PA REPRESENTS OF THE TOTAL AREA FUNDED BY THE ef (5)						100%
Adjusted BCII across all PAs funded by EF (EF-ABCII) (6)						(7)

Annex J

Work Sheet - Calculating the Adjusted Biodiversity Conservation Impact Index for RedLAC (RedLAC - ABCII)

The purpose of this work sheet is to summarize the conservation impacts of the investments in PAs made by RedLAC members, and develop a single indicator of RedLAC's conservation impact in the PAs to which its members contribute funding. Two separate sets of numerical values are included. The first develops a RedLAC Adjusted Biodiversity Conservation Impact Index and the second indicates the investment by the EFs as a percentage of the total investment in these PAs from all sources.

The two sets of data are not mixed here, because of problems of interpretation and attribution. For example, while a 17.4% investment by EF's in the portfolio could be interpreted as a 17.4% contribution to the overall biodiversity impact, it cannot account for reducing threats in areas which are struggling with increased threats to biodiversity. Thus for example a negative EF-ABCII score in the theoretical EF 5 example below would be seen as a negative biodiversity impact of the $ invested by the EF rather than as a major investment that probably stopped the biodiversity impact from the threats from being even greater. We therefore report these numbers separately for EF and RedLAC review and interpretation.

The steps for filling out the worksheet to calculate the RedLAC Biodiversity Conservation Impact Index (RedLAC-ABCII) are as follows. The theoretical example used in this case is for six EFs across Latin America and the Caribbean who have compiled EF-ABCII's over the past year. Boxes on the worksheet are numbered to correlate with the steps below.

1. List the EFs that have compiled solid data for the EF-ABCII (Annex I) over the past year.

2. From Annex I provide the overall EF-ABCII f or each EF.

3. From Annex I, provide the total area in hectares of the PAs in which the EFs are investing.

4. Once again the size of the PAs to which the EF contributes finance will be weighted. Divide the area of the PAs the EF finances by the total area of the PAs to which RedLAC's members as a whole contribute funding. In this hypothetical example, for EF 1 it will 2,180,000/8,231,338 = 26%.

5. Now multiply the EF-ABCII % by the % of the total area of PAs to which RedLAC EFs contribute funding. For EF 1 this would be 5.7% x 26% = 1.5%. This number indicates the adjusted biodiversity conservation impact that this EF contributes to the RedLAC portfolio.

6. Sum the weighted EF-ABCII contributions to the total RedLAC PA portfolio. This then is the indicator for RedLAC's biodiversity conservation impact across the full PA portfolio of its member EFs (in this example, 6.1%).

7. From Annex I, fill in the total US$ contribution to management of PAs by the EF over the past year.

8. List the total amount invested by all donors/governments to the same PAs during the past year.

9. Establish the % of funding provided by the EF to this PA portfolio. In the example of EF 1: US$1,750,000 / US$ 7,954,545 = 22%. EF 1 contributed 22% of the financing for this specific portfolio of PA's in their country.

10. Establish the % of funding provided by the EF's of RedLAC to this total PA portfolio. In the example, the total EF investment is divided by the total investment in the portfolio: US$7,098,775 / US$ 40,697,258 = 17.44%. RedLAC members contributed 17.44% of the financing for this PA portfolio across Latin America and the Caribbean.

REDLAC ADJUSTED BIODIVERSITY CONSERVATION IMPACT INDEX (REDLAC-ABCII) AND % OF INVESTMENT WORK SHEET

Date: Jan 21, 2013	**Period covered: From:** January 1, 2012 **To:** Dec 31, 2012

Name (who is completing the work sheet?):

RedLAC Adjusted Biodiversity Conservation Impact Index (6): 6.1%

Total area in hectares financed by Environmental Funds in this portfolio (3): 8,231,338 hectares

Annual investment made by Environmental Funds to this portfolio (7): US$ 7,098,775

RedLAC Investment as a % of the total investment in this portfolio (10): 17.44%

Adjusted Biodiversity Conservation Impact of RedLAC Environmental Funds across Protected Areas in Latin America and the Caribbean

EF (1)	EF-ABCII (2)	Area (Ha) of All PAs supported by EF (3)	Area (Ha) as % of Total in RedLAC PA Portfolio (4)	Weighted EF-ABCII contribution to the RedLAC Portfolio (5)
EF 1	5.7%	2,180,000	26%	1.5%
EF 2	3.2%	700,554	9%	0.3%
EF 3	-1.2%	950,063	12%	-0.1%
EF 4	8.9%	3,670,678	45%	4%
EF 5	-3.4%	160,000	2%	-0.1%
EF 6	7.7%	570,043	7%	0.5%
Total RedLAC PA Portfolio		8,231,338	100%	6.1%

Average % of Investment of RedLAC EFs across Protected Areas in Latin America and the Caribbean

	EF Investment (US$) (7)	Total Investment by all Parties in this portfolio ($US) (8)	% of EF investment in Total Portfolio (9)
EF 1	1,750,000	7,954,545	22%
EF 2	327,000	18,166,666	18%
EF 3	675,450	2,701,800	25%
EF 4	3,430,325	16,334,880	21%
EF 5	86,000	1,720,000	5%
EF 6	830,000	1,765,957	47%
Total	US$ 7,098,775	US$ 40,697,258	**17.44%** (10)

REDLAC ADJUSTED BIODIVERSITY CONSERVATION IMPACT INDEX (REDLAC-ABCII) AND % OF INVESTMENT WORK SHEET

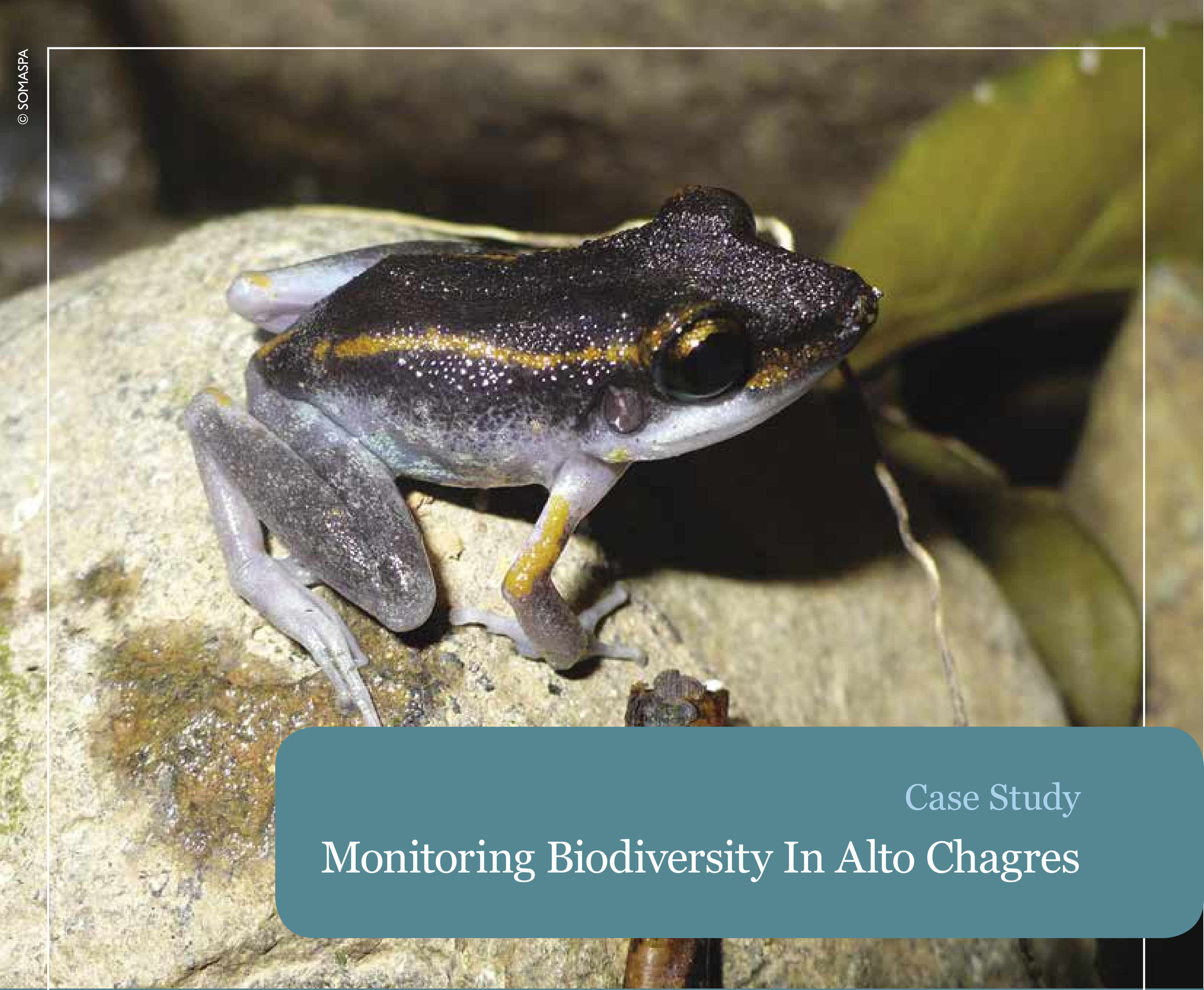
Date:	**Period covered: From:** **To:**
Name (who is completing the work sheet?):	
RedLAC Adjusted Biodiversity Conservation Impact Index (6):	
Total area in hectares financed by Environmental Funds in this portfolio (3):	
Annual investment made by Environmental Funds to this portfolio (7):	
RedLAC Investment as a % of the total investment in this portfolio (10):	

Adjusted Biodiversity Conservation Impact of RedLAC Environmental Funds across Protected Areas in Latin America and the Caribbean

EF (1)	EF-ABCII (2)	Area (Ha) of All PAs supported by EF (3)	Area (Ha) as % of Total in RedLAC PA Portfolio (4)	Weighted EF-ABCII contribution to the RedLAC Portfolio (5)
EF 1				
EF 2				
EF 3				
EF 4				
EF 5				
EF 6				
Total RedLAC PA Portfolio				

Average % of Investment of RedLAC EFs across Protected Areas in Latin America and the Caribbean

	EF Investment (US$) (7)	Total Investment by all Parties in this portfolio ($US) (8)	% of EF investment in Total Portfolio (9)
EF 1			
EF 2			
EF 3			
EF 4			
EF 5			
EF 6			
Total			(10)



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Case Study

Monitoring Biodiversity In Alto Chagres

The FOUNDATION FOR THE CONSERVATION OF NATURAL RESOURCES, NATURA, is a non-profit Organization, established in 1991, which has broad experience in the administration of national and international funding focusing on environmental programs, plans, and projects that support civil society as well as governmental organizations. NATURA works independently or in coordination with other entities to strengthen clients' capacities, including both institutional development and project execution. NATURA currently runs Panama`s Ecological Trust Fund (FIDECO), the Chagres National Park Conservation Fund (Chagres Fund), and the Darien National Park Conservation Fund (Darien Fund).

The Chagres Fund is a national environmental fund created through a Park Conservation Agreement, signed in 2003, by the National Government of Panama, The Nature Conservancy (TNC), and NATURA Foundation. The Chagres Fund's capital comes from Panama's first Debt-for-Nature Swap in 2003 for 10 million dollars. The equivalent amount of Panamanian foreign debt was bought by the U. S. Government with counterpart funding from TNC, within the framework of the U.S.' 1998 Tropical Forest Conservation Act, amendment N. 105-214.

The Chagres Fund contributes to the conservation, maintenance, and restoration of forest in Chagres National Park (PNCh) and its buffer zone (5 kilometers around the Park), by funding the Park's management programs, and other environmental initiatives carried out by non-profit organizations in accordance with the Park's Management Plan.

To develop the Fund's Biodiversity Monitoring component, eight conservation targets, selected in two previous planning processes -- the Alto Chagres Conservation Plan[1] and the Chagres National Park Management Plan[2] -- were reviewed, together with the technical experience generated during the Parque en Peligro Project. In the end five conservation targets were selected, and ecological attributes were defined with respect to size, condition and landscape category.

The conservation targets include the jaguar, the harpy eagle, the semi-deciduous forest, the lotic ecosystem, and the cloud forest. To assess the status of each conservation target, a total of eleven biological indicators were identified.

The process of prioritizing indicators was based on the outcome of feasibility analyses, cost-benefit analyses, and a review of situational threats. Monitoring started in 2006, and is carried out for some indicators in the dry season and for others in the rainy season, depending on their life cycles. For instance, aquatic insects from the benthos show up in the early rainy season.

The biological indicators now being monitored include the abundance of jaguar and harpy eagle prey, the number of jaguars killed by hunters, the density of jaguars, the number of amphibian species, the number of bat species, the number of aquatic insect families, forest cover, and the number of orchid bee species (an indicator added in 2009).

Among the findings thus far, the following are noteworthy:

- Cloud Forest:

These biodiverse forests are found on Cerro Brewster, Cerro Bruja, Cerro Jefe, and Cerro Azul, and are notable for their endemic species and as protection areas for the headwaters of rivers and streams. The Number of Amphibian Species in Canyons indicator is used, among others, to measure the condition of the cloud forest.

The 2006-2010 censuses used 200 m. x 1 m. transects along selected canyons in the cloud forests at altitudes ≥ 600 masl. The trend from these censuses points at an increasing wealth of amphibian species in the monitored region.

The Ecological Analysis for the Number of Amphibian Species in Canyons indicator is based on the following rankings:

Indicator	Number of Species				Current status	Desired status
	Poor	Regular	Good	Very Good		
Number of Amphibian Species in Canyons if	≤17 spp	18-22 spp	23-26 spp	≥27 spp	Good	Very Good

During the three monitoring periods (2006-2008, 2009 and 2010), the Ecological Analysis ranked the conservation status of Cerro Brewster site as Very Good to Good. The Cerro Jefe and Cerro Azul sites presented two of the lowest scores, with Cerro Jefe ranked as Regular to Poor, and Cerro Azul ranked as the only site that presented Poor values throughout the monitoring periods.

[1] Candanedo, et al. 2003
[2] ANAM, 2005

- Relative density of the jaguar population (individuals per 100km^2)

Jaguar density is the number of jaguars occupying a certain area and, in Alto Chagres, this has been estimated by employing the camera-trap method. The information thus obtained is then analyzed by a population size estimating program (CAPTURE).

The cameras enable an assessment of the minimum activity area for some individuals that have been photographed and the estimated density is obtained by dividing the number of jaguars (abundance) within the ef- fective sampling area (Wilson y Anderson 1985).

- Rio Piedras: In 2009, a pilot sampling of this southeast sector of Alto Chagres indicated five photo-identified jaguars, and in 2010, they were down to four. The number of jaguars per 100 km2, or jaguar density, was estimated in 2010 at 6.02 jaguars/100km2. This number falls within the Regular range, according to the conservation status indicator, and the upper range of that category is ranked as being in Good condition.
- La Llana: The survey was conducted in 2006 and 2008. In the pilot study conducted during the first year (2006-2007), two jaguars were photo-identified, and the same result was achieved in 2007 and 2008. The number of jaguars/100km2 (density) was estimated at 3 for 2007 and 2008. The conservation status of the jaguar for both years was ranked as Poor. In this sector, jaguar condition is that of a severely threatened species.

- Relative abundance of jaguar prey

This is a jaguar conservation status indicator that informs on food availability for this cat and, indirectly, on poaching effects upon ecosystem ecological integrity, and on deforestation effects on jaguar populations. The availability of forest mammals is indicated by their abundance. The reduction or disappearance of these prey species, such as the white-lipped peccary (Tayassu pecari), collared peccary (Pecari tajacu), red brocket (Mazama americana), mountain paca (Cuniculus paca), and Central American agouti (Dasyprocta punctata), among others, is the main reason jaguars move to cattle raising areas in search for food.

- La Llana: the main jaguar prey species have been identified as collared peccary (*Pecari tajacu*), red brocket (*Mazama americana*), mountain paca (*Cuniculus paca*), and Central American agouti (*Dasyprocta punctata*), among other earthbound and tree-dwelling frugivores. The relative abundance index (indic/km) of these prey in this sector was obtained in 2006, 2007, and 2008, except for the Central American agouti (*Dasyprocta punctata*).
  - From 2006 to 2008, the collared peccary shows a reduced relative abundance index (0.78-0.35) whereas it increased for the mountain paca (0.13-0.27).
  - The red brocket showed an increased relative abundance index in 2006-2007 and a reduced index in 2008.
- Río Piedra: Measurements of jaguar prey indicatos began in this sector in 2009, whereby the Central American agouti (*Dasyprocta punctata*), the red brocket (*Mazama americana*), and the mountain paca (*Cuniculus paca*) were found to be in regular condition. The latter two fall within the lower range, close to Poor, whereas the Central American agouti is in the upper range, closer to Good.

The availability of jaguar prey species may be affected in the survey area, first because of the local extinction of important prey (Tayassu pecari) a couple of decades ago; then, because of poaching pressure on the prey species, which still persists in the area; and finally, because of changes to their habitat. In addition, the prey under analysis here are also preyed upon by other carnivores (Puma concolor and Leopardus pardalis).

- Relative abundance of harpy eagle prey:

This is an indicator of the threat to, and of status of, the harpy eagle conservation target, which is indicated by the relative abundance of prey such as the mantled howler monkey (Alouatta palliata) and the brown-throated two- and three-toed sloths (Choloepus hoffmanni and Bradypus variegatus, respectively). These species are the harpy eagle's main prey in Panama and in other sites of the Neotropic and since they are all tree-dwelling the loss of forest coverage because of cattle raising or other activities would seriously affect the harpy eagles main food sources.

All three of these harpy eagle preferred prey species were recorded in Alto Chagres (La Llana – Santo Domingo, Rio Piedra) in the 2006-2010 studies.

In La Llana (2007), it was concluded that the primate group is in Regular to Good condition, and, are a good food source for the harpy eagle. Within the group, the bigger size species, such as the mantled howler monkey, the black-handed spider monkey (A. geoffroyi), the Panamanian night monkey (Aotus zonalis), the white-throated capuchin (Cebus capucinus), and the Geoffroy's marmoset (Saguinus geoffroyi) do not appear to be the subjects of strong poaching pressure, and this is why their availability as prey is likely to continue in the midterm.

Other tree-dwelling species that have been observed are squirrels (Sciurus and Microsciurus), sloths (Choloepus), and anteaters (tamandua), which could eventually be incorporated into the eagle's diet, thereby increasing the availability of different types of prey.

In general, primates appear to be in Regular to Good condition in the survey area, possibly due to full forest coverage and low poaching pressure in the La Llana Sector.

> **"The Chagres Fund contributes to the conservation, maintenance, and restoration of forest in Chagres National Park (PNCh) and its buffer zone"**

- Number and abundance of bat species in the Cerro Azul and Cerro Jefe cloud forest, Chagres National Park:

This area is located towards the south of the Park and is a higher altitude zone within this protected area (1.077 masl). The area shown in Cerro Azul is composed of secondary forest located in the vicinities of El Patriarca and Romeo & Julieta nature trails. The purpose of this 2010 study is to learn about the bat diversity, and also to determine the functionality of the ecosystem and the threats to biodiversity.

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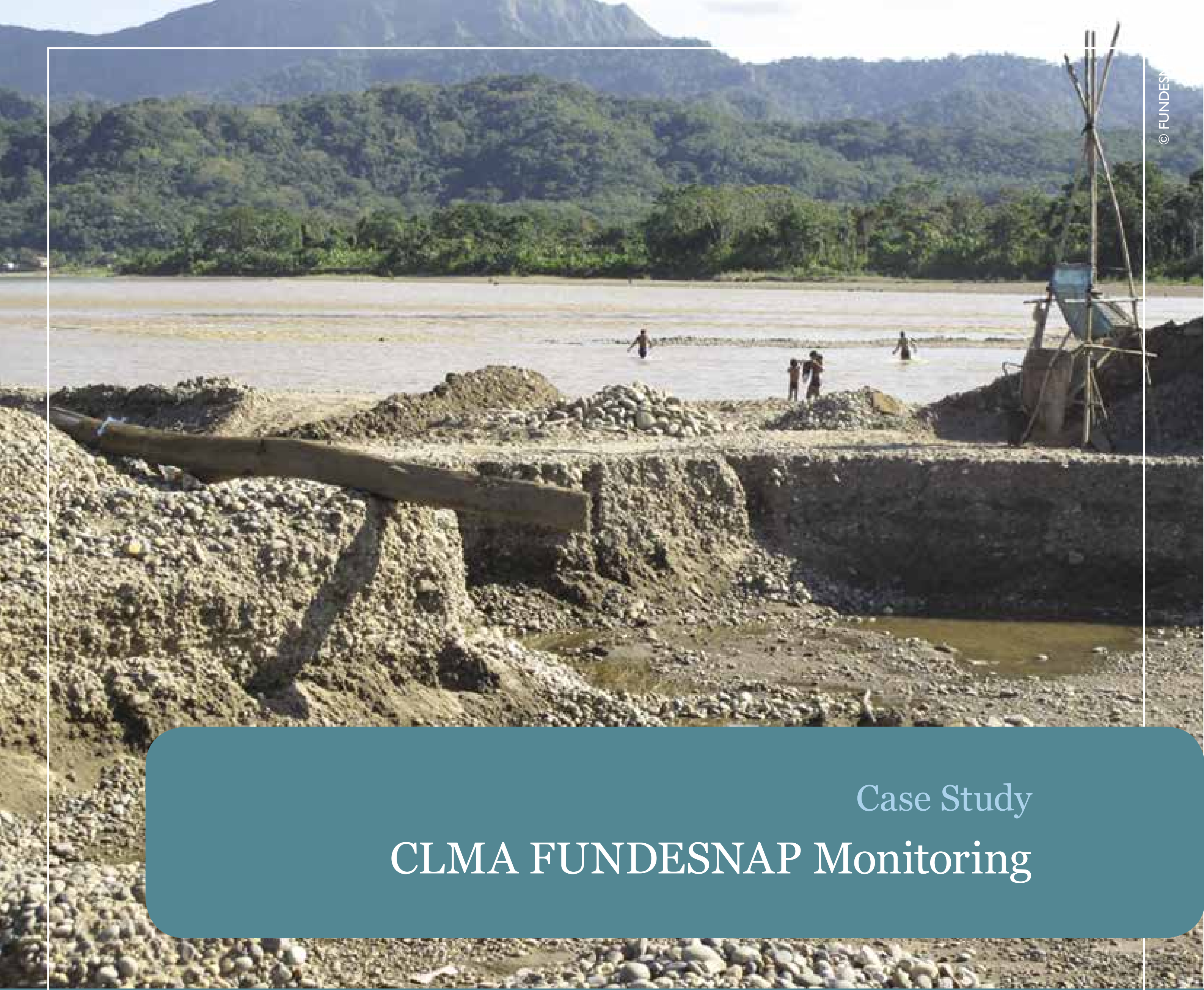


Case Study

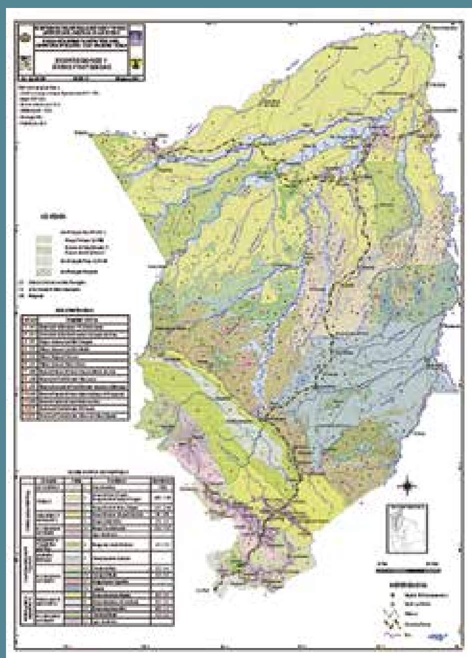
CLMA FUNDESNAP Monitoring

Brief description of FUNDESNAP

FUNDESNAP, the Bolivian Environmental Fund, was established in 2000 to support the National System of Protected Areas (SNAP), which includes protected areas and their buffer zones at the national, departmental, municipal, and community levels. Initially, FUNDESNAP was established with funds donated by the UK, Switzerland, the U.S. (PL-480) and the GEF. At the same time, the Fund has been diversifying through the use of new financial mechanisms. It has also developed extensive experience in capacity building for overall management of protected areas and their buffer zones.

Through the financial support provided to Pilón Lajas (since 2002), Madidi (since, 2005, including the Monito Lucachi Trust Fund) and Manuripi protected areas, FUNDESNAP has been developing its experience base. Thematically, the focus has been on social and environmental impact monitoring and mitigation

Chart 1: Ecoregions and Protected Areas



Source: ABC & DHV 2006: Strategic Environmental Evaluation of the North Corridor.

for highway construction and improvement in the context of an initiative funded by CEPF, AVINA and other partners.

FUNDESNAP is implementing activities to further the social, environmental, and financial management capacities of the different players involved in the three protected areas. It also administers four sub-donations for social organizations. Social and environmental monitoring tools have been designed for use in a joint effort by the local Environmental Monitoring Committees for highways in the Pilón Lajas and Madidi protected areas.

Methodology to define indicators

Community environmental monitoring mechanisms have been created as a means to strengthen the prevention, control, mitigation, and supervision of the impacts of highway construction. These mechanisms complement those available to the Bolivian governmental authorities in the context of safeguard policies established by the World Bank (WB), Inter-American Development Bank (IDB), and other entities funding highway construction. Environmental Monitoring Committees were established at the local level after a process of conceptual analysis of alternatives for social and environmental monitoring mechanisms developed by FUNDESNAP, the Deputy Minister for the Environment (VMA), the National Service of Protected Areas (SERNAP), the Bolivian Highway Administration (ABC), and other entities. This is in response to new challenges put forth by the Political Constitution of the State in 2009 about the implementation of social control mechanisms for infrastructure and development projects in the country.

In March 2011 two Environmental Monitoring Committees were formed with the participation of Madidi and Pilón Lajas residents, municipal governments, and indigenous and intercultural organizations. These were established in order to put into place complementary monitoring mechanisms to generate up-to-date technical information on the community's environmental situation within the protected areas impacted by construction of the North Corridor highway from the perspective of local players. This provided feedback for the prevention and mitigation measures developed for the construction, as well as protection and monitoring measures developed for the protected areas.

Table 1: Composition of Environmental Monitoring Committees at the local level

Highway section	Composition of the local Environment Monitoring Committee
Yucumo – Rurrenabaque	Regional Council of Tsimane Mosetene (CRTM) Indigenous Peoples Center of La Paz (CPILAP) Federation of Yucumo Agroecological Producers (FEPAY) Federation of Yucumo Agroecological Women Producers (FEMAY) Federation of Rurrenabaque Agroecological Peasants (FECAR) Autonomous Municipal Government of Rurrenabaque Autonomous Municipal Government of San Borja Municipal District of Yucumo Protected Areas of Pilón Lajas
San Buenaventura – Ixiamas	Indigenous Council of the Takana People (CIPTA) Indigenous Council of the Takana Women (CIMTA) Federation of Indigenous Peoples of La Paz (CPILAP) Federation of Agroecological Producers of Abel Iturralde (FESPAI) Federation of Agroecological Women Producers of Abel Iturralde (FESMAI) Autonomous Municipal Government of San Buenaventura Autonomous Municipal Government of Ixiamas Protected Areas of Madidi

Source: CEPF FUNDESNAP, 2011.

Monitoring indicators have been identified through a knowledge exchange process between the local Environmental Monitoring Committee and the Ecology Institute of the Universidad Mayor de San Andrés, La Paz. This started with an analysis of documents such as Management Plans for the protected areas (particularly the Protection and Management Programs) and the environmental manage-ment tools for the highway infrastructure in the Pilón Lajas and Madidi area of influence (EEIA, EAE, PPM- PASA, and so on). In a series of knowledge exchange workshops, in combination with back office and field work support (reconnoitering, baseline assessment, and highway monitoring), the potential environmental, social, and economic impacts from the highway construction project were assessed. The most important impacts were prioritized, and indicators and tools for data collection, processing and analysis were identified.

Table 2: Monitoring Indicators for Highway construction during different construction phases

Construction Phase	Indicators
Construction / Improvement until 2013	1. Families reporting changes in water quality. 2. Families reporting difficulties to access water sources for their daily activities (domestic and productive). 3. Families reporting difficulties with changes to the natural course of rivers and water streams. 4. Families reporting changes to their daily activities. 5. Families reporting changes to their customs, traditional activities and/or deep rooted beliefs. 6. Families reporting increasing lumbering activities along the highway. 7. Accidents. 8. Respiratory infections and cases of diarrhea.
Operation since 2013	1. Families reporting changes to their customs, traditional activities and/or deep rooted beliefs. 2. Families reporting changes to their traditional economic and/or productive activities. 3. Families reporting major difficulties in harvesting plants or animals for use and/or consumption. 4. Families reporting increasing lumbering activities along the highway. 5. Families reporting cases of new community settlements and/or community centers in the vicinity of the highway. 6. Number of squatting cases on Native Community Lands or in protected areas. 7. Deforested areas per year and advancement of the agricultural frontier.

Source: Ecology Institute / UMSA & local Environmental Monitoring Committees, 2012.

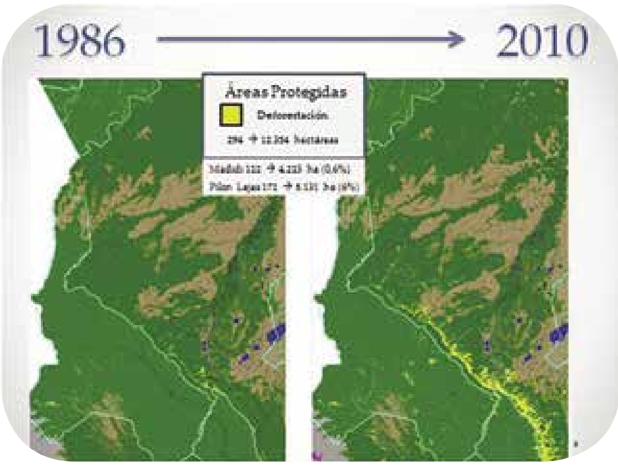
Currently, records are being kept on the negative impacts perceived at the onset of highway construction by both protected area personnel and nearby communities. Through Patrols by protected area personnel and local Environmental Monitoring Committees incursions into the protected areas are identified and recorded (resource allocation activities, new settlements, heat sources identified on satellite images, felled timber, water and air contamination, etc.).

Biodiversity indicators were designed for the highway's operational phase when the impacts of construction will be felt. The focus for the indicators is the monitoring of threats to ecological integrity, including issues such as deforestation. This monitoring will be complemented as protected areas monitoring programs are put in place.

These programs will be the most concrete biodiversity monitoring tool for the protected areas and their buffer zones. The conservation monitoring programs handled by the National Service of Protected Areas (SERNAP) have identified the main threats to the protected areas. These include: new human settlements, illegal timber harvest, poaching, agriculture, grazing, and fires (Lilienfeld et al., 2004). The indicators used for the protected areas are: crop surface, fallow land and secondary orchards (agricultural frontier), types of crops, production technologies, domestic species used, and stocking rate (Ibid.).

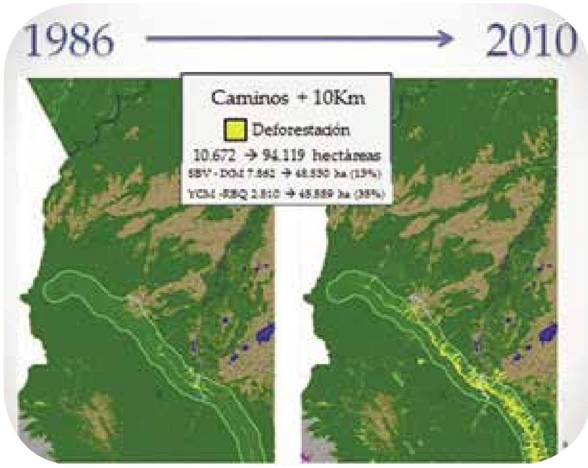
Information on deforestation was also being generated until 2011 through a partner organization with funding from the Critical Ecosystem Partnerships Fund (CEPF). This complemented nicely the monitoring carried out by protected area personnel and the local Environmental Monitoring Committees.

Chart 2: Deforestation of the Pilón Lajas and Madidi Protected Areas



Source: CI Bolivia 2011.

Chart 3: Deforestation along highway margins

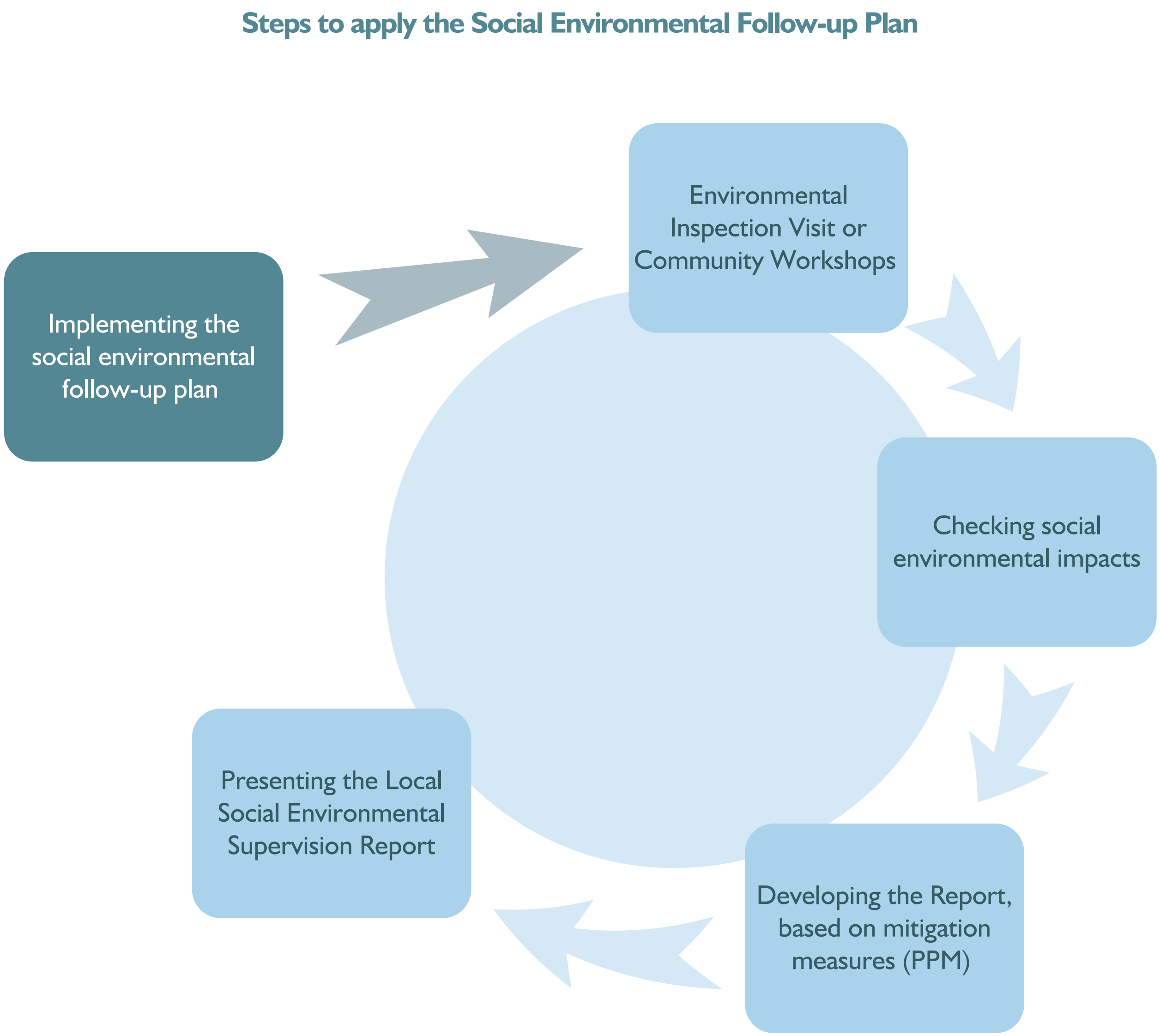


Source: CI Bolivia 2011.

The way local Environmental Monitoring Committees and protected area personnel work in our case is focused on detecting the immediate effects of highway construction in order to be able to intervene and suggest complementary prevention and mitigation measures to environmental authorities and reinforce park ranger protection activities in protected areas.

As a result, local Environmental Monitoring Committees have presented three complementary environmental follow-up reports to date, concerning compliance with prevention and mitigation measures, to the Deputy Minister of the Environment, SERNAP, the Bolivian Highway Administration, and the General Public Attorney.

Chart 4: Yucumo – Rurrenabaque Highway Complementary Social Environmental Follow-up Report



Source: CLMA Yucumo – Rurrenabaque with support from the Ecology Institute / UMSA and FUNDESNAP, 2012.

Two observation flights were made during the course of the project, one in early October 2010 and another one in late September 2012, to complement the community's and protected area's monitoring programs We are currently analyzing the data generated thus far. and this has generated relevant information for more robust environmental management of the Pilón Lajas and Madidi protected areas.

Table 3: Comparing the results of observation flights over the RB TCO Pilón Lajas

First Flight (05.10.2010)	Second Flight (29.09.2012)
Results	
Activity between SERNAP and CRTM. A total of 17 active pockets of heat have been identified within the RB TCO, which are the result of burning Gran Chaco areas for planting, 10 of which are in the Eastern Sector between Yucumo and Rurrenabaque, and 7, in the Southern Sector (Cascada and Sillar). A new track has been identified, which is apparently for timber harvest, stretching from the Michel buildings along the slope of the Pelado Mountains towards the West, branching off into the RB TCO. There has been evidence that, in the East/Southeast Sector of the RB TCO, the impacts of agricultural activities by mestizo communities are larger with 15 pockets of heat against none in the Central Sector in indigenous communities along the Quiquibey River, apart from extensive deforested zones in the highway sector versus minimum deforestation in the indigenous communities of the Quiquibey River.	Activity between SERNAP and CRTM. The Michel buildings track has not been changed, nor has it been further extended, since the intervention in the protected area after the first observation flight. The track to the telephone towers along the Pilón range, has also been halted to comply with the legal process brought by the protected area against the Municipal Government of San Borja. Three pockets of heat have been identified in the Southern Sector (Villa Tunari, Boquerón, and Michel buildings). In the Central and Western Sectors of the RB TCO, no problems have been identified. Along the Yucumo – Rurrenabaque road, pockets of heat have been identified near the Río Hondo and San José communities.

Source: CEPF FUNDESNAP CRTM sub-project Final Report (prepared by Juan Carlos Miranda, 2012).

A specific theme for a more robust coordination of highway construction monitoring activities within the Pilón Lajas protected area that needs to be monitored is streamflow, particularly considering the importance of conserving this protected area for the provision of water to the municipalities of San Borja, Rurrenabaque, and Reyes.

Table 4: Monitoring of RB TCO Pilón Lajas Streamflow Rates

			Coordinates		Date		Date	Date		
	Name of River	Time	X	Y	11/06/12	Time	08/08/12	09/08/12	DIFF Flow Rate	DIFF %
1	Arroyo la Herradura	11:45	675246	8394610	0.277	16:30	0.023		0.254	91.70
2	Arroyo la Asunta	12:15	679407	8393939	0.623	17:30	0.261		0.362	58.11
3	Rio Colorado	15:30	696512	8349666	0.632	08:00		0.417	0.215	34.02
4	Arroyo Siquili afluente Yacumita	17:25	704082	8334738	0.233	10:10		0.118	0.115	49.36
5	Rio Caripo	18:00	708355	8329591	0.407	10:45		0.201	0.206	50.61
6	Arroyo Aguas Claras	18:35	710944	8322828	0.665	11:25		0.623	0.042	6.32
7	Rio Yucumo	19:00	710987	8322892	0.606	11:40		0.343	0.263	43.40
8	Rio Piedras blancas	11:40				14:45		0.266		
9	Rio Cauchal	15:45				15:45		0.992		
					3.443		0.28	2.96		

Source: CEPF FUNDESNAP (prepared by Jaime Villanueva, 2012).

For activities like these, an exchange of knowledge has been established between the Environmental Monitoring Committees and the Hydraulics and Hydrology Institute of the UMSA for the monitoring of streamflows and the management of the road cut and fill areas that, in one case, significantly affected one of the rivers in that zone. Based on this experience and on this constellation of players, we considered that a highly effective way to generate capacities, even more than workshops or other formal capacity building efforts, is hands-on practice together with monitoring visits that include work on the different priority themes.

Finally, under the same project, FUNDESNAP applied the Management Effectiveness Tracking Tool (METT) in early 2011 to three national and two municipal protected areas. Designed by Stolton et al. (2007) for W WF and the World Bank, this tool is part of the WB's monitoring kit to measure Protected Area System Sustainability and enables the identification and valuation of themes such as threats to, and management tools for, protected areas. It is similar to other macro tools used by the National Service of Protected Areas at different moments of their mandate, such as measuring the Effectiveness of Managing the National System of Protected Areas (MEMS) which was implemented until 2007/2008, and Measuring the Effectiveness of Performance (MED), which is now under way. In late 2012, the METT was again applied to the three national and three municipal protected areas supported by the project.

In short, the monitoring system is carried out by local Environmental Monitoring Committees and by protected area personnel. The components of this system include both effect (threat reduction) and impact (condition of focal conservation targets) indicators. Thus, FUNDESNAP is focusing on monitoring the impacts of their contribution to the protected areas in Bolivia, while also using effect indicators to enable the development of new or complementary activities in an attempt to reduce the threats detected by the monitoring effort.

Monitoring periodicity and Investment Costs

The first visits of the local Environmental Monitoring Committees to the highway sections under construction in the area of influence of the protected areas were carried out in mid 2011. Since then, various follow-up activities have taken place virtually every quarter, and the second measurement of all indicators in the highway construction/improvement phase is currently being prepared.

Chart 5: METT tool application for the RB TCO Pilón Lajas in 2011

RB TCO Pilón Lajas (16.03.2011)				
Protected Areas Threats: Data Sheet 2				
Please tick all relevant existing threats as either of high, medium or low significance. Threats ranked as of high significance are those which are seriously degrading values; medium are those threats having some negative impact and those characterised as low are threats which are present but not seriously impacting values or N/A where the threat is not present or not applicable in the protected area.				
1. Residential and commercial development within a protected area				
Threats from human settlements or other non-agricultural land uses with a substantial footprint				
High	Medium	Low	N/A	
		X		1.1 Housing and settlement
			X	1.2 Commercial and industrial areas
	X			1.3 Tourism and recreation infrastructure
2. Agriculture and aquaculture within a protected area				
Threats from farming and grazing as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture				
High	Medium	Low	N/A	
	X			2.1 Annual and perennial non-timber crop cultivation
			X	2.1.1 Drug cultivation
			X	2.2 Wood and pulp plantations
			X	2.3 Livestock farming and grazing
			X	2.4 Marine and freshwater aquaculture
3. Energy production and mining within a protected area				
Threats from production of non-biological resources				
High	Medium	Low	N/A	
		X		3.1 Oil and gas drilling
		X		3.2 Mining and quarrying
			X	3.3 Energy generation, including from hydropower dams
4. Transportation and service corridors within a protected area				
Threats from long narrow transport corridors and the vehicles that use them including associated wildlife mortality				
High	Medium	Low	N/A	
X				4.1 Roads and railroads (include road-killed animals)
		X		4.2 Utility and service lines (e.g. electricity cables, telephone lines,)
		X		4.3 Shipping lanes and canals
			X	4.4 Flight paths
5. Biological resource use and harm within a protected area				
Threats from consumptive use of "wild" biological resources including both deliberate and unintentional harvesting effects; also persecution or control of specific species (note this includes hunting and killing of animals)				
High	Medium	Low	N/A	
	X			5.1 Hunting, killing and collecting terrestrial animals (including killing of animals as a result of human/wildlife conflict)
		X		5.2 Gathering terrestrial plants or plant products (non-timber)
	X			5.3 Logging and wood harvesting
	X			5.4 Fishing, killing and harvesting aquatic resources
6. Human intrusions and disturbance within a protected area				
Threats from human activities that alter, destroy or disturb habitats and species associated with non-consumptive uses of biological resources				
High	Medium	Low	N/A	
	X			6.1 Recreational activities and tourism
			X	6.2 War, civil unrest and military exercises
		X		6.3 Research, education and other work-related activities in protected areas
			X	6.4 Activities of protected area managers (e.g. construction or vehicle use, artificial watering points and dams)
			X	6.5 Deliberate vandalism, destructive activities or threats to protected area staff and visitors

Source: CRTM 2012.

The knowledge exchange process between the local Environmental Monitoring Committees and the Ecology Institute of the Universidad Mayor de San Andrés has cost 75,000 USD. Each monitoring visit or work meeting of the local Environmental Monitoring Committee costs between 250 and 400 USD. These amounts are further increased by the coordination and follow-up expenditures from FUNDESNAP, such as the complementary process of generating nearly 40,000 USD and the other sub-donations that have partly contributed to this process.

Results Achieved

To date, the local Committees for Environmental Monitoring have presented three complementary community environmental follow-up reports to the Deputy Minister for the Environment, SERNAP, and ABC. This information is enhanced by monitoring reports and personnel patrols of the protected areas, as well as with specific reports about the different priority themes, for example, monitoring of streamflows, and management of cut and fill along streambanks.

Main challenges and success factors

The monitoring activities undertaken thus far have kept up with the implementation phase of highway construction. The threats occasioned by the construction are monitored (i.e., changes to water flow rates, management of stream banks, etc.). Once the works have been finished and the highways start to operate, the environmental social, cultural and economic impacts will begin to be felt (i.e. deforestation, degradation of ecosystems, new settlements, new production patterns). The tools to proceed with the monitoring of the highway operation phase have already been developed during project meetings.

Neither the environmental standards of Bolivia, nor the safeguard policies of donors, provide for specific environmental monitoring measures for the mitigation of negative environmental impacts of major projects. For example, for highways, after construction / improvement works are finished, the main challenge is to ensure the maintenance of conditions for proper and effective community environmental management on the part of protected areas and municipal governments in coordination with local Environmental Monitoring Committees.

> **“The knowledge exchange process between the local Environmental Assessment Committees and the Ecology Institute of the Universidad Mayor de San Andrés has cost 75,000 USD.”**

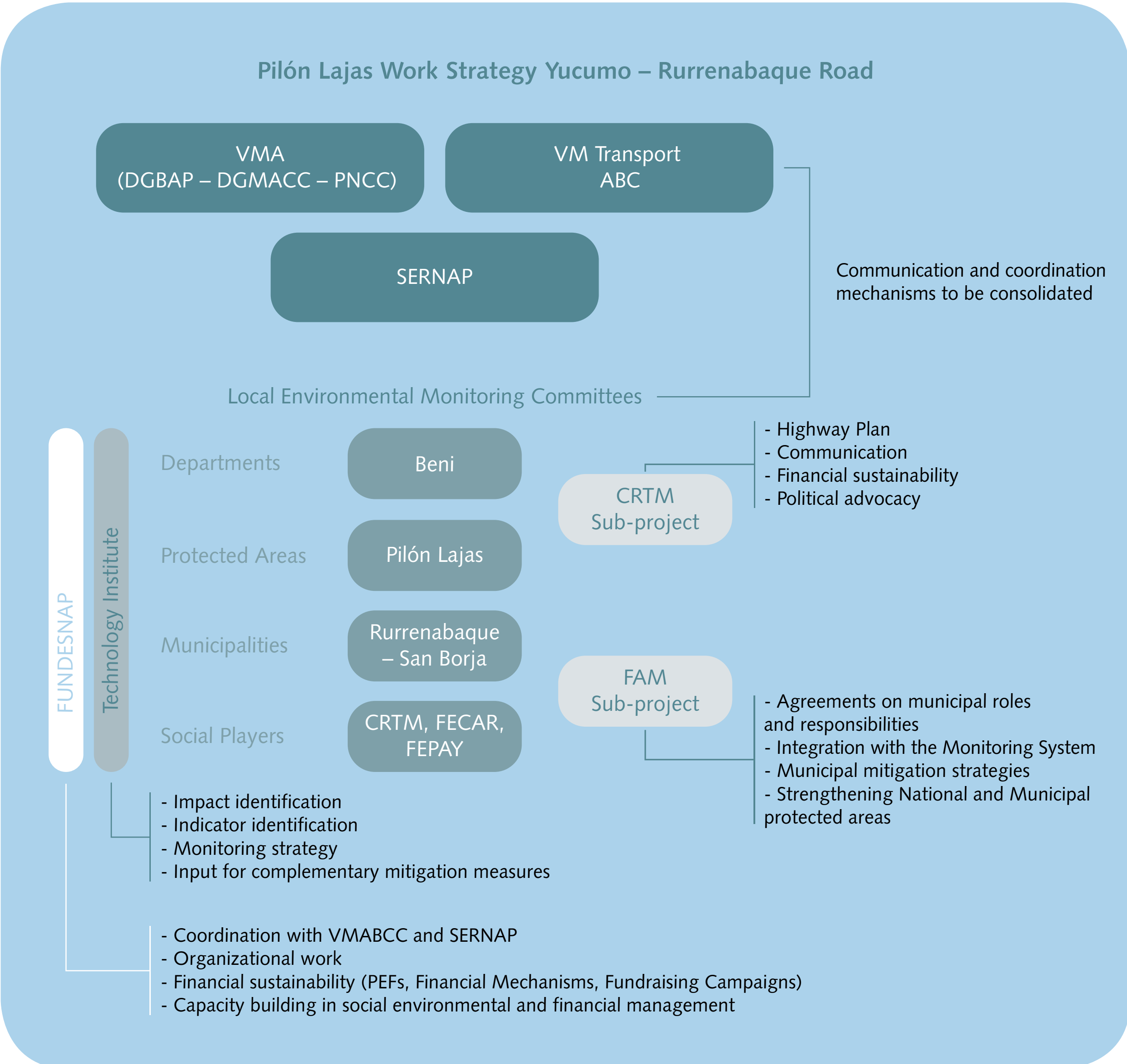
Financial sustainability is required to maintain capacities for continuous monitoring. One opportunity that could be built upon is the recent re-instatement of Management Committees for the Pilón Lajas and Madidi protected areas. They include the same players as the local Environmental Monitoring Committees, and this will facilitate the continuous integration of the information dealt with in managing the protected areas. Still, a most important challenge for the implementation of monitoring systems at the level both of individual protected areas and the Bolivian National System of Protected Areas has been to continuously generate relevant informa- tion for management and for focusing conservation actions and investments. The effort of generating information is often exhausted in the phase of developing the baseline. And though this information helps to better steer conserva-tion actions and investments, thus far there have been few repetitive data gathering activities to identify mid- and long-term impacts that may require further conservation actions and investments.

Graphic representation of the system

The set of monitoring components being implemented for the project supported by FUNDESNAP is graphi-cally presented below:

Chart 6: Working strategy for monitoring by different entities in relation to the RB TCO Pilón Lajas

Source: CEPF FUNDESNAP, 2011.



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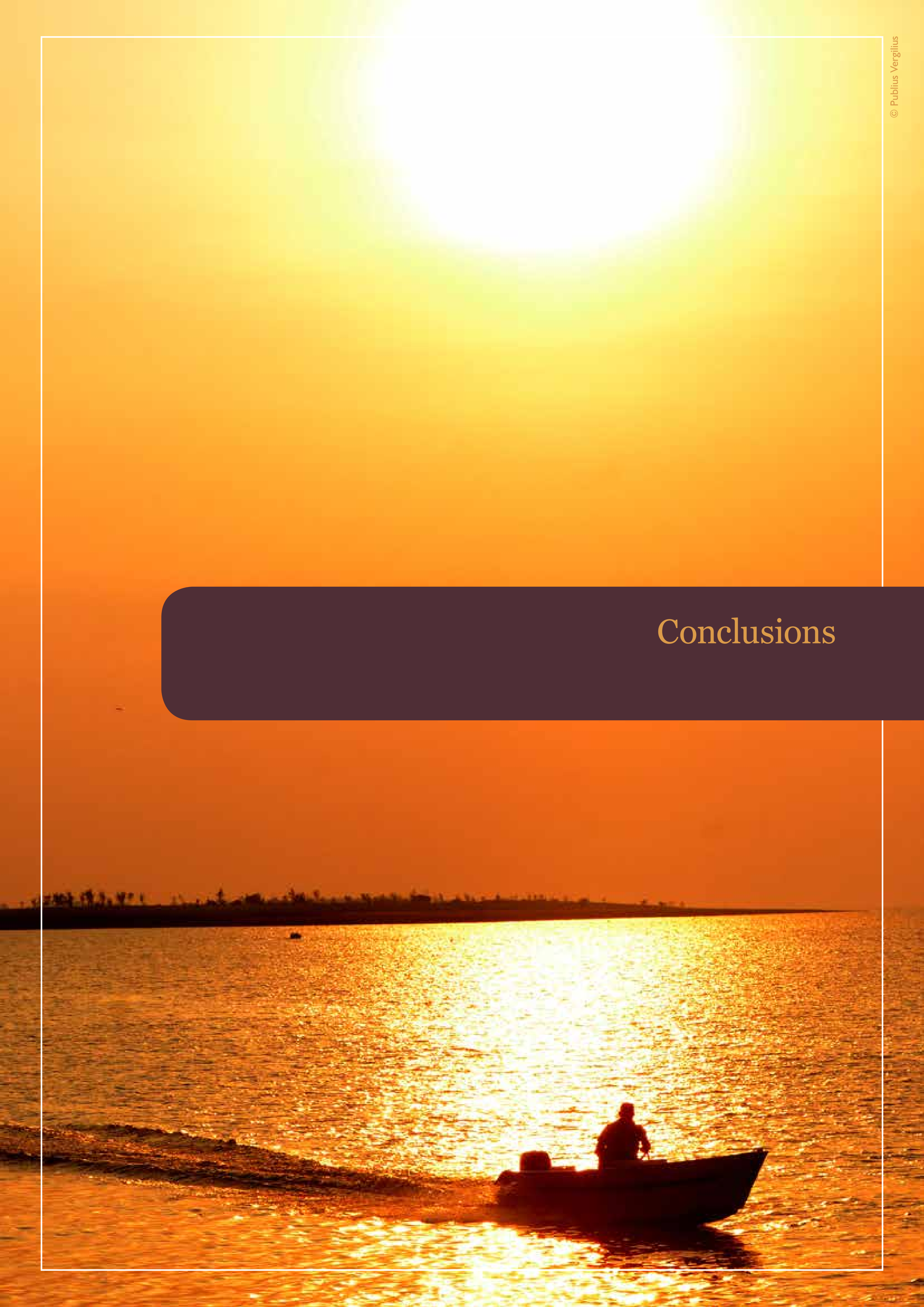
WWF & BM 2007: Management Effectiveness Tracking Tool. Reporting Progress at Protect Area Sites. Second Edition, Gland, Suiza. El Management Effectiveness Tracking Tool (METT) ha sido desarrollado por Sue Stolton, Marc Hockings, Nigel Dudley, Kathy MacKinnon, Tony Whitten y Fiona Leverington.



Conclusions

Outcomes

The workshop on monitoring EFs' impacts on biodiversity conservation in PAs was held in Lima, Peru, November 9-11, 2012, to present the recommended RedLAC impact monitoring system to interested EF personnel. The workshop served as a vehicle for building capacity in the use of the system, while at the same time serving as an opportunity to get first hand feedback and suggestions for improvements to the manual.

Workshop Objectives:

- Understand key concepts of biodiversity impact monitoring for PAs
- Analyze previous experiences and proven monitoring systems
- Understand the system proposed by RedLAC for biodiversity impact monitoring for EF projects that support PAs
- Analyze experiences in monitoring of biodiversity impact related to EFs
- Analyze the expectations and experiences of donor funds with impact monitoring
- Discuss the costs and funding for impact monitoring processes
- Discuss how to report the fund's aggregated impact monitoring results

Workshop Content Summary

This manual served as background material for the workshop. The workshop itself focused on presentation of the manual content, individual and group exercises, practical discussions, and additional case studies.

The workshop content was as follows:

I. Introduction

- General framework – what EFs seek to achieve
- Definitions and types of EF monitoring
- Main M&E methodologies for impact assessment – summary of experience

II. Monitoring Environmental Funds' Impact on Biodiversity

- Biodiversity indicators for PAs commonly used by EFs
- RedLAC proposal for a multidimensional M&E system for EF's impacts on biodiversity in PAs
- Viability and cost-effectiveness of using satellite images
- Trade-offs with respect to cost, time frames, accuracy, reliability and attribution
- Additional recommendations for best practices
- Advantages and limitations of the proposed system
- Incentives for adopting a biodiversity impact monitoring system
- Applicability of the system to both terrestrial and marine protected areas
- Scaling up from the Protected Area to the fund level and to the RedLAC level.

III. Case Studies

Strengths and weaknesses of the proposed RedLAC system as experienced by EFs that have applied it:

- PROFONANPE, Peru - Favio Rios
- Costa Rica Forever - Pamela Castillo

Experience with effect indicators:

- FUNDESNAP, Bolivia – Sergio Eguino
- SERNANP, Peru – Rudy Valdivia

Experience with impact indicators:

- Alto Chagres, Natura Foundation, Panama – Vilna Cuellar
- Malpelo Marine PA, Fondo para la Acción Ambiental y la Niñez, Colombia – Juan Carlos Sandino

Experience with Satellite Images:

- TerraLook – Alvaro Espinel
- Conservation International - Curan Bonham

Discussion Points and Conclusions

Throughout the workshop there was ample time for questions and answers, and discussions. Given that the proposed methodology is a work in progress – there were a lot of substantive comments designed to make the methodology more applicable and robust. These have also been captured through edits to the draft manual (October 2012) and are incorporated to this manual. The discussion points are presented by theme.

Attribution

Comments

- How do you distinguish the impact of your Project within the larger context?
- EFs have to be careful to not overstate the impact of their investment within the larger overall conservation effort. Governments can be particularly sensitive in this regard

Conclusion

- The way this is handled in the RedLAC system is to show what % of overall investment in the PA comes from the EF's project. That provides one indication of the proportion of the effort that can be attributed to the EF's input.

Definitions

Comments

- Outputs and outcomes are different so Figure 1 was corrected to reflect that.
- As used by IUCN, Outputs are the results of an intervention in terms of products and services, while outcomes are synonymous with impacts.

Conclusion

- "Outcomes" is part of the "impacts" column in Figure 1.

Geographic distribution of threats within PAs

Comments

- Threats are located in specific areas within a PA, but detection of each threat depends on your sampling intensity.
- Peru's GRILLA monitoring system measures the presence of threats within a grid superimposed on the PA, thereby making it feasible to calculate the % of the PA that is impacted by specific threats. Threats can be identified by any stakeholder, but are reported by the PA's administration. These are placed on-line so all stakeholders can indicate their agreement or disagreement.

Conclusion

- The GRILLA monitoring system, used by the Peruvian PA System, is one way of developing a Threat Reduction Index, and has the advantage of being able to show the spatial distribution of threats within a protected area.

Social indicators

Comments

- For many governments and communities, social indicators are more important than natural indicators.
- Foundations of Success has an excellent new paper: Addressing Social Results and Human Wellbeing Targets in Conservation Projects

Conclusion

- It was decided from the beginning that this project on monitoring would be limited to the impact of projects on biodiversity conservation in PAs. Inclusion of social indicators in the RedLAC system could be added in the future.

Size of PAs

Comments

- Size is an important factor in determining how to monitor a given PA. How does the RedLAC system take account of that?

- Indicators should be stated in terms of area so that the indicator is consistent between countries.
- In some instances, a project may finance work in only a part of the PA, and this should be reflected in the conservation index.
- It would increase clarity if indices were segregated according to size.

Conclusion

- The RedLAC system takes account of size at the national level by showing the area of PAs supported by each EF at the national level as a % of the overall PA system for that country. At the regional level, the overall RedLAC conservation index is adjusted to give greater proportional weight to large areas over smaller areas.

Project duration

Comments

- Measuring impacts on PAs of relatively short projects is quite different than measuring the impacts of a long-term project, or a PA supported by an endowment. How do we capture those differences?
- In many cases, an EF will have provided support to a site for a much longer period than data on impact indicators have been collected. This would provide the PA with a foundation of work that might not be picked up in the indices based on only recent data.

Conclusion

- For short-term projects, threat reduction is the most relevant indicator, while for longer-term projects measuring the status of conservation targets, especially using satellite images to detect habitat change, is usually the most relevant, and will reflect the conservation measures taken in periods before impact assessment data was collected.

Use of both species and habitats as conservation targets

Comments

- Should indices of change in species abundance and habitat be weighted equally in determining a biodiversity conservation index?
- Can we compare conservation impact indices when one is based on the use of satellite imagery and the other on indicator species? At least the summary sheets should have columns to show both so that it is clear which indices are being used.
- We need to consider implementing the system in steps. Species monitoring will be more difficult for most EFs, and we will have to invest in training, development of methodologies, and selection of indicator species. It will take a few years. We should start by using the analysis of satellite images, and then add on information on indicator species as possible. A single contractor for the analysis of satellite images for all PAs financed by RedLAC Member EFs would be ideal.
- We also have to remember that for marine PAs, the only method available is the monitoring of indicator species.

Conclusion

- The proposed RedLAC system weights species and habitats equally, though each is recorded separately and could be weighted differently if there were reason to do so.

Number of sampling points for determining the conservation status of indicator species

Comments

- How many sampling points are recommended for determining the conservation status of indicator species in each PA?

Conclusion

- The proposed RedLAC system recommends a minimum of 4 measurements each for 2 indicator species. However, the more measurements that can be made and the more complete their geographical distribution, the better.

Cost implications

Comments

- Costs can be extremely high. We are supporting PAs where data acquisition and analysis costs are $100,000/yr. just for data relating to fire control.
- It would be ideal for RedLAC to contract a single provider to carry out the acquisition and analysis of satellite images to determine habitat change and fragmentation for all PAs that receive funding from member EFs. An endowment fund would be needed to guarantee the long-term viability of the system.
- Where possible, it is best to use data that has already been gathered by others to reduce costs.

Conclusion

- In some cases, use of satellite images can lower costs, while in others it will increase costs. It depends on the size of the PA, and existing institutional capacities. In many cases only one image is needed. Free images are available for most areas and the price is low for images that need to be purchased. Park staff can also help lower costs by monitoring indicator species during their normal patrols.

Demand for monitoring data

Comments

- Our EF receives regular questioning on conservation effectiveness from stakeholders. We are continually asked to justify our existence and to prove that the EF is making a difference on the ground, especially by Government.

“Each EF should seek to develop the basic RedLAC monitoring system as it can, building on its strengths.”

- Pressure to show results comes more from Government than from donors. Government sometimes feels threatened by an EF that receives funds that it considers should have come directly to Government.
- What is needed is to show long-term impact.
- While in the Ministry of the Environment, biodiversity indicators are considered relevant; in other ministries it is social indicators that are considered most relevant.
- Certainly there is interest on the part of donors to determine the conservation impact of their investments. However, on the government side the interest in many cases is in knowing how the funding was generated and how it is being managed.
- In many cases, our EF gets asked to justify why investments are made in biodiversity conservation instead of in food production, security, infrastructure, etc.
- It is important to carry out impact assessments for ourselves as well, and for our Boards of Directors. We do not invest in all protected areas, so we really cannot compare ourselves with Government, and in any case, the Government does not have the data to assess their own impact.
- Governments make commitments under international conventions, and biodiversity impact assessments for PAs should help them in developing required reports to the Conventions.
- Our EF promotes community governance of PAs and we need to use methods that show how community-managed PAs are achieving conservation.
- We have to demonstrate to communities that live in PAs that EF projects are having positive impacts on biodiversity conservation. There is a need to explain the role of the EF and its value to the community
- Having a sound and effective monitoring system in place gives an EF an advantage when seeking out new donors. It is a way of distinguishing the institution.
- Development and implementation of a monitoring system cannot be left to Governments, because in many cases they do not do it. In such cases, the pressure will be on the EFs to do it.

Conclusion

- The RedLAC Monitoring System provides a common methodology and format for measuring the impact of EF projects on biodiversity conservation in PAs. The data can be used in a variety of ways to demonstrate the impacts of EF investments; provide quantifiable results that can be used to compare projects and EFs; show the impact of RedLAC as a group; measure progress over time; and provide key inputs for the adaptive management process.

Presentations

Throughout the workshop, presentations and comments were captured on both large graphic images as well as through minutes. This section summarizes the most important conversations.

1. SWOT analysis of RedLAC Monitoring system

Presented by Costa Rica Forever and PROFONANPE based on their pilot applications of the RedLAC system (Pamela Castillo and Favio Rios)

Strengths

- System uses historical data that was gathered for development of the management plan
- Relatively low cost; uses free satellite images to detect habitat changes
- The PA Administration is engaged in the monitoring process
- Adaptive and flexible

Weaknesses

- Subjectivity of the Threat Reduction Index
- Only way to attribute impact of the EF's investment is indirect as a % of the overall investment.
- Does not compare conservation status of indicator species inside the PA with the status of those outside the PA.
- Species population studies require a lot of time and regular follow-up.
- Not a part of the on-going government data collection system.

Opportunities

- Can involve local people in monitoring
- Quantitative data on indicator species reduces subjectivity
- Can make use of volunteers and scientific studies to collect data on indicator species.

Threats

- Will not be useful unless applied systematically over time.
- Needs long-term support by the PA management agency.
- There is a temptation to make the system overly complicated.
- Requires staff time and specialized capacities, such as ability to acquire and interpret satellite images.
- Represents long-term management cost.
- System not yet tested in marine areas.

2. Chagres case study

Presented by Fundación Natura Panamá (Vilna Cuellar - see text beginning on page 49 of the Manual)

3. FUNDESNAP case study

Presented by FUNDESNAP (Sergio Eguino - see text beginning on page 55 of the Manual)

4. Case study on the use of the GRILLA methodology for monitoring of the Peru PA system

Presented by SERNANP (Rudy Valdivia)

- Remote sensing has its strengths, especially its low cost for large areas, but it also has its limitations. It generally cannot be used to detect species abundance, contamination, invasions, or other features important to conservation.
- The GRILLA methodology was implemented to complement analysis of satellite images.
- A grid system overlays a map of the park and each cell has a number. The size of the cells varies according to the total area of the PA. Existing, verifiable threats are tabulated on an annual basis (potential threats are not included) with respect to the cells where they exist.
- There is a learning curve. The reporting of threats improves over time, as does the ways these threats are verified and confirmed by making them available to stakeholders.
- The results for each component of the PA system are reported annually and posted on the internet for public viewing. The method is used specifically as a key indicator of management success and is reported to the Ministry of Finance to justify the annual budget, and to report to donors.

5. TerraLook: Simplified Access to Satellite Images

Presented by TerraLook (presentation developed by Gary Geller, and presented by Alvaro Espinel)
(see http://terralook.cr.usgs.gov for more information)

- Satellite images have been available for more than 40 years
- Increasingly important to conservation users for monitoring change (especially land cover and use), mapping, planning, and communicating.
- Many satellite images and formats are complicated, hard to use, require specialized software, and are expensive
- TerraLook designed to be simple, user-friendly, and free
  - Global coverage
  - Online tool to identify and order images of interest
  - Free, open source software specifically for TerraLook available online for image processing and GIS capabilities
- LandSat and ASTER Images available free
  - LandSat image size is 180 x 180 km.
  - ASTER image size is 60 x 60 km.
  - Georeferenced JPEG format with simulated natural color
- TerraLook Software
  - Simple and intuitive

- English and Spanish
- Current version: 2.0 ("Machu Picchu")
- Can display images, look at current and past images side by side, detect change over time, and create and display overlays

- Limitations
  - LandSat images available on 5 yr. Cycles, but a workaround is available to provide 1-4 images for each year
  - ASTER – full archive available
  - Cloud cover sometimes an issue
  - Selective logging or other issues may not be visible
- Coming in 2013
  - TerraLook-inspired online, web-based system using Google "Earth Engine"
  - Access to full LandSat archive plus other sensors
  - Some new capabilities

6. Presentation on the monitoring system used by CI for the Global Conservation Fund

Presented by Conservation International (Curan Bonham)

- System monitors 4 components
  - Management effectiveness (METT method)
  - Financial effectiveness (survey)
  - Deforestation rates (satellite images); or changes in the abundance of target species when satellite images are not available
  - Return on investments (accounts)
- Use of satellite images
  - Image acquisition and processing
  - Compare images over time
  - Validation and refinement
  - Compare PA and buffer zones
  - Cost about US$2,000 per PA per analysis

Next Steps

Along with the decision to make changes to the manual based on the recommendations of the participants, at the end of the workshop a discussion was held on next steps and the willingness of EFs to apply this methodology going forward.

Comments:

- It would be good for EFs to host meetings with stakeholders to share monitoring results and to developed inter-institutional committees to discuss how to improve monitoring. During such meetings, data can be shared, concepts clarified, and a culture of monitoring promoted among stakeholders
- Our EF only deals with community conserved areas and we have to consider how to put in place an M&E system for each client. We will organize a meeting with the network of community conserved PAs, and discuss how to set up our own M&E system.
- It is important that we in RedLAC move together to put in place a basic M&E system that takes into account our discussions at this workshop.
- In the future it would also be important to include in the RedLAC monitoring system indicators of climate change.
- The African EFs, now grouped together in CAFE, want to continue to work with RedLAC and its members. We value the assistance you have provided as it has helped us to advance more rapidly.
- It would be useful to include M&E data in the RedLAC Ecofunds Database.

Conclusions

- Each EF is different. For some it will be easier to develop methods using indicator species than it will be to develop capabilities for analysis of satellite imagery. The point is that each EF should seek to develop the basic RedLAC monitoring system as it can, building on its strengths.
- It is important to continually strive for simplicity so that the monitoring systems are used, and not discarded because they are too costly or onerous. It is often necessary to challenge academics in this sense, since their tendency is to want to make systems more complex so that they capture variability in time and space.
- RedLAC plans to begin the Ecofunds Database with financial information first, and then include biodiversity conservation impact assessment data as it becomes available
- RedLAC will be pursuing the development and marketing of a follow-up project on biodiversity conservation impact assessment that will include a component to develop a feasibility study for establishment of an endowment fund for the acquisition and analysis of satellite images to detect habitat changes beginning with the PAs that are supported by endowment funds over the long-term.

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