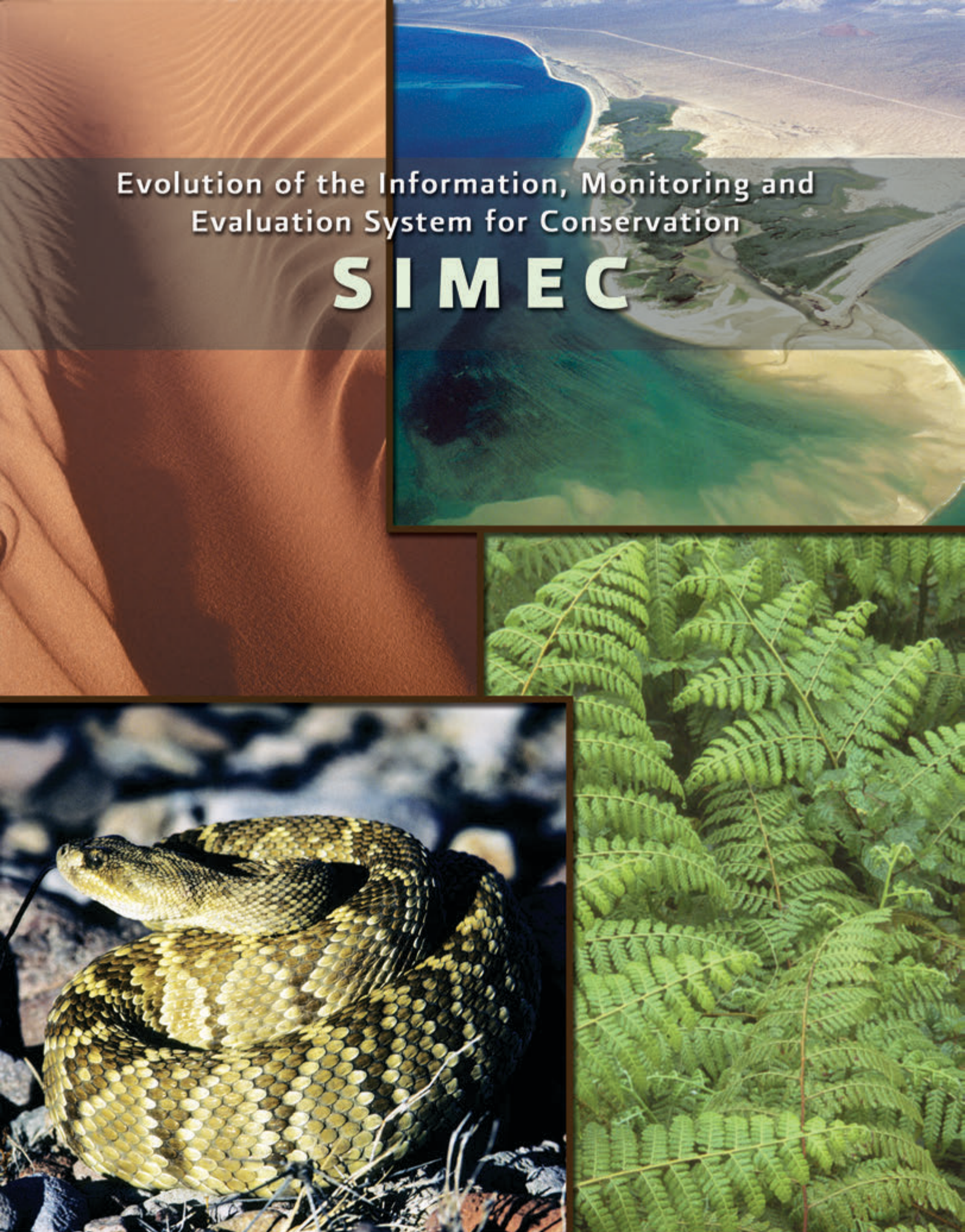


Evolution of the Information, Monitoring and Evaluation System for Conservation

SIMEC

Vivir Mejor

FONDO MEXICANO PARA LA CONSERVACIÓN DE LA NATURALEZA, A.C.
Institución Privada.

COMISION NACIONAL DE ÁREAS NATURALES PROTEGIDAS

GOBIERNO FEDERAL

SEMARNAT

ESTADOS UNIDOS MEXICANOS

Evolution of the Information, Monitoring and Evaluation System for Conservation

SIMEC

2010

Presentation

Since its creation, ten years ago, the National Commission on Natural Protected Areas (CONANP), has been developed with a vision of working together with allies from all societal sectors, in order to succeed in the conservation of protected areas and other modalities of conservation. With its commitment to people, the Commission has made every effort to work effectively and transparently.

These efforts are reflected in the creation of the Information, Monitoring and Evaluation System for Conservation (SIMEC) in 2001, when for the first time in the history of Protected Areas it became possible to practice accountability through an instrument that began as a working philosophy, a form of working within a growing institution, with an accelerated dynamic of generating knowledge about ourselves and about our allies.

Today, the SIMEC has become an institutional tool that has been developed thanks to the work of all of us who work at the CONANP, together with the invaluable support of our allies and partners in conservation, individuals, organizations and institutions from all sectors.

This tool has allowed us to assemble information, at a national and international level, on issues relating to the conservation, protection and management of Protected Areas and other modalities of conservation and translate it so as to inform all sectors of society about the progress made by the institution to comply with our mandate. It has also enabled us to correct our course, make adjustments to national, regional and local processes, and take decisions in a planned manner, guided by a continual improvement process to achieve the goals and targets of the institution.

In light of the above, and in accordance with the aims of the SIMEC to provide information about the activity of the CONANP, the present publication is a sample of ten years of work creating, developing and operating the SIMEC based on a philosophy of transparency and accountability, about what we do and how we do it, and most importantly how far we have advanced in the conservation of our natural heritage.

Luis Fueyo Mac Donald
National Commissioner for Natural Protected Areas

Mexico is the fourth-richest country in the world in biodiversity and the country of origin for around one hundred different crops. Conservation of its natural wealth represents a major challenge, for which knowledge generation is a strategic investment. The National Commission for Natural Protected Areas (CONANP) is responding to this priority. The present publication describes the efforts made by the CONANP and its partners in terms of generating information, monitoring and evaluation. This is the result of a decade of working and learning.

The Information, Monitoring and Evaluation System for Conservation (SIMEC) was set up by the CONANP in 2001, and to date it has resulted in notable advances. An important step was to bring together the different actors who have shared information, and continually adjust our trajectory according to independent evaluations. The generation of a significant number of indicators, together with the compilation of the corresponding data, quantification of goals and ongoing adjustments have allowed us to enjoy in Mexico a practical tool that will soon be available for consultation on-line.

The SIMEC is valuable for two reasons: 1) it allows adaptive management of protected areas; and 2) it generates key information for local appropriation and general support. Adaptive management based on reliable and opportune information is the surest method of increasing effectiveness in the management of our protected areas. The generation of information, together with a good communication strategy, leads to a higher level of public participation.

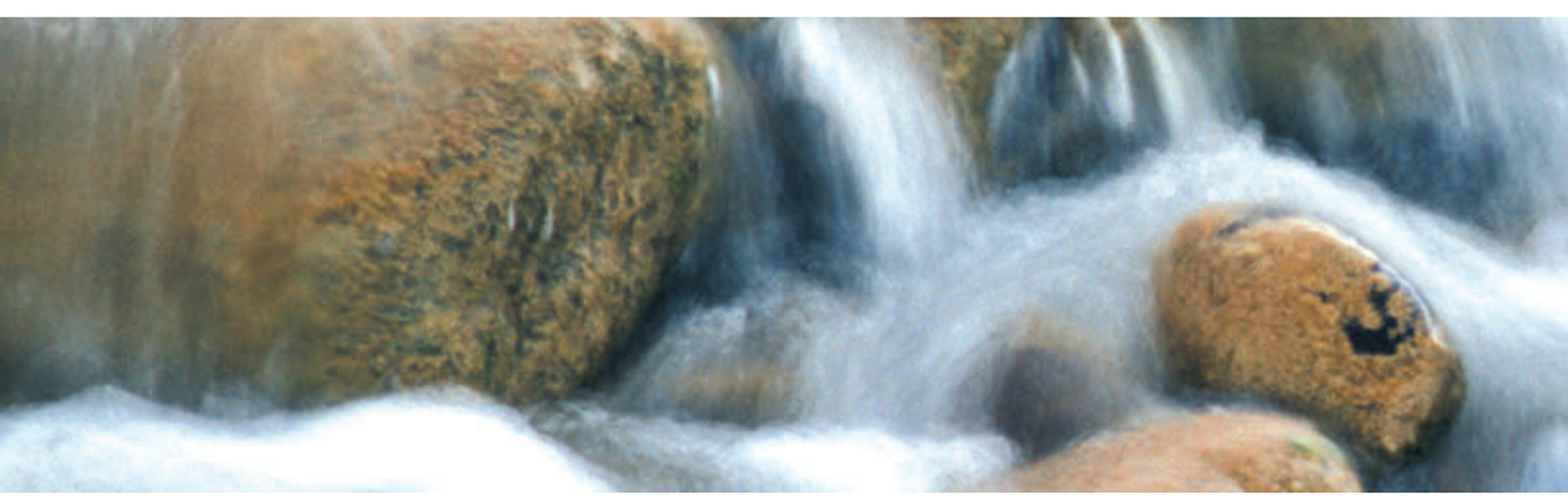
The SIMEC has three components. 1) The information component brings together practical data and documents relating to each protected area, providing us with an approach and a commitment to our natural heritage. 2) The monitoring component focuses on coverage of natural habitats and populations of key species, like a thermometer of our ecosystems' health. For example, data on the number of Hawksbill sea turtle nests in the Laguna de Términos protected area displayed an increase up until the year 2000. After this date numbers began to fall again, which is related to climate change and the increasing loss of coastal areas. 3) The evaluation component of the SIMEC quantifies the results in the field of the investments made by the CONANP. In this way we can know that the number of communities that have benefited from being in a protected area are on the increase.

As a partner of the CONANP we celebrate these advances and commit ourselves to continue accompanying this process, as we have done since 1997. We perceive two major challenges ahead. The first one is the generation of alliances with institutions to support the CONANP in monitoring the health of ecosystems in protected areas over the long term, permitting independent evaluation, which without a doubt will be a significant aid in the management of the CONANP. A second, equally significant, challenge will be to continue refining indicators and methodologies to generate reliable data, favoring quality over quantity. Responding to both challenges simultaneously will make it possible to establish a reliable nationwide monitoring system of federal protected areas, an indispensable tool for building a future through conservation.

Lorenzo Rosenzweig Pasquel
Executive Director of the Mexican Fund for Nature Conservation (FMCN)

ABBREVIATIONS AND ACRONYMS USED

AICA	Important Areas for Bird Conservation
AOP	Annual Operating Program
APFF LT	Laguna de Términos Flora and Fauna Protection Area B2B Baja to Bering Sea Initiative
BR	Biosphere Reserve
CBD	Convention on Biological Diversity
CCA	Environmental Cooperation Commission CICIMAR-IPN National Polytechnic Institute Interdisciplinary Marine Science Center
CIIEMAD-IPN	National Polytechnic Institute Interdisciplinary Environment and Sustainable Development Study and Research Center
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMP	Conservation and Management Program
COBI	Comunidad y Biodiversidad, A.C.
CONABIO	National Commission for the Knowledge and Use of Biodiversity
CONAFOR	National Forestry Commission
CONANP	National Commission for Natural Protected Areas
CONAPESCA	National Aquaculture and Fishing Commission
CONEVAL	National Council for the Evaluation of Social Development Policy
COP7	Seventh Conference of the Parties to the Convention on Biological Diversity
CONAPESCA	Comisión Nacional de Acuacultura y Pesca
CONEVAL	Consejo Nacional de Evaluación de la Política de Desarrollo Social
COP7	Séptima Conferencia de las Partes del Convenio sobre Diversidad Biológica
CRUNO-UACH	Northwest Regional University Center – Autonomous University of Chapingo
EIA	Environmental Impact Assessment
ERIC	Rapid Climate Information Extractor
ERMEXS	Mexico Receiving Station of the Spot Constellation
FANP	Natural Protected Areas Fund
FAO	Food and Agriculture Organization
FMCN	Mexican Fund for Nature Conservation
FOS	Foundations of Success
GEF	Global Environment Facility
GIS	Geographic Information System
INAPESCA	National Fisheries Institute
INEGI	National Institute for Statistics and Geography



ITMAR	Technological Institute of the Sea
IUCN	International Union for the Conservation of Nature
MAB	Man and the Biosphere Programme
MPA	Marine Protected Area
NAMPAN	North American Marine Protected Areas Network
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NP	National Park
NPA	Natural Protected Area
NPNPA	National Program of Natural Protected Areas 2007-2012
OECD	Organization for Economic Co-operation and Development
PACE	Endangered Species Conservation Action Program
PNCP	Cabo Pulmo National Park
POET	Environmental Zoning Program
PROCER	Endangered Species Conservation Program
PROCODES	Conservation Program for Sustainable Development
PRODERS	Regional Sustainable Development Program
PROFEPA	Federal Attorney for Environmental Protection
PROMAC	Conservation Program for Native Corn
PT CONANP	Working Program 2001-2006
RAMSAR	Ramsar Convention on Wetlands
RARE	International conservation organization for endangered species and ecosystems
RBISPM	Isla San Pedro Mártir Biosphere Reserve
REEF	Reef Environmental Education Foundation
SEMARNAT	Ministry of Environment and Natural Resources
SGPOA	General System for Annual Operating Programs
SIMEC	Information, Monitoring and Evaluation System for Conservation
SINAP	National System for Protected Areas
SP	Strategic Plan
TEP	Temporary Employment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
WCPA	World Commission of Protected Areas
WWF	World Wildlife Fund

CONTENTS

I. INTRODUCTION

Historically, evaluation of social programs and projects began in the fields of health and education. It wasn't until the 1960s that evaluation emerged as a significant aspect of public social programs. In the United States, for example, in the 60s and 70s the federal government began to make major expenditures on a series of social programs, and a sense of responsibility emerged with regard to the results of these, which created a demand for an empirical and systematic method of evaluating their efficacy. This need led to the creation of this field of work. The origins of program evaluation lie in the practice of measuring their outcomes, and emerged as a specialized professional field on the basis of two fundamental lessons that had been learned: the lack of financial resources for all the necessary projects; or, on the contrary, sufficient financial resources but more complex problems, such as the time necessary to make use of those resources. Given these situations, it was essential to be able to decide how to prioritize which actions to take, and that is how evaluation processes came to be established, in November 1995 at the First International Evaluation Conference in Vancouver, Canada.[1]

The demand for evaluation mechanisms grew and extended to the private sector, foundations and civil society organizations, together with academic institutions, among others. The World Bank, Global Environmental Facility (GEF) and the United States Agency for International Development (USAID) are a few examples of organizations that have offices to evaluate their programs. In 2002, The Nature Conservancy developed a set of audits and measures that included the participation of other organizations in order to assess their achievements.[2]

Meanwhile, Latin American countries face economic, political and social changes as part of the process of entering the market economy, while high levels of poverty and inequality persist. State reform processes and the resultant "modernization" of public institutions; the quality and impact of policies, the growing levels of participation by citizens who demand transparency and accountability, and the emergent issues and problems all make it necessary for evaluation to take into account theories and methodologies that respond to these changes. Evaluation has not only undergone conceptual and methodological changes, but has also changed with regard to the place it occupies in society, such that it is no longer only a function directly associated with those who plan and take decisions, but is also a tool for organizational learning, accountability and empowerment of social actors.[3]

These international efforts coalesce in a philosophy of information integration for program evaluation required by an internationally-recognized and acclaimed institution. For this reason, over the last ten years, the Evaluation and Monitoring Office of the National Commission for Natural Protected Areas (CONANP) has developed a strategies for designing and operating a system that promotes the internalization of processes of planning, follow-up and evaluation. For the first time in the history of conservation of Natural Protected Areas (NPAs) this led to the creation of the System of Information, Monitoring and Evaluation for Conservation (SIMEC) whereby the information generated within the institution is systematized and analyzed in order to provide reports about the institution's activities and how it meets its objectives, and above all to reveal the impact of the conservation strategies on the protected areas that are under the care of the institution.

[1] *Cracco, M., J. Calvopiña, J. Courrau, M. Medina, I. Novo, I. Oetting, J. Surkin, R. Ulloa and P. Vásquez, 2006. Fortalecimiento de la efectividad de manejo de áreas protegidas en los Andes. Análisis comparativo de herramientas existentes. UICN. Quito, Ecuador.*

[2] *The Nature Conservancy, 2002. Measuring success: The Parks in Peril Site Consolidation Scorecard Manual. p. 22.*

[3] *Congreso Internacional de Evaluación y III Conferencia ReLAC, "Reformas sociales, evaluación y participación ciudadana en América Latina: debates y posibilidades", 2010. Conferencia Magistral titulada "Evaluación, política y políticas en América Latina" - Nerio Neirotti, Vicerrector Universidad de Lanús, Argentina*

In 2007 the SIMEC initiative was joined by a federal government program to institutionalize planning, monitoring and evaluation systems throughout its departments in order to establish an annual "Results-Based Budgeting". This process consists of a set of activities and tools to support budgeting decisions with information that systematically incorporates evaluation of the results of the use of public resources, thereby motivating public institutions to achieve an improvement in the quality of federal spending and promoting appropriate accountability, using the logical framework methodology.[4]

Naturally, alliances have played an important role in this process. One of the most successful is that established with the Natural Protected Areas Fund (FANP). In 1997 the signed an agreement with the Mexican government and the Mexican Fund for Nature Conservation (FMCN) that led to an initial outlay of funds from the Global Environment Facility (GEF), a contribution that allowed the creation of the FANP. In this innovative public-private initiative, the FMCN takes charge of the financial management of the FANP, channeling the earned income to the basic operation of the priority NPAs via the Annual Operating Plan (AOPs), supervising their use and procuring additional funding. Since 2009, part of the interest from the FANP continued to support the operating costs of the NPAs, while most of the resources are aimed at Innovative Strategic Projects (ISPs), conservation projects carried out by Mexican non-governmental organizations (NGOs). The ISPs are focused on consolidating the management of priority NPAs and responding to the threats identified in the strategic planning for each area. Coordination and cooperation between the CONANP and the NGOs enhances the success of these projects. Meanwhile, the Mexican government, through the CONANP, ensures that these funds are put to use in the field for strategic conservation activities. Over the last decade, the FANP has quadrupled its endowment thanks to the contributions from a second donation by the World Bank and 13 further donors, and due to this today it is possible to support 23 NPAs in developing a range of conservation activities (such as biological monitoring of species and the rate of habitat change).

Today the challenge of conserving our ecosystems and their biodiversity is greater than ever. Alliances based on complementarity of strengths, on mutual respect and a shared vision, are the way forward. Progress is measured with indicators and continuous monitoring. It is only thanks to the use of such measures that alliances can weigh up, plan, and adjust. For this reason, the present publication about the use of the SIMEC is timely, since part of the results presented in this document have been supported by the FANP, including some of the biological monitoring projects and the estimations of the rate of natural habitat change in terrestrial NPAs.

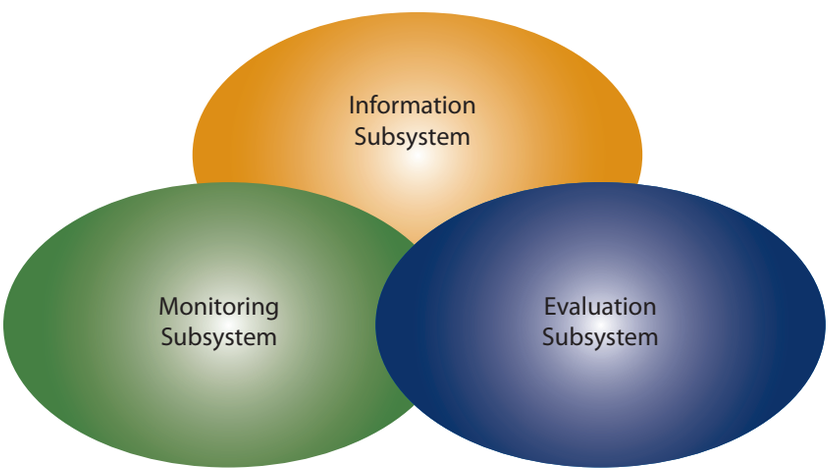
[4] *For further information see the Ministry of Finance and Public Credit website http://www.apartados.hacienda.gob.mx/sed/*

II. GENERAL OBJECTIVE OF THE SIMEC

In 2001, the Ministry of Environment and Natural Resources (SEMARNAT), through the CONANP, established the Evaluation and Monitoring Office as the area responsible for designing and developing the SIMEC, as indicated in article 149, paragraph VI of the SEMARNAT Internal Regulations.[5]

The general objective of the SIMEC is to "Possess a system that comprises biological, geographical and social indicators which make it possible to make known the results of the effectiveness and impact of the application of public policies to federal Natural Protected Areas and other modalities of conservation."

The SIMEC has been conceptualized according to three operational aspects:



1) Information Subsystem. The specific aim is to consolidate information produced by the CONANP that fits the general purpose of the SIMEC, in order to facilitate its location by users.[6]

2) Monitoring Subsystem. The specific aim is to provide users with technical data sheets giving the results of key species biological monitoring carried out in NPAs.[7]

3) Evaluation Subsystem. The specific aim is to explain and display the results obtained in different kinds of evaluation carried out by the CONANP.[8]

While it is the case that each subsystem contains different and independent information, this data is complementary in terms of evaluating the fulfillment of the public policies set out in the National Program of Natural Protected Areas 2007-2012 (NP-NPA) and the interaction of the subsystems that allows evaluation of the effectiveness in conservation of NPAs.

That is why it is important for the CONANP to share with readers how the process of design, development and operation of the SIMEC has evolved, as will be seen below.

[5] *Official Gazette of the Federation, published November 29, 2006.*
[6] *For further information see Section IV, Information Subsystem, below.*
[7] *For further information see Section V, Monitoring Subsystem, below.*
[8] *For further information see Section VI, Evaluation Subsystem, below.*

III. HISTORICAL OVERVIEW OF THE DESIGN AND OPERATION OF THE SIMEC

The design and operation of the SIMEC has presented an institutional challenge, due to the complexity of the programs and projects that are developed year after year, as well as the number of actors involved in generating the information that feeds each of the subsystems. The major steps that have been taken to date are summarized below.

Throughout **2001** – through a participatory strategic planning process – the 2001-2006 CONANP Working Program (PT) was established, comprised of 11 processes, 12 projects and 53 indicators. During the planning process, the goals to be reached for each indicator were defined. Based on this master plan, the first steps were taken to organize the institutional role. Various governmental and civilian institutions that are involved in the institution's role participated in the process alongside CONANP administrators.

That year, a literature review was prepared on different measurement methodologies, including those used by the International Union for Conservation of Nature (IUCN), The Nature Conservancy (TNC), World Wildlife Fund (WWF), Organization for Economic Cooperation and Development (OECD) and the De Faria methodology, which has been implemented in several Protected Area systems in Latin America, among others. The conceptual framework was prepared based on Hockings'[9] methodology, which assesses management effectiveness in protected areas, and was used to define the six-year strategic planning cycle.

In **2002**, the administrative units that generated information were identified and a link was formed between the information and each of the strategic indicators. The first form was designed in Excel so that the administrative units could generate their annual operating programs in alignment with the Working Program (PT). Measurement units were established for each indicator in order to standardize the information produced by different supervisors, guidelines and frequency.

The distinct information generators were informed about the responsibility that they would take for PT processes and projects and the need to submit the results of the tasks performed in due time and manner. Thus, the first systematization of the results for each of the strategic indicators was carried out.

During **2003**, a data search was made and databases were developed for the strategic indicators, and various analytical tools were identified. An analysis was performed on the different substantive activities that linked each one of the strategic indicators in order to improve the quality and relevance of the information.

In **2004**, the mid-term evaluation process was held to evaluate the PT implementation resulting in a more streamlined process and an improved institutional measurement system. In order to perform the PT evaluation, the results that were obtained during the first three years for each strategic indicators were reviewed. Based on the results of the process, 25 indicators that did not fulfill their function were eliminated because they duplicated results with other measurements, rendering them irrelevant, leaving 28 strategic indicators to be applied during the second three-year period (2004-2006). This improved the information-gathering and quality evaluation procedures, and reduced information gaps.

In order to disseminate the SIMEC design and construction process, in **2004** the first publication was produced to present the first steps taken by CONANP, such as the preparation of the PT comprised 11 processes, 12 projects and 53 indicators. Based on this effort the first alignment of the different administrative units comprising the Commission was undertaken, and the first guidelines, measurement units, annual goals and the systematization of the results of each of the indicators were defined.

[9] *Hockings, M., Stolton, S. and Duley, N. 2000. Evaluation effectiveness: A framework for Assessing the management of protected areas. IUCN.Gland, Switzerland and Cambridge, UK. X + 121pp.*

During **2005** and **2006**, the results of the 28 strategic indicators that had been defined during the PT mid-term evaluation process were systematized. At the end of 2006, the diagnostic process was begun on the results that were obtained during the PT implementation, which served as a base for the NPNPA.

In **2006**, the second SIMEC publication was presented and the developments of the three subsystems that make up the system (information, monitoring and evaluation) were disseminated. It included a description of the process of improving the definition, construction and streamlining of the indicators after the PT review and mid-term evaluation, as well as its implementation through the annual operating programs for the responsible units. This publication included various examples of biological monitoring and progress in some of the strategic indicators.

In **2007** the strategic planning process was carried out again in order to integrate the NPNPA[10], which was aligned with the 2007-2012 National Development Plan strategies with the Environmental Sustainability Axis and with the objectives of the 2007-2012 Environment and Natural Resources Sector Program. During the joint planning process, the CONANP mission and vision revised and modified, and were expressed as follows.

Mission: "To preserve Mexico's natural heritage through the Protected Areas and other conservation measures, fostering a culture of conservation and sustainable development in the surrounding communities".

Vision: "Within six years, the CONANP will have led the articulation and consolidation of a national system of Protected Areas and of diverse conservation methods for land, water, marine, coastal and island ecosystems and their biodiversity. The system will involve the three levels of government, civil society and rural and indigenous societies, which will be representative, systemic, functional, participatory, socially responsible, subsidiary and effective".

Another substantive change in producing the NPNPA was the push toward internal work through the definition of six strategic approaches: 1) protection; 2) management; 3) restoration; 4) knowledge; 5) culture, and 6) administration.

The NPNPA was comprised of 49 indicators distributed throughout the six strategic approaches, through which the effectiveness and impact of the application of public policies in the Protected Areas and other conservation methods could be analyzed. Again, the strategic planning process was carried out with the CONANP different administrative units and members of different academic and government institutions, as well as organizations from civil society.

This effort allowed us to mesh the work of the different administrative units that comprise the CONANP, and to define the guidelines for the new indicators, measurement units, annual goals and the systematization of the results for each of the indicators.

In order to ensure the alignment of the annual results with the NPNPA for the different administrative units as well as the quality of information, on **2007** the General System of Annual Operating Programs (SGPOA) was developed and was implemented in **2008**. It operates through a restricted-access Intranet and may be accessed only by CONANP personnel with appropriate access codes. Through the SGPOA, supervisors of each administrative unit registered the projects for each of the categories of the six strategic approaches. Thanks to the SGPOA, data input times have been reduced, the project information is standardized through the use of activities catalogues and measurement units, and the results of each project are reported each quarter by each administrative unit; this information is used to feed strategic indicators.[11]

[10] *Available at http://www.conanp.gob.mx/quienessomos/Programa Nacional 2007-2012*
[11] *The results of the 30 strategic indicators are available in the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluación*
[12] *For more information about the 2007-2012 NPNPA Review and Evaluation Process, please consult the available document at http://www.conanp.gob.mx/quienessomos/Proceso de evaluación NPNPA 2007-2012*
[13] *This information may be consulted at http://www.conanp.gob.mx/quienessomos/Programa Nacional 2007-2012*
[14] *The metadata for each indicator are available in the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemainformación*

On **2008** and **2009**, the results of the indicators published in the NPNPA were systematized.

An important part of the consolidation and strengthening of the strategic planning process that has been designed and implemented in the CONANP have been the mid-term evaluations, as foreseen in the Strategic Planning Cycle (Figure 1), and so at the end of **2009** and in the first quarter of **2010** the NPNPA Mid-Term Review and Evaluation Process was carried out in order to assess the usefulness of each strategic indicators in terms of the results that were obtained on 2007, 2008 and the first quarter 2009. The results of that evaluation allowed for some indicators to be modified, eliminated and added, and the goals for the last three years of the current administration (2010-2012) were updated according to physical and financial scenarios.

It is important to mention that the NPNPA[12] analysis and evaluation process focused on revising the indicators and goals, without changing any information with regards to the message, justification, general and specific objectives, strategies and general activities for each strategic approach and the subjects that make them up.[13] There are 30[14] indicators that were generated through the current review and evaluation process, distributed as seen in Charts 1-6.

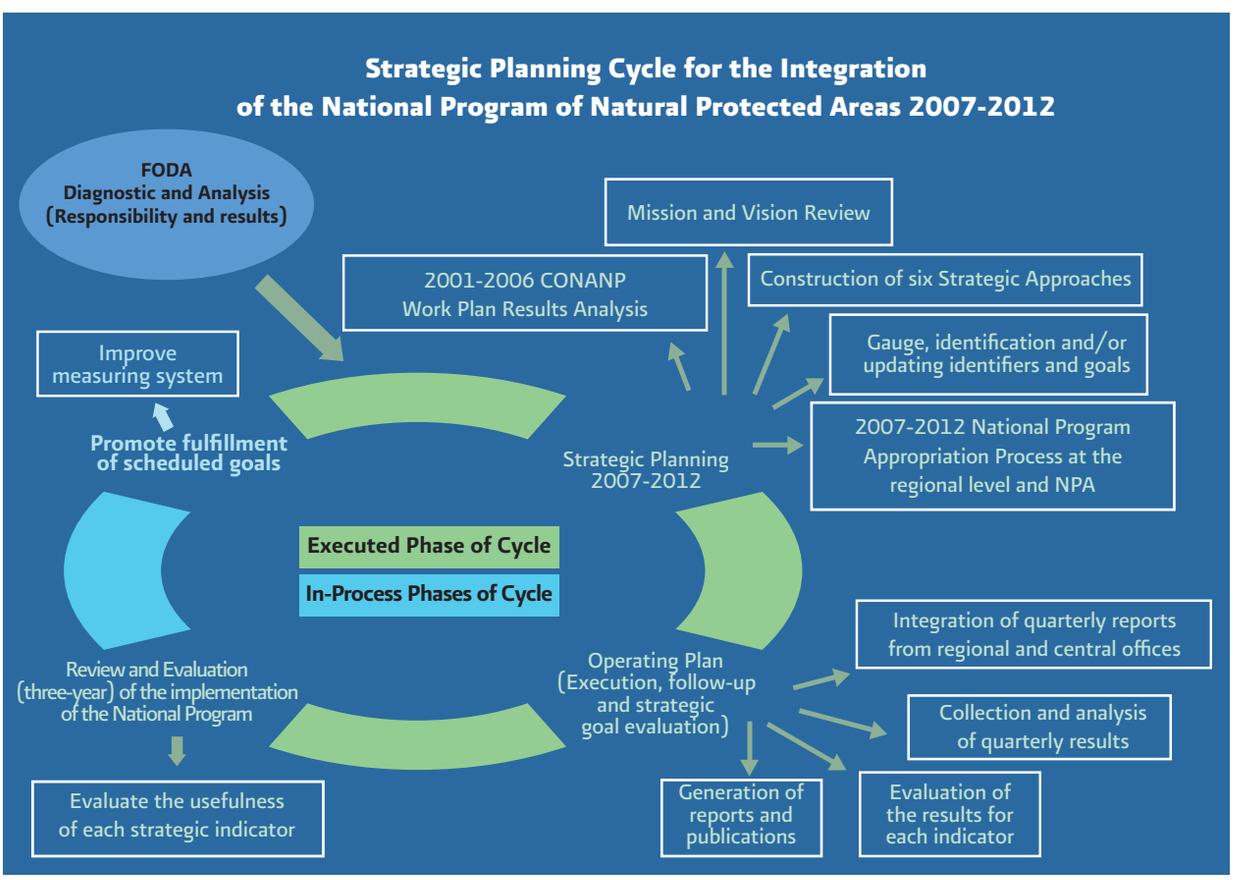


TABLE 1. STRATEGIC APPROACH: PROTECTION		
Subject	**NPNPA Indicator name**	**Name of current indicator**
Oversight	Number of established and operating annual inspection and oversight programs Number of programs of inspection and oversight established and in operation annually	Institutional presence for oversight, prevention and control
	Number of federal protected areas with a program in operation for the control and eradication of invasive and exotic species (accumulated)	Percentage of federal protected areas with a program in operation for monitoring, prevention, control or eradication of invasive and exotic species
Vulnerability Reduction	Percentage of federal protected areas with sustainably planned coastal ecosystems (accumulated)	Percentage of federal protected coastal areas with an environmental zoning program.
	Percentage of protected federal areas with contingency care manuals (accumulated)	Protected coastal areas that have a contingency care manual.
Forest Fire Protection	Percentage of federal protected areas that operate a fire prevention program	Percentage of the surface area of federal protected land areas with an integrated and operating fire management program
Forest Health	Percentage of federal protected areas that have a monitoring system for pests and diseases	Percentage of federal protected areas with an operating program for the monitoring, prevention, control and sanitation of forest pests and diseases

2. STRATEGIC APPROACH: CONTROL		
Subject	**NPNPA Indicator name**	**Name of current indicator**
Development Conservation Strategy	Number of communities that participate in conservation actions	Sites that participate in conservation actions
Sustainable Use and Control	Percentage of surface area with sustainable management	Percentage of surface area of federal protected land areas with sustainable use and management practices
Tourism in Protected Areas	Number of federal protected areas with support infrastructure for taking care of visitors under established regulations (accumulated)	Number of federal protected areas with support infrastructure for taking care of visitors under established regulations (accumulated)
	Number of community tourism companies that operate sustainably in federal protected areas	Sustainably operating community tourism companies
	Number of federal protected areas that charge an admission fee	Number of federal protected areas that charge an admission fee
	Millions of pesos collected per year	Pesos collected per year through admission fees

3. STRATEGIC APPROACH: RESTORATION		
Subject	**NPNPA Indicator name**	**Name of current indicator**
Ecosystem Restoration	Hectares in the process of accumulated restoration (active or passive) in federal protected areas (accumulated)	Surface area undergoing restoration process
Recovery of Endangered Species	Number of action programs for the conservation of endangered species (PACE)	Action programs for the conservation of endangered species (PACE)

4. STRATEGIC APPROACH: KNOWLEDGE		
Subject	**NPNPA Indicator name**	**Name of current indicator**
Knowledge	**Number of federal protected areas that monitor at least one key species (accumulated)**	**Key species that are monitored effectively in federal protected areas and other conservation modalities.**
	Number of active research projects that are registered in federal protected areas	**Research projects registered in federal protected areas in operation in the year**
	Percentage of federal protected areas with a reduced transformation rate of natural land ecosystems	**Percentage of land area of the federal protected areas where the loss of natural ecosystems is evaluated**

5. STRATEGIC APPROACH: CULTURE		
Subject	**NPNPA Indicator name**	**Name of current indicator**
Culture of Conservation	**Percentage of the population that recognizes at least one value of the environmental goods and services provided by federal protected areas**	**Number of federal protected areas that implement some of the elements of the National Program for a Culture of Conservation**
Identity, Communication and Dissemination	**Number of activities, presentations, tours and events per year that contribute to fostering a culture of conservation**	**Number of activities, presentations, tours and events each year that foster the conservation of federal protected areas**
Participation	**Number of people who joined conservation projects in federal protected areas**	**Society's increased participation in conservation actions**
		Conservation actions in federal protected areas that include the effective participation of different formal and informal entities

Ever since the SIMEC design and implementation began, several inputs have been generated in terms of the progress of strategic indicators, which have been published in official reports (government, labor, execution, public accounts, among others). In addition, the results have been disseminated both in achievement and SIMEC publications.

On 2010 the on-line SIMEC was developed, and will be made available to the public at the end of November of this year; it may be consulted through the CONANP portal. Through the three subsystems of the on-line SIMEC, the public may search for information related to the following points:

1) Information Subsystem: general information about the 174 NPAs, geographical information, NPAs with Conservation Programs and International Control and Designation, PACE for endangered species, etc.[15]

2) Monitoring Subsystem: results of the biological monitoring of iconic species that are carried out in NPAs.[16]

3) Evaluation Subsystem: the result of the NPNPA mid-term review and evaluation, results of the 30 strategic indicators, gaps and omissions analysis of land, marine and coastal ecosystems, external assessments of the subsidized programs, estimates of the habitat change index of NPAs with land ecosystems, among others. [17]

[15] *For further information see Section IV, Information Subsystem, below.*
[16] *For further information see Section V, Monitoring Subsystem, below*
[17] *For further information see Section VI, Evaluation Subsystem, below*

6. STRATEGIC APPROACH: MANAGEMENT		
Subject	**NPNPA Indicator name**	**Name of current indicator**
Conservation Area Systems	Thousands of hectares protected by a Federal Protected Area Decree per year	Federal protected areas decreed
	Percentage of surface area that is protected as state and municipal protected areas (accumulated)	Effectiveness of the integration of state and municipal protected area systems and other conservation modalities in coordination with the CONANP
Resource Procurement	Thousands of pesos that come from alternative funding sources	Federal protected areas that have complementary funding projects that are applied to conservation projects according to the 2007-2012 NPNPA priorities
Environmental Services	Percentage of the surface area of federal protected areas that are under compensation plans for owners of nuclear areas and strict protection areas	Federal protected areas that undertake management for payment of ecosystem services to owners of land in federal protected areas
Administrative Development	Thousands of hectares of federal protected areas that are sufficiently strengthened	Surface area of federal protected areas that have operating personnel who execute various natural heritage conservation activities
International Cooperation	Number of federal protected areas with new international designations or projects stemming from international cooperation	New international designations in federal protected areas and other conservation modalities
		Inter-institutional cooperation projects and agreements
Conservation and Management Programs	Percentage of decreed area in federal protected areas that have a conservation and management program	Percentage of territory that is protected by a federal Natural Protected Area Decree with its respective prepared management program

IV. INFORMATION SUBSYSTEM

There is a current and evident need to access information about the state and condition of the NPAs and to obtain specific details about what is happening in biodiversity conservation issues, what more may be done to guarantee the conservation of these representative samples of natural heritage, and what is the real role of protected areas within the framework of the requirements for the preservation, protection and maintenance of this heritage that is considered increasingly strategic.

Often, experts, decision makers and people interested in conservation do not have adequate information about the NPAs. Large obstacles continue to impede access to information that is real, systemic, integrating, reliable, timely and rigorous with regards to the achievements and requirements of biodiversity conservation. Even national protected area systems are worried about existing limitations to consolidate their databases and the ability to use the information as a decision making tool.[18]

The NPA biodiversity information system is a strategy to facilitate the management and dissemination of knowledge about NPAs and to contribute to generating consensus, based on knowledge about the challenges and opportunities and the mobilization of resources and corporate will. It implies new computer tools, classification and communication systems, geographic information systems, and biodiversity databases and publications.[19]

Several countries have made an effort to compile and update information. However, these efforts are minimal when compared to the need for organizing, updating and searching for the information, which is why having a data administration tool is essential for protected areas. It will grant access not only for inter-institutional use, but also enable information-sharing between allied institutions and the communities that work within them.[20]

The general objective of the information subsystem revolves around the need to gather and make information about the NPAs accessible in order to: 1) Have sufficient and efficient databases to enable adequate planning and decision-making, thus establishing a permanent diagnostic system; 2) to offer databases and computer resources that will streamline information management, and 3) to disseminate the information that is gathered in a timely manner.

The SIMEC information subsystem is an organized group of data that has been generated by the NPAs and other CONANP units and systematized for use and consultation by different actors and decision makers. It handles two types of information – qualitative and quantitative – that may be used to perform statistical and descriptive analysis.

The need to electronically systematize and provide access to the large quantity of information generated within the institution has guided efforts toward the creation of a platform that will allow an on-line SIMEC to function through the CONANP portal and facilitate consultation by internal and external users.

The information currently available in the information subsystem in the CONANP portal (http://www.conanp.gob.mx/SIMEC/subsistemainformación) is the following:

[18] *The information requirements and need of countries to build databases for Protected Areas in Latin America. FAO/OAPN Program to Strengthen Sustainable Management of Natural Resources in Protected Areas in Latin America, Latin American Network of Technical Cooperation in National Parks, Other Protected Areas, Wild Flora and Fauna, November 2009, p.2*

[19] *"Natural Protected Areas in Mexico", http://rincondelvago.com/areas-naturales-protegidas-en-mexico.html*

[20] *"Systematizing and Updating Information on Natural Protected Areas in El Salvador" Available (In Spanish)at: http://www.oas.org/dsd/IABIN/Component2/Salvador/PATN_MinisterioMedioAmb&RecNat/MinisterioMeeioAmb&Rec.Nat.pdf*

- NPAs by federal decree
- Conservation and management programs
- Certified areas
- Areas registered in the National System of Protected Areas (SINAP)
- RAMSAR sites
- Map site
- Endangered Species Conservation Program (PROCER)
- Fire statistics
- Metadata for strategic indicators

Users may also perform general searches through fact sheets that are organized by NPA and by region.

The purpose of these types of searches is to have access to basic information about each of the nine CONANP regions (including the federal entities that comprise the region, the NPAs that make them up, and other categories), as well as the decreed natural protected areas at the federal level (including the decree date, surface area, management category, whether it has international designations, types of vegetation, main threats, and other relevant points).

Likewise, users may also perform specific searches using a combination of several offered options, and may also generate graphs based on the search results.

The following individual or combined information is available through specific searches:

- Decree date
- Geographic location (by state)
- Vegetation type
- Management category
- Conservation and management program
- International designations
- Areas registered in the SINAP
- Certified areas
- Conservation Program for Sustainable Development (PROCODES)
- Temporary Employment Program (TEP)
- Conservation Program for Native Corn (PROMAC)
- Action Program for Species Conservation (PACE)

V. MONITORING SUBSYSTEM

The monitoring subsystem was set up to organize knowledge about the status of biological diversity populations, communities and ecosystems, as well as the environmental changes in the Protected Areas (PAs), analyzing species' population trends. It also aims to detect modifications in species diversity and abundance found in these protected sites. The monitoring results provide information that helps to evaluate the impact of institutional programs on ecosystem conservation and biodiversity in NPAs; furthermore, it provides continuous improvements to the institution's processes, by enabling operators to adapt their work based on reliable information, with time series that have involved continuous activities monitoring in time and space (Figure 2).

Biological monitoring has been taking place in NPAs since the 1990s, with the participation of Mexican and foreign institutions, as well as not-for-profit organizations. This academic and financial synergy has strengthened work in these areas by promoting monitoring projects that provide over a decade of useful information about important species for the NPA managers. Through these partnerships, standardized methodologies have been used to bolster data compilation, improving the quality of the resulting information.

In the process of setting up the monitoring subsystem, a nationwide diagnosis was needed to define the monitoring type being implemented in the NPA, as well as a general assessment of the process to help determine how to apply the results. This revealed that biological monitoring is carried out in approximately 40 NPA and is based on monitoring, over time, species populations that are, indicative, key, umbrella, etc.

Currently, all taxonomic groups are monitored (mammals, birds, reptiles, amphibians, fish and plants); however, the group comprising resident and migratory birds is the most studied in Mexico, in 26 of the NPA. A process to analyze the monitoring results was designed to determine how closely the proposed aims, methodology, compiled data, analysis, and use of information fitted together.

On 2009 the CONANP decided to identify the strengths and areas of opportunities in the planning and implementation capacities of its current biological monitoring strategy. This analysis looked at regulatory, strategic and tactical factors at a central, regional and local level. The diagnosis involved documentary compilation and analysis, followed by a participative process of reflection that included NPA personnel.

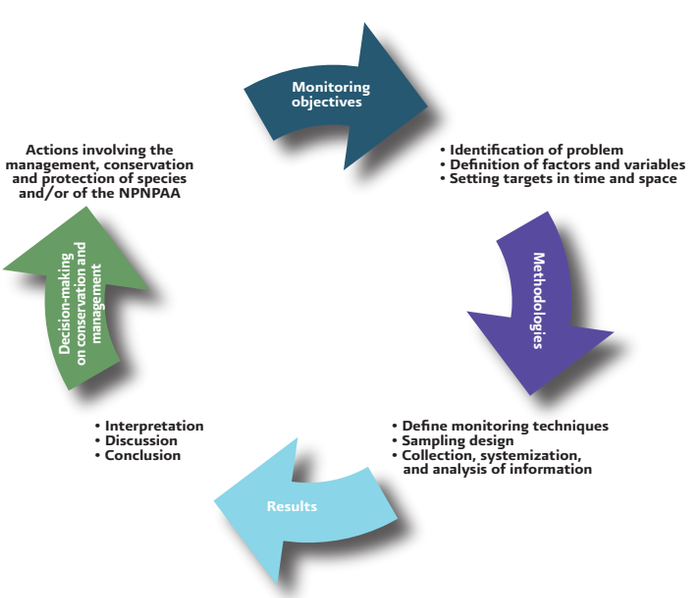


Figure 2. Assessment of monitoring process

In regulation terms, the diagnosis focused on the legal framework on which the mission and vision is based, and which is used to develop the overarching strategies directly and indirectly related to biological monitoring. Results indicate that CONANP has a regulatory framework that has picked up where the previous administration had left off, adjusting the strategic objectives to factor in the components of participation, synergy and learning as the cross-cutting issues found in the entire process. The regulatory framework is found to be fully in line with the SIMEC's aims and scope. A formal induction is required for members of the teams managing the integral knowledge of the regulatory framework, and of the SIMEC itself.

The NPA management teams recognize the need and are willing to work regionally, both to establish shared objectives and to make the most of capacities through mutual cooperation. We must therefore consider strategies for collaborative learning (such as in learning communities) to professionalize human resources in SIMEC's integral operations. Similarly, it is essential to define the sphere of competence of those in charge of biological monitoring, for they are generally the same people who participate in other NPA activities and operations; the management teams must be professionalized as project managers. In this capacity they must play an active role in generating and consolidating partnerships to achieve the biological monitoring objectives and goals.

And, finally, in terms of our tactics, the diagnosis focused on the methods, procedures and actions needed to achieve the objectives of biological monitoring, taking into account the knowledge, skills and attitudes of the management teams and their partners must therefore develop. Since strategy determines tactics, the proper planning of the former ensures the consistency of the latter. To strengthen knowledge and promote partnerships and synergies that contribute to achieving the biological monitoring objectives, we must raise awareness, systemize and share information about our tactical experiences on a national, regional and local level. These experiences will promote good management decisions; this requires systemized, readily available and updated information on the situation of species currently monitored in the NPAs. This information will be used for planning, making decisions, following up and assessing progress in the NPA conservation work.

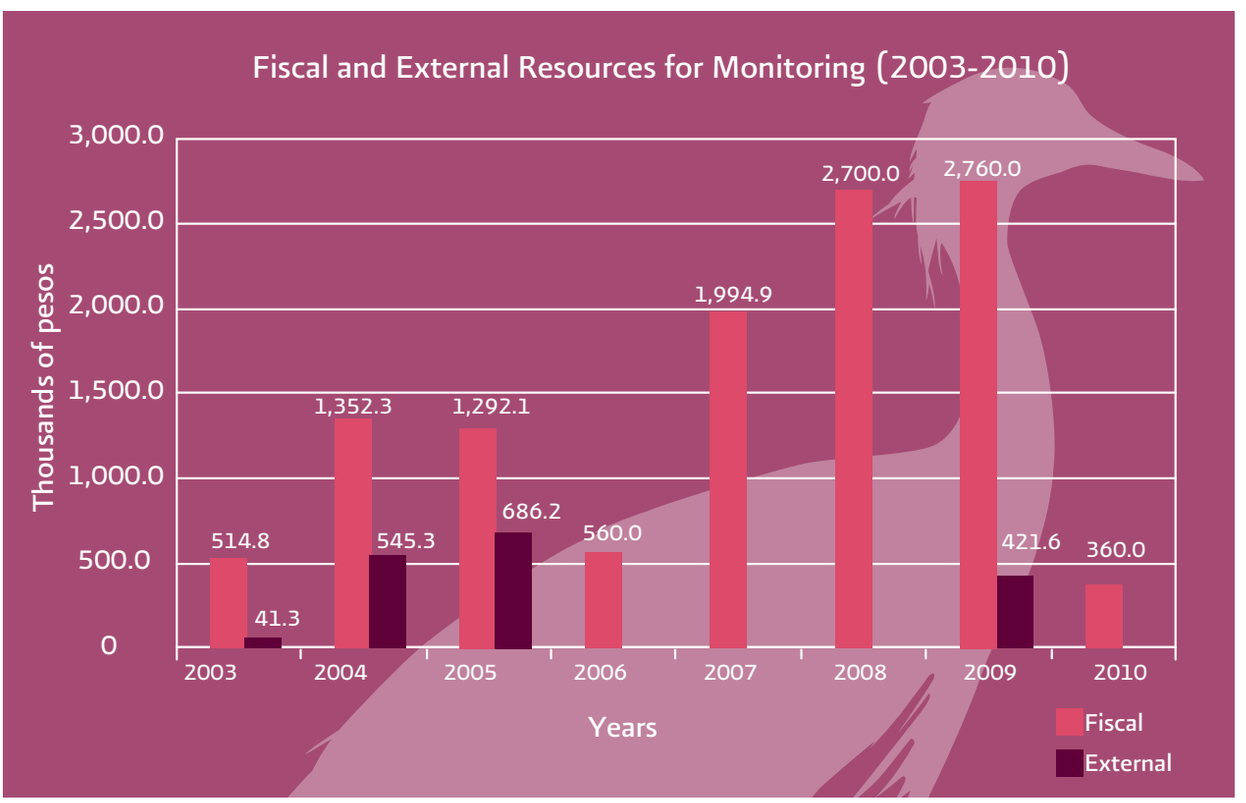
To further reinforce the systemization of the monitoring results, a database system was designed to monitor birds, through which the field data collected by monitoring personnel is systemized. And this system also enables ecological and statistical analysis to be carried out, producing reports in real time. The system holds the database of birds of the National Commission for the Knowledge and Use of Biodiversity (CONABIO), and work is being done to link up to aVerAves. This has been an important step forward in the systemizing of the monitoring of Mexican avifauna, since by using this system, less time is needed to systemize the information in order to keep the databases updated to the predefined standard of quality.

Moreover, the CONANP takes on an important and necessary role by making the monitoring results widely available: it is useful for the general public because it informs about the status of species populations being monitored and the usefulness of this information in NPA management. Therefore, since 2005, the CONANP portal has featured the technical descriptions of biological monitoring, and currently there are 35 descriptions online for the same number of species. In 2010, a new format was designed for the online technical descriptions to make the technical and methodological content that is updated each year more dynamic and readable. It includes information about the species biology and the analyses of the time series obtained up until that year; the aim was also to provide the reader with a concise document containing the necessary information in an article format with graphs and photographs showing the monitoring activities implemented by NPA personnel.[21]

[21] *See the CONANP website http://www.conanp.gob.mx/SIMEC/subsistemamonitoreo for detailed information on the assessment process.*

Achieving these levels of systemization and analysis of monitoring information has required new funding sources, to complement the financial support provided by institutions, for training, equipment and operation of monitoring protocols. With these resources we have been able to run 13 training courses on methodologies for monitoring aquatic and terrestrial birds, reptile fauna, protocol design, data analysis, habitat assessment, ecology and management of wildlife, and 15 studies have been contracted with higher education and research institutions.

In eight years, the CONANP has spent MXN$11 million, in addition to the MXN$1.3 million from external resources; this has considerably strengthened NPA monitoring activities.



Some example of biological monitoring are described below:

1. Monitoring of Crocodiles (*Crocodylus acutus and Caiman crocodilus fuscus*) in La Encrucijada Biosphere Reserve, Chiapas.

2. Monitoring of bird life in the Monarch Butterfly Biosphere Reserve, Mexico State and Michoacán.

3. Monitoring of coral reefs in the Veracruz Reef System National Park, Veracruz.

4. Effects of climate change on hawksbill sea turtles populations, Campeche.

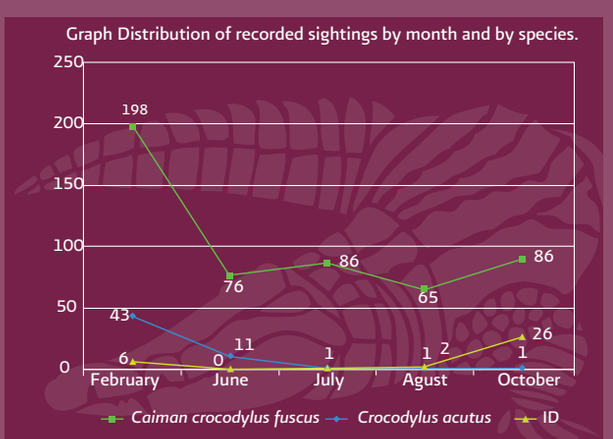
1. Monitoring of Crocodile (*Crocodylus acutus* and *Caiman crocodilus fuscus*) in La Encrucijada Biosphere Reserve, Chiapas

Since 1994, the Reserve's personnel identified, using strategic planning methods (threat analysis), the principal environmental issues in the Reserve, highlighting ecosystems and wildlife threatened and endangered and which have a key role in the long-term maintenance of the natural processes and functions within the most important ecological systems of the wetlands; these function as an excellent wetland health indicator . Taking that into account, to improve the management systems and to optimize resources, the Reserve's personnel selected two crocodile species (*Crocodylus acutus* and *Caiman crocodilus fuscus*) as key species and group to act as biological indicators, since their presence enriches the functioning of the ecosystems far more than just their numbers would suppose. The selection of these species was based on the following hypothesis: the removal of one of these species would have a considerable impact on the other species, causing changes in the ecosystem's structure and losses in the biodiversity and ecological processes due to their strong influence on the integrity of a land-water interface ecosystem (coastal wetlands); however, their management offers an excellent opportunity to maintain or restore the ecosystems' processes through targeted actions.

To monitor the numbers and distributions of the Reserve's crocodile populations, nocturnal and capture-recapture methods were used. In 2009, 609 records were obtained, 64 concerned *Caiman Crocodilus fuscus*; 35 individuals were unidentifiable (ID), and 510 records related to *Crocodylus acutus*. The following table and graph shows the distribution of the records of *C. acutus* by month; significantly, the highest numbers were found during June-August of each annual cycle, corresponding to the hatching season. However, June, July and August saw a drop in recorded numbers. The peak numbers were found in February, due to the intense rainy season prevented the monitoring to be concluded, even at low tide; also, the influence of high tides on dragging currents towards outflow zones, channels and coastal lagoons also impacted the number of sightings.

Transect	Month	Lenght	*C. acutus*		*C. crocodilus*	
			Rec.	ind/km	Rec.	ind/km
T1	Feb	14	82	5.86	1	0.07
	Jun	14	59	4.21	0	0
	Jul	14	30	2.14	0	0
	Agost	14	31	2.21	0	0
	Oct	14	32	2.28	1	0.07
T2	Feb	14	42	3	30	2.14
	Jun	14	16	1.14	11	0.79
	Jul	14	29	2.07	1	0.07
	Agost	7	16	2.28	0	0
	Oct	7	19	2.71	6	0.86
T5	Feb	14.5	74	5.10	12	0.83
	Jun	0	0	0	0	0
	Jul	14.5	28	1.93	0	0
	Agost	14.5	18	1.24	1	0.07
	Oct	14.5	34	2.34	1	0.07

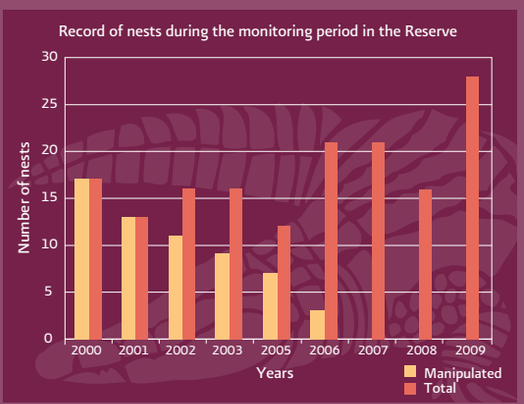
Relative numbers by transect and species.



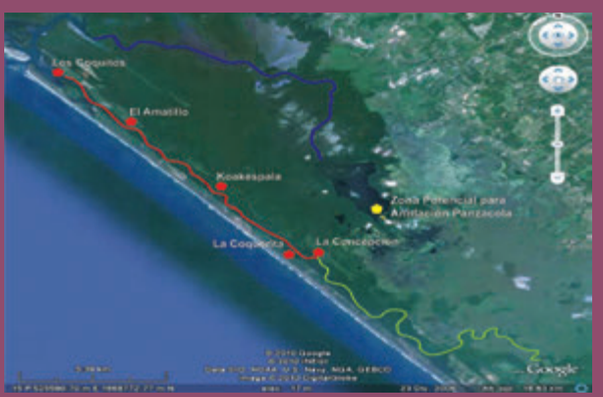
Distribution of recorded sightings by month and by species.

The nesting areas are formed by long beaches and elevated ground with limestone-sand substrates that make it possible to make nests in March and April. Of the seven nesting areas identified along the Huévate estuary, the map below shows the distribution of the nesting areas of the *Crocodylus acutus*. The largest number of nests were recorded during the monitoring period in 2009; this is probably due to the changes in methodology as a result of the adaptive management process which enabled a more reliable location and quantification approach for the hatched nests by finding the remains of exposed shells on the surface, as opposed to tracing them below the ground, in which case information is often lost because it is outside visual range, despite inserting a thin rod into the substrate until finding incubation chambers.

These results also give information about the growth of the population of females of reproductive size and the progress in the awareness-raising work among the inhabitants of elevated ground in the mangrove swamps, who no longer destroy nests as can be seen in the graph below. During the first years of monitoring, more nests were collected. This was possibly due to the fact that the inhabitants of zones with crocodile nesting beaches destroyed them; now it is no longer necessary to collect any nest in zones where people live, because now the local population help protect the nests. Through the adaptive management of natural resources, the Reserve personnel leave.



Record of nests during the monitoring period in the Reserve.



Location of the *Crocodylus acutus* nesting areas in the Reserve.
Transect 1, Transect 2, Transect 3

The nests of the river crocodile *in situ*, leading to increasing sightings of actual nests as well as nesting areas.

The presence of both crocodile species, the abundance and representativeness of all age groups are signs of a viable population that has adapted to its environment, the availability of food, and factors that alter its habitat. The distribution of species is differentiated by their respective needs; for example, there are higher numbers of *C. acutus* during the year in the study area in the estuary locations nearest to the spits where the water is more saline, since it has the physiological ability to handle high concentrations of salt.

The distribution of nesting beaches is another factor in the species' distribution, since most of the high ground areas with large beaches on a limestone-sand substrate are mostly found in the locations nearest to the San Juan Spit (Bocabarra de San Juan). Due to the historical processes of human settlements and sedimentation that the Reserve's coastal wetlands have undergone, and the speed at which the depth of outflow zones is changing, combined with other natural and anthropogenic activities that impact the dynamic of crocodile populations, with a pronounced effect on their habitat, an assessment of their habitat has begun to gather more information on the trends of the species-all in order to establish control and conservation strategies.

Furthermore, the inhabitants of the established communities in the monitoring transects have complained about the presence of the crocodiles: they are large animals and pose a risk to humans living in the area; their feeding habits have caused the inhabitants to report that "the lagoons are drying up and there are hardly any fish left, the crocodiles are eating them all so the fish are getting harder to find." This indicates that the local inhabitants are noticing the sedimentation processes; however, the fact that they are competing with the crocodiles for fish could lead to a threat for the wild populations of these species.

An environmental education strategy is therefore being developed to raise awareness and increase understanding of crocodiles' ecological role in maintaining the coastal wetland systems. One of the factors observed through the monitoring is the proximity of crocodiles to humans, as a result of the transformation of coastal zones due to anthropogenic activities. It is worth noting that the crocodiles can be financially beneficial to the rural communities living in their distribution zones,[22] for they provide an eco-tourism attraction.

Crocodiles loss reduces the value of the wetlands (fisheries dependent on the mangroves, carbon capture, waste water filtration, storm surge protection, nitrogen fixation, etc.) and alters ecological processes. Monitoring is an important tool to establish conservation measures for coastal ecosystems and crocodile species.

[22] *Abadia (2002) found that the ecotourism value of the C. acutus far exceeds the commercial value of their leather.*

2. Monitoring of bird life in the Monarch Butterfly Biosphere Reserve, Mexico State and Michoacán

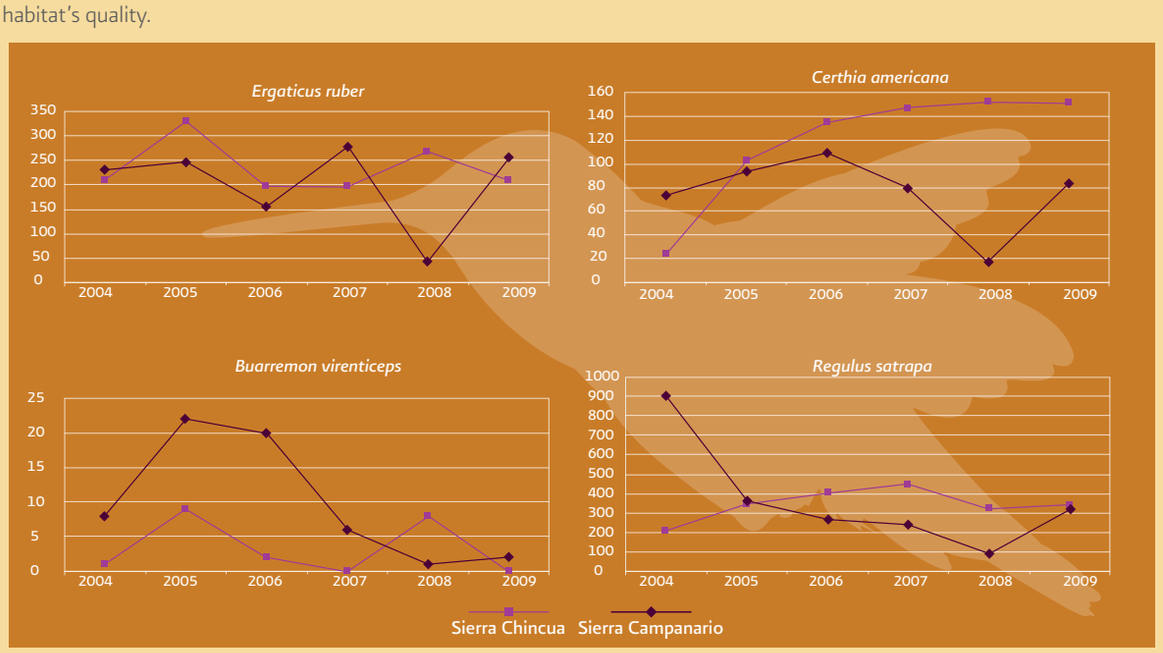
The bird monitoring program implemented since 2004 in the Monarch Butterfly Biosphere Reserve has the central aim of monitoring the long-term quality of the ecosystem, using bird diversity as an indicator of changes in the habitat's quality. As well as using diversity indexes, a sample is made of four species of particular interest for the Reserve, due to its level of association with the temperate mountain woodlands and endemic features of the Eje Neovolcánico region. The objectives of the monitoring focus on determining diversity, abundance and distribution of the Reserve's avifauna, analyzing the population trends of the *Ergaticus ruber, Certhia americana, Buarremon virenticeps and Regulus satrapa* species.

In 2009, as a result of the adaptive management process, changes were made to the sampling methodology used to identify the species acoustically and/or visually in the Chincua and Campanario mountains, with an additional four sites to apply the techniques of netting and ringing the species. All the sampling sites were distinguished by the dominance of the tree called "oyamel" (the Nahuatl name for *A. religiosa*) mixed with species of pine and in some areas, oak and "madroño" (*A. unedo*), located in sampling sites in conservation areas, some in good condition and others fragmented.

Information was compiled on the diversity, distribution, abundance and protection category of species in the Chincua and Campanario mountains. Following these adjustments to the monitoring protocol, it was found that the Campanario mountain (the La Mesa *ejido* or communal land) have a greater diversity of species (66), compared with the Chincua mountain, with 61 species. With regard to abundance, a total of 6,684 individuals were recorded: 3,369 in the Campanario mountain and 3,315 in the Chincua mountain.

It was also detected that species registered in the oyamel and oyamel-pine forests in the Chincua and Campanario mountains have a very similar altitudinal distribution, since of the 72 species registered in these ecosystems during 2009, according to the counts by points carried out, 58 species are widely distributed and detectable in both mountain areas, five are only recorded in the Chincua mountain (*Carpodacus mexicanus, Catharus ustulatus, Columba fasciata, Mniotilta varia, Polioptila caerulea*) and nine in the Campanario mountain (*Aegolius acadicus, Buarremon virenticeps, Caprimulgus vociferuss, Diglosa baritula, Icterus parisorum, Melanerpes formicivorus, Piranga flava, Selasphorus rufus, Sitta pygmaea*).

The following graphs show the population trends of the bird species that were used as indicators to detect changes in the habitat's quality.



In terms of sampling sites, it was found that both in the Chincua and in the Campanario mountains the places with most abundant numbers of individual members of the *Ergaticus ruber* (Red Warbler) species are the conservation sites called El

Llano del Toro and Llano Chico. In the case of the *Certhia americana* (American Tree Creeper) species, there appears to be no differentiation between the level of detection in conservation sites in good condition compared with fragmented areas. This is also the case with *Regulus satrapa* (Golden-crowned Kinglet), whose distribution and preference is very similar in both types of wood. Moreover, the negligible records of the *Buarremon virenticeps* (Green-striped Brush Finch) makes it impossible to suggest any preferred habitat.

Including an objective that considers aspects related to the population trends of the four species mentioned above, in order to establish their level of association in the temperate mountain woodland, it was necessary to substitute the *Buarremon virenticeps*, because despite several years of monitoring, not enough information or records of individuals have been compiled to help understand the dynamics and awareness of their population; the species is hard to locate and is found in the undergrowth in the mountains, and therefore they are not as widely distributed in the Reserve's woodland as originally believed.

The diversity of birds found throughout the five years of monitoring has been vital in establishing the management strategies and the decision-making in the short, medium and long-terms. As proof of this, resources from the Temporary Employment Program (TEP) were used to re-site fuel and therefore prevent the spread or forest fires in the region which have a direct impact on the conservation of the various local species and that represent—together with tree-cutting—one of the main threats to biodiversity; resources are also used to relocate stone or wood to construct shelters and potential nesting sites for various bird species: *Troglodytes brunneicollis, Buarremon virenticeps, Atlapetes pileatus and Pipilo maculatus*, among many others.

The monitoring results have also helped in the understanding of the woodland's phenological dynamics and its relation to the presence/absence of certain species, particularly hummingbirds, which play a vital role as pollinators of flowering plants or dispersers of seeds.

Seven hummingbird species have been detected in the reserve (*Colibri thalassinus, Hylocharis—Bassilina—leucotis, Lampornis amethystinus, Lampornis clemenciae, Eugenes fulgens, Selasphorus platycercus and Selasphorus rufus*) which are fundamental for the reproduction and propagation of species of Salvia, Senecio, Lupinus, Splenium and Satureja; the reserve also has some migratory species such as the *Vermivora celata and the local species Diglossa baritula*.

The monitoring also produced knowledge about the birds' reproductive behavior and their critical months for reproduction, as well as aspects related to the seasonality of the migrating species which use the thickly wooded areas of the Reserve for hibernation or as a place to stop over on their way further south.

Four illustrated guides were published on the 15 most representative species for the Chincua, El Rosario, La Mesa and Cerro Pelón mountain reserves, so that local inhabitants and users have more information to learn about the local avifauna. Three thousand five hundred printed guides were delivered at each touristic site offering services to Mexican and foreign visitors, as one of the activities included to mark the beginning of the 2009-2010 season for visiting the Monarch butterfly sanctuaries.

3. Monitoring of coral reefs in the Veracruz Reef System National Park, Veracruz

Coral reefs provide shelter for a quarter of all known marine species, hence their importance as a reserve of biodiversity. By absorbing the impact of waves, they protect the coastline from the ravages of powerful storms and act as a barrier to protect beaches against the force of currents and ocean tides. Tourists come to the Veracruz Reef System National Park for recreational water sports, attracted by the beauty of the coral reefs and the archeological remains, all features of the landscape that attract visitors.

Unfortunately, the condition of the National Park is rapidly deteriorating due to the increasing pressure applied through various human activities: coastal development; deforestation; intensive agriculture; a sugarcane industry that is hastening the deterioration of the reef environment by producing harmful and polluting sediments that enter the coastal waters; and overfishing that upsets the ecological balance. Uncontrolled tourist activities cause direct damage to the reefs, and the excessive collection or marine organisms causes major damage to their populations.

A biological monitoring program using the Reef Environmental Education Foundation (REEF) methodology has been implemented to discover the state of conservation of the Park's coral reefs, with the support of volunteers as service providers, teachers and divers previously trained in the identification of fish and coral. A considerable amount of human resources and specialized infrastructure is needed for an eco-systemic and environmental monitoring of the Park. The program has two components: 1) monitoring and identifying the reef fish (REEF), and 2) monitoring the composition and abundance of benthos and fish in the artificial reef "Excañonero C-50 Gral. Vicente Riva Palacio".

The reef fish Monitoring Program in the Veracruz Reef System National Park began in November 2003 with the first 25-hour theory/practical course given by the instructors Laddie Akins (Executive Director of REEF, Florida, United States), Sheryl Shea (REEF volunteer working in Cozumel) and Rosalinda García Márquez (coordinator of the Program in the Cozumel National Reef Park) who trained and certified 24 volunteers. The courses to identify fish is based on the Reef Environmental Education Foundation's (REEF) visual methodology; the most common families and its species are checked, with practical sessions using slides with photographs of the organisms, and as well as dives with an underwater guide and an acrylic table carry out the census.[23] The table below gives the monitoring information over the five-year period.

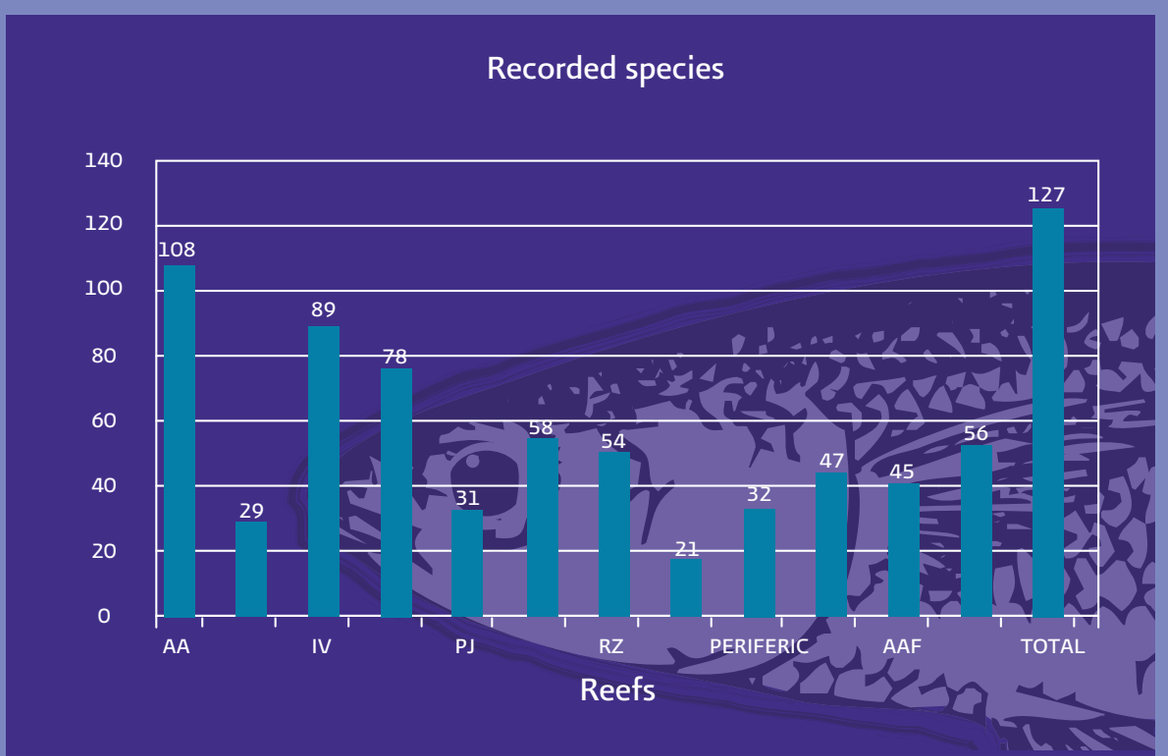
Monitoring of Reef Fish				
Year	**Number of Censuses**	**Number of sorties / reefs**	**Volunteers**	**Total Reported Species**
2005	62	5 sorties / 5 reefs	23	180
2006	84	6 sorties / 12 reefs	13	147 (15 new records for the SAV and 2 new species)
2007	153		18	(150 species of fish and 1 species of sea turtle)
2008	72			128

[23] *For more detailed information on the methodology used, write to the Veracrus Reef System National Park: sarreciv@conanp.gob.mx*

In 2004, a monitoring protocol called "Composition and abundance of the community of benthos and fish in the artificial reef Excañonero C-50 Gral. Vicente Riva Palacio" and two people were trained in the identification of fish and benthos (in collaboration with experts from Technological Institute of the Sea (ITMAR) and from the Acuario de Veracruz, A. C.) to follow up the program. The following table shows the results.

Monitoring of Fish				
Year	**Number of Censuses**	**Number of sorties / reefs**	**Volunteers**	**Total Reported Species**
2006				28
2007	152	8	14	101
2008	94	6	18	128
2009	104	12	12	127

The monitoring of the artificial reef C-50 recorded 103 species, 57 general and 29 families in the three reefs. A greater abundance of young specimens was found in June and July, indicating that the area could be working as a shelter and feeding area. The most abundant families are *Haemulidae* (6,044 individuals), *Labridae* (4,124 individuals), *Pomacentridae* (3,648 individuals), *Gobiidae* (3,363 individuals) and *Carangidae* (1,141 individuals).



The number of species recorded per reef; notably, the number of species, and even the reported abundances, are directly related to the number of censuses carried out per reef, and the possible differences are due to the level of expertise and experience of each volunteer .

The diversity of fish has been maintained in the Veracruz Reef System National Park, with an estimated abundance exceeding 25,000 individuals. The fish monitoring with the volunteer group has provided relevant information to describe the characteristics and seasonal behavior of the fish population during the year.

The participation of volunteers has been a core aspect of the program; however, their low level of participation has been noticed, and therefore it is recommendable to encourage the volunteers registered on the program through special dives, so that they produce censuses at day and at night. This will require training of volunteers to identify diurnal and nocturnal species.

4. Effects of Climate Change on Populations of Hawksbill Sea Turtles

The hawksbill sea turtle is a critically endangered species. In Mexico, the most important breeding sites are in the Gulf of Mexico: Bajos de Tanhuijo, Isla de Enmedio and Isla de Sacrificios in Veracruz; from the Atasta Peninsula to Isla Arena in Campeche; the inland beaches of Laguna de Términos, between the Ría Lagartos estuary and Isla Holbox in Yucatán; and from Isla Contoy and Tulúm to Bahía de Asunción in Quintana Roo. In the northern hemisphere, the largest groups of hawksbill sea turtles lay their eggs in the Yucatan Peninsula, particularly in Campeche—which has over 60% of all nesting areas in Mexico.[24]

After more than two and a half decades of implementing the hawksbill sea turtle conservation programs, in 1999 the Yucatan peninsula became one of the largest nesting areas in the world,[25] and the largest in the Atlantic basin,[26] because of the abundance of hawksbill nesting populations, with sustained levels of recovery up until 2000. However, since then nesting in the Yucatan began to decrease dramatically each year, to the extent that by 2004 the number of nests was equivalent to just 37% of that observed in 1999. Although in 2008 there was a 15% rise compared to 2007, numbers were still down by 44% compared to 1999.[27] During 2009, population numbers continued to dwindle, showing a persistent general downward trend.

There is scientific evidence, observed over time, that shows the effects of climate change on sea turtle populations, especially hawksbill sea turtles (E. imbricada), in the Yucatan Peninsula. Over the past 16 years, the state of Campeche has seen a downward population trend in the number of nesting sites of the hawksbill sea turtle. The yearly drop in numbers of active reproductive females has various causes; with very few deaths and strandings on beaches, it is possible that environmental factors may be harming their reproductive capacity.[28] Rising sea levels and the intensity and frequency of annual storms alter their nesting habitat (beaches), and the increase in average temperatures cause changes to the habitat for embryonic development, aggregation, foraging and protection.

In 1995 there was a rise in temperature that coincided with the reduction in the number of nests, taking into consideration trends observed over decades. In a study carried out by the Interdisciplinary Marine Science Center of the National Polytechnic Institute (CICIMAR-IPN) to determine the changes in the population trend of the hawksbill sea turtle in the south-east of the Gulf of Mexico and its relation to climatic indicators,[29] various variables were used, and the conclusion was that —regarding climatic variables—there exists a notable link between the series of anomalies in the sea surface temperature locally and the multivariate index of the Atlantic, pointing to a trend in the sea surface temperature at basin level (AMO). This index is inversely proportionate to the population trend (the proportion of females) which was added to or subtracted from the population measured from one year to the next, i.e., when the sea temperature at basin level is anomalously high, there is a decrease in the index of population trend.

Similarly, in a study carried out by the National Fisheries Institute (INAPESCA)[30] a correlation was found between the number of hawksbill sea turtle nests deposited each year in the state of Campeche and environmental changes;[31] below is a brief outline of the methodology and results.

The following table summarizes the methods used.

[24] *Monitoring program description of the hawksbill sea turtle (Eretmochelys imbricata) in the Laguna de Términos Flora and Fauna Protection Area, www.conanp.gob.mx/acciones/ficha/carey/fichitas/index.html*

[25] *Garduño-Andrade et al, "Increases in Hawksbill Turtle (Eretmochelys imbricata) Nettings in the Yucatan Peninsula, Mexico, 1977-1996: Data in Support of Successful Conservation?" Chelonian Conservation and Biology IUCN/SSC, Vol. 3, No. 2, 1999, pp. 286-295*

[26] *Anne B. Meylan & Marydele Donnelly, "Status justification for listing the hawksbill turtle (Eretmochelys imbricata) as Critically Endangered on the 1996 IUCN Red List of Threatened Animals", Chelonian Conservation and Biology IUCN/SSC, Vol. 3, Number 2, 1999, pp. 200-224.*

[27] *A. Abreu-Grobois et al. Memoria del Taller Rumbo a la COP 3: Diagnóstico del estado de la tortuga carey (Eretmochelys imbricata) en la Península de Yucatán y determinación de acciones estratégicas. SEMARNAT, CONANP, IFAW, PRONATURA- Peninsula de Yucatán, WWF-Defenders of Wildlife. 2005, XIV+75pp.*

[28] *Vicente Guzmán H., Patricia Huerta R. y Pedro García A. "Monitoreo de tortugas marinas en el Área de Protección de Flora y Fauna Laguna de Términos"-*

[29] *Pablo del Monte Luna, Francisco Arreguín-Sánchez and Daniel Lluch Belda, "Cambios de corto, mediano y largo plazo de la tendencia poblacional de tortuga carey en el sureste del Golfo de México y su relación con indicadores climáticos", National Polytechnic Institute Interdisciplinary Marine Science Center (CICIMAR-IPN).*

[30] *Ministry of Agriculture, Liverstock, Rural Development, Fisheries and Food (SAGARPA)*

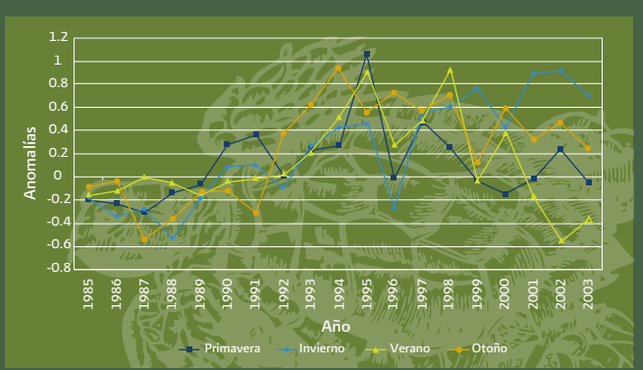
[31] *María del Carmen Jiménez Quiroz, "Determinación de la correlación entre la cantidad de nidos de tortuga carey depositados anualmente en el estado de Campeche y los cambios ambientales", INAPESCA-SGARPA.*

Biological Variables	**Total Nests**	**Difference in nesting between year i+1 and the year i (_n). This difference was used to describe changes in nesting, rather than total amounts, due to the differences in scale. These differences between the scales of nests recorded were used to calculate the surplus nest production.**
Environmental Variables	**Sea Surface Temperature (SST)**	**POET NOAA database[32] used to obtain SST data.**
	Atmospheric Temperature	**Isla Aguada. ERIC database[33] of the National Meteorological Service (SMN The monthly, seasonal and annual thermal anomalies standardized were calculated using the quotient of the difference between the monthly observed temperature minus the average monthly temperature between the standard monthly deviation.**
	Total Rainfall	**Isla Aguada. ERIC database.**

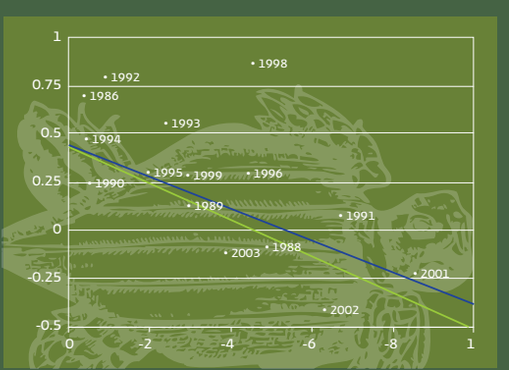
The anomalies show that since 1985 the sea surface temperature (SST) has risen in the area under study. The monthly and seasonal anomalies have mainly occurred at the end of the winter and in the spring, although on occasion they were also detected in the summer and autumn. However, it is the seasonable anomalies that are most useful in analyzing the nesting situation. The analyses suggest that the most drastic falls coincide with high temperatures. Later the same analysis was carried out, but this time using the surplus production of nests, which gave the same picture as the previous analysis: falls coincided with the highest temperatures.

Environmental Temperature and Total Rainfall on Isla Aguada, Campeche

This analysis uses a time series from 1985 to 2003. Isla Aguada showed a positive trend evident between atmospheric temperature and total rainfall since 1992; the relation was inverse before 1992. The variations of seasonal anomalies differ between the seasons. The winter variations maintain a positive trend, while the spring and summer ones increased up until 1995, from which point they fell until 2003. The following graph shows most clearly the decrease in temperature in 1996, a year before the first decrease in hawksbill sea turtles nests.



The correlations between the nesting indicators (total nests, difference of nests and surplus production) with atmospheric temperature, anomalies and rainfall did not provide statistically relevant results. Significant results (p= 0.056) were only obtained by correlating the surplus production of nests with the standard deviation of summer temperature (indicative of the temperature variability during that period).



Correlation between the surplus production of nests and standard deviation in temperature measured during the summer in Isla Aguada. The blue line is the adjustment obtained with the 1988 data (p=0.057). The green line excludes 1998 (p=0.01).

This data suggests that sea surface temperature can be used as an environmental indicator. The sea surface temperature data used for this exercise corresponds to a very large area with highly dissimilar oceanographic conditions of the northern and southern parts of the Gulf of Mexico. The atmospheric variables measured locally have the limitation that they would only affect organisms when they are near the coast. However, possibly a mosaic of atmospheric data obtained from satellites and coastal monitoring stations could give a clearer view.

[32] *National Oceanic and Atmospheric Administration*
[33] *ERIC II (1999) Extractor Rápido de Información Climatológico de México Vol. 2.0 CNA-IMTA (CD).*

Hurricanes and tropical storm systems (known locally as *nortes*) affect the critical habitats of wild populations, such as those of sea turtles. This extreme weather coincides with the final days of egg incubation and development on the beaches, or with hatching, and sometimes both situations happen at the same time. It is possible to predict some future variations observing the drastic changes in the number of recruits expected each year. Causes that are more global, such as the El Niño/La Niña climate pattern that could have a positive or negative impact on population trends, allow us to speculate on the possibility that they affect reproductive females, having more of an influence on breeding behavior, linked to foraging sites and the variation in the abundance of food available there. The suggested relationship is that this shortens or lengthens the remigration periods[34], and this is expressed in the presence of more or fewer females on the beach.

Although there is a lack of clarity regarding the direct relation between Niño/Niña years and the presence of females on the beach —given the complications of looking at consecutive years between both phenomena and the number of turtles from the various affected cohorts of hatchlings— in this case statistical tests should be applied to provide better criteria to determine the positive or negative impact for each event.

Impact on the Laguna de Términos Flora and Fauna Protection Area

The *nortes* are more frequent in this area, but they rarely have such a devastating effect as the storms that hit in 1992 and 1995, given the intensity of the accompanying rainfall and dramatic rise in the tide level along the coast due to the direction and seasonality of the predominant winds that caused flooding in the low-lying areas (see table below).

Year of Event	Start Date or Duration	Affected Place	Effects On	
1992	September	Isla del Carmen-Isla Aguada, Sabancuy and Chenkan	Nests	Hatchlings
1995	August	Isla del Carmen-Isla Aguada, Sabancuy and Chenkan	Nests	Hatchlings

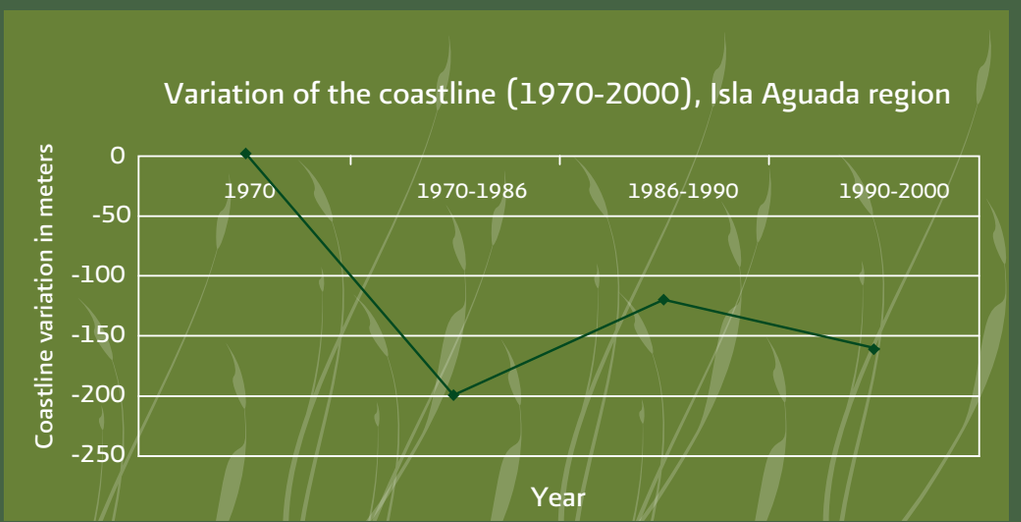
Years when tropical storms or *nortes* affected beaches in Campeche during the breeding season.

In 1995, the speed with which the storm hit gave little time for contingency measures to be taken. The scale of the impact on the number of nests and broods harmed in those years is unknown, but the repercussions will be seen in the number of females observed between 2012 and 2018.

There are other factors or phenomena which will have a future impact on the productivity of populations of hawksbill sea turtles that nest in Mexico; two of the main ones are erosion and infrastructure construction on the coast. Marine erosion processes and the reduction in coastal dune vegetation deriving from the plundering of plant species for various uses—such as for vegetable carbon, fish bait and construction—has caused a major shift of the coast inland, dramatically altering the profile of beaches and reducing their area, making it more difficult for the turtles to reach the beach and modifying temperatures in the substrate, which has affected the size of the hawksbill sea turtle nesting area. For example, in 2009, on Isla Aguada, the hawksbill sea turtle had a temporal distribution from April until October, with a peak nesting period in June; however, there were few nests, and by July their numbers were falling sharply.[35]

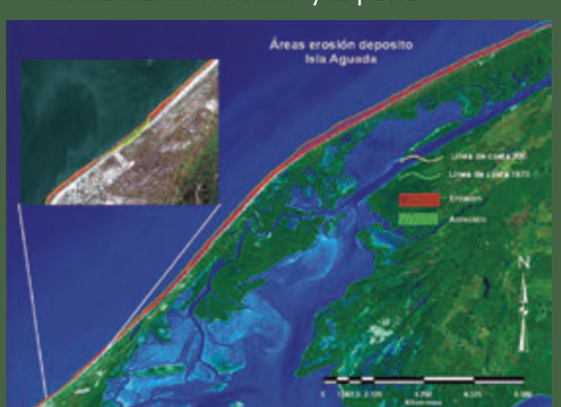
An analysis was carried out on the changing coastline in the region of Isla Aguada-Chenkan using four satellite images of the area between Isla Aguada and Chenkan[36] taken in 1970, 1984, 1995 and 2005, i.e. over a period of three and a half decades (1970-2005). This found an average annual loss of 5.3 meters of beach width per year.

[34]*The term "remigration" was coined by biologists specializing in sea turtles, and refers to the migration back from the foraging zone to the nesting area by an individual who has already nested in a previous season.*
[35]*CONANP. "Monitoreo de tortugas marinas en el Área de Protección de Flora y Fauna Laguna de Términos"*
[36]*Antonio Márquez García, "Variación de la línea de costa en la Región de Isla Aguada-Chenkan, Campeche", UAEM-ANIDE.*

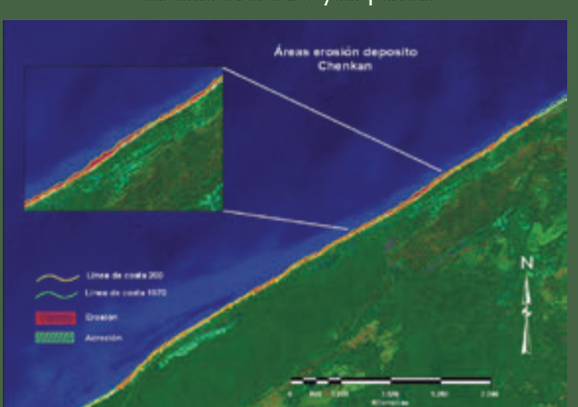


Fluctuations exists in the coastline during the 1970s and 1980s, when the line receded inland an average of 19.5 meters per year; this could have been caused by a reduction in the amount of sediment entering the sea, as a result of the interruption to natural deposit patterns by the construction of dams or hydrological modifications further inland, the construction of highways, roads, canals, as well as the potential effects of climate change.[37]

Process of erosion and accretion along Isla Aguada's southern-central coastline over a 30-year period



Process of erosion and accretion along the Chenkan coastline over a 30-year period.



The effect of the degradation on the beaches of Campeche is shown in the changes made in the 1970s with the construction of dams on the rivers that retained the sediments that used to reach the sea and the beach; another factor was the construction of the coastal highway that acted like a barrier preventing sediments from reaching the beach at several points along Campeche's coastline. Subsequently, an attempt was made to stop the erosion of beaches by building three different types of structure: breakwaters, [38] gabions[39] and tetrapods.[40]

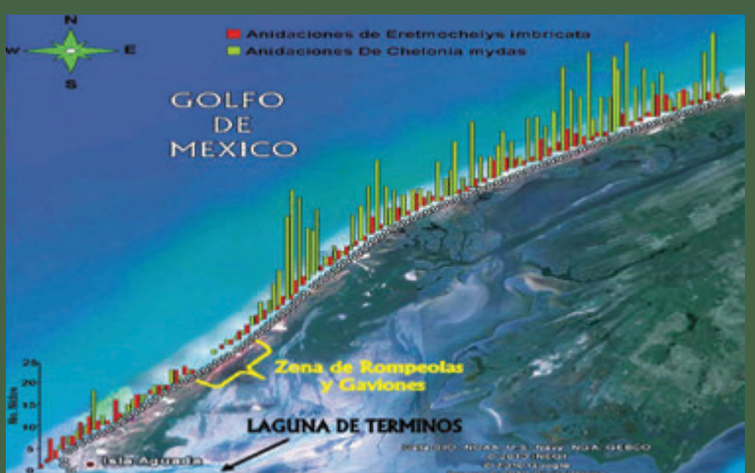
None of these structures, nor other works, have halted coastal erosion; on the contrary, the lack of oceanographic studies and proper analysis of coastal dynamics means these projects have actually ended up preventing sediments from reaching the coast, accelerating beach loss, and where the beaches do still remain, changes to their shape and size are significant.

Currently beach loss through coastal erosion is worsening each year, with the side effect that sediments retained in the wetland areas causes siltation and acidification of the Términos river-lagoon system. This infrastructure also significantly changes the nesting behavior of female sea turtles, by forcing them to move from where they originally nested and where they would most probably lay again, given the phenomenon of philopatry. An example of this impact is found at monitoring station 434 of

[37] *Andrea Bolongaro-Crevenna Recasens, Vicente Torres Rodríguez, Antonio Márquez García, Aideé García Vicario (UAEM-ANIDE) y Vicente Guzmán Hernández (APFFLT-CONANP).*
[38] *Formed by barriers of solid wooden trunks, filled with rocks, placed at an angle to the predominant direction of the waves.*
[39] *Rock-filled structures made with galvanized wire, built in stepped, pyramidal forms, generally placed on the open beach in an exposed position parallel to the coast, very close to or far up the beach.*
[40] *High-endurance concrete structures built for marine use, shaped like jacks with four points or feet and measuring over a meter high. They are positioned in the sea, parallel to the beach, at depths less than one meter, in order to reduce the force of the waves.*

the Turtle Camp on Isla Aguada (2.5 km of beach) where since 1999 the number of nests has reduced to the point they have practically disappeared.

On the other hand, the number of nests at monitoring station 435 of the same Camp, which lacks any kind of physical barrier, has risen sharply in recent years: more than four times in 2006 and more than double in 2007, This may be due to the fact that turtles that previously nested on beaches that have since been lost have moved to areas with better nesting conditions.



Density of 2009 nests of the hawksbill sea turtle and green sea turtle on the beach of Isla Aguada, distributed by beacons related to structures placed by the Ministry of Communications and Transport (SCT) in certain locations to protect the edges of the federal highway. Modified from Google.

A similar situation can be observed with other structures placed along various sections of the beach at Chenkan, an important nesting site for the hawksbill sea turtle. Although the effects are yet to become very noticeable—the structures were only placed in the region in 2005—a reduction in the population density has been recorded over the years at kilometer 107.

The placement of tetrapods parallel to the coast makes them veritable barriers that turtles find hard to cross: these structures cover various kilometers of coastline, are placed very near the surface and the tides rarely cover them completely. Therefore the nesting females are forced to go in search of nearby beaches in order to lay their eggs. The combination of such structures along the beach are deadly for the nesting females and their hatchlings. The females face the stress of being prevented from reaching the beach, smashed onto the rocks by the tide, and stranded in the gaps or between the rocks. The infrastructure also acts as a treacherous path that leads them to the highway, and prevents them from returning as they get run over by passing cars; or they get lost among the stone barriers. Meanwhile, the hatchlings can become stuck among the rocks or be killed from being slammed against the breakwaters.

Conclusions

There was evidence showing changes in the temperature of the sea surface in the short, medium and long-term, an increase that coincides with changes in reproductive behavior of females in the area (for example, the delayed effect in nesting and reduction in the number of nests), taken as the index of the abundance and population growth observed on nesting beaches. The anomalous temperature variations at basin level include a cause and effect relationship. The causes include rising sea levels, greater tidal range, changes in the intensity and direction of coastal currents, rising sea surface temperatures, extreme climatic variations in nesting sites, an increase in the frequency and strength of tropical storms, anomalous thermal variations along the migratory corridors and in foraging sites. The effects include loss of beaches previously used for nesting due to alarming levels of erosion, changes in population growth, higher mortality rates of hatchlings, and gender imbalances, the destruction of the stock of the initial egg-hatchling population (recruits), a reduction of proper available food, and coral bleaching (death).

Due to their migratory nature and their extreme dependency on critical habitats during the hawksbill sea turtle's life cycle, spent 1% on nesting beaches and 99% in the sea, where it rests, feeds and develop, efforts must be redoubled to improve this critical habitat, without abandoning the years of conservation and monitoring work on the beaches where this species chooses to nest, with a special focus on the effects of climate change.

VI. EVALUATION SUBSYSTEM

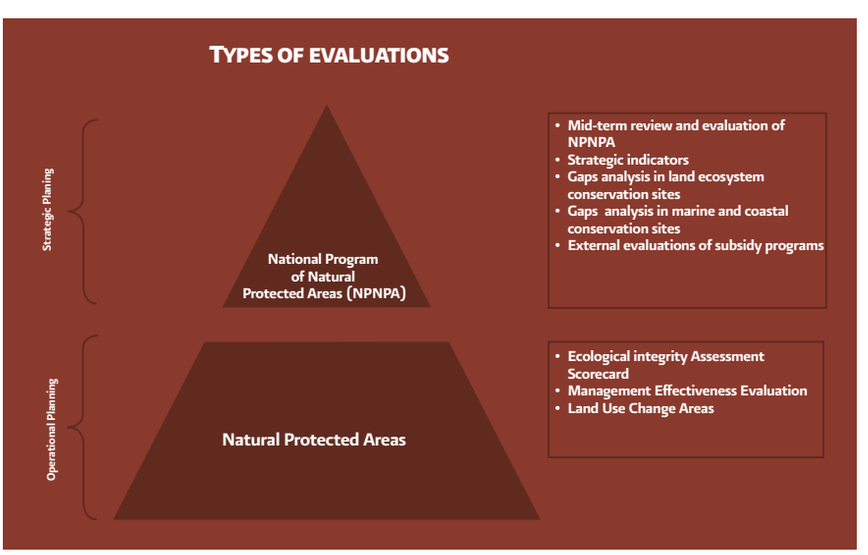
The need for greater efficiency in terms of investment in PA management becomes increasingly important due to a scarcity of resources on the global, national and local levels for in situ conservation. This shortage underlines the importance of proving that the objectives for which a PA was created are in fact being fulfilled, in addition to providing evidence of the benefits that they provide to surrounding communities and to society in general.

The importance of evaluating the effectiveness of PA management was analyzed during the V World Parks Congress held by the IUCN in Durban in September 2003, and in the Seventh Conference of the Parties (COP7) to the Convention on Biological Diversity (CBD) in Kuala Lumpur, in 2004, specifically through the Program of Work on Protected Areas. One of the goals proposed by that program included evaluating and improving management effectiveness in protected areas for 2010, and therefore the parties adopted and implemented strategies for management monitoring, evaluation and information both for sites as well as for national and regional systems and protected cross-border areas.[41]

In general, the goal is to measure progress, get to know the achievements, and identify the weaknesses and strengths of a program or project. They will also be evaluated to analyze the costs and benefits, collect information, share experiences, improve effectiveness and permit better planning through adaptive management. Efforts will be made to improve functions and to promote responsibilities focused on results and learning, and that move away from finger-pointing. The results from the follow-up and evaluation thus open the way to improve and learn from the experience, that is, to generate lessons learned and best practices; taking basic decisions within an objective evaluation helps us to base decisions and actions on causes, rather than effects. Evaluation is most useful for ensuring current sources and negotiating better and additional sources of resources[42]

Given the complexity involving each of the protected spaces from the social, economic, political and cultural point of view, and since each of these themes exceed the CONANP capabilities, we have tried to be very careful in the methodologies that we apply to different levels of analysis (national, regional or PA) with the evaluations. Each of the evaluations presented below has a different objective and, as such, the information to be presented is different, as well as the procedure that must be followed for its implementation.

The progress made in the different types of evaluations is described below.



[41] *Cracco, M., J. Calvopiña, J. Courrau, M. Medina, I. Novo, I. Oetting, J. Surkin, R. Ulloa y P. Vasquez. 2006. Strengthening management effectiveness in protected areas in the Andes. Comparative analysis of existing tools. IUCN. Quito, Ecuador.*

[42] *Hockings M., Stolton, S. and Duley, No. 2000. Evaluation effectiveness: A framework for assessing the management of protected areas. IUCN. Gland, Switzerland and Cambridge, UK X + 121pp.*

- **Mid-term review and evaluation of NPNPA**

One of the main conceptual differences between traditional planning and strategic planning is that the latter evaluates scheduled goals on an ongoing basis through the use of monitoring systems. Thus, the environment is seen as continuously evolving and, based on the variations, it is possible to modify the objectives by orienting them toward achieving the institutional mission and vision. In this way, an important part of the consolidation and strengthening of the strategic planning process that has been designed and implemented in the CONANP has been the mid-term evaluations of the strategic indicators of the 2001-2006 CONANP Working Program that were carried out in 2004 and 2009, respectively. As a result of the mid-term evaluations, some of the proposed indicators have been modified or eliminated, thus enriching the planning process. This has allowed institutional efforts to focus on those conservation measures that will fulfill the institution's mission and vision.

In conclusion, it may be said that the mid-term evaluations of the policies and programs implemented by the public sector have allowed us to analyze the scope of the scheduled goals and the objectives that were proposed during their implementation, contributing to the correction, modification or suppression of the actions or projects that, given the changing conditions of the context, either impede or turn out to be a priority for the achievement of the declared mission and vision. In this way, the mid-term evaluation serves as an instrument of transparency and accountability for society, and contributes to improving program performance and optimizing resource use. Without it, it would be unclear whether the actions taken were in fact helping to achieve the expected results.

One of the first steps for carrying out the review and assessment on the NPNPA implementation was to procure the study "Review and Analysis of the Goals and Indicators of the National Program of Natural Protected Areas (NPNPA) 2007-2012", which analyzed, among other things, the main strengths and areas of opportunity for the six strategic approaches established in the NPNPA, reaching the following conclusions:

1) The strategic approaches reflect the purpose of the NPNPA; however, it is essential and appropriate to provide a more precise definition of the meaning and scope of most of them, in order to avoid interpretations that could lead to dispersed efforts and resources in a context of budgetary restrictions.
2) The subjects contained in each strategic approach adequately reflect what is proposed in the CONANP conservation focus, which in turn determines its mission and vision, thus contributing to their fulfillment.
3) The main area of opportunity that was identified stems from the fact that different general and specific objectives prioritize the preparation and implementation of problems and strategies, instead of focusing on obtaining significant conservation results, and so modifications to their orientation are recommended.
4) For the strategic approaches of protection, management and restoration, their general and specific objectives, indicators and goals should clearly demonstrate their specific impact with regards to ecosystem and biodiversity conservation, as well as the environmental services that they provide.
5) In special cases, there is a need to verify the consistency between the specific objectives, the general objectives and the reference framework (focus, mission and vision), in order to ensure that the proposed goals are achieved.

An essential part of this study was evaluating the usefulness of each strategic indicator according to the results that were reported by the responsible departments during 2007, 2008 and the first half of 2009.

[43] *Cabrero, Enrique 2000, "Costumbres en la hechura de las políticas públicas en México" [Customs in Public Policy Making in Mexico] in Política Pública, Volume IX, No. 2, CIDE, Mexico.*

The consultant also concluded that of the 49 indicators published in the NPNPA, 22 were not useful for evaluating institutional performance based on the objectives in the strategic approaches and not therefore, for the mission and vision either. Only 17 of the 49 indicators were oriented toward measuring results and impacts, which underscored the affirmation that there is an existing tendency to prioritize establishing management or processing indicators (which refer to carrying out activities) above the indicators that reflect obtaining products or services and that measure the degree to which these objectives were met. This constitutes an area of opportunity, because it does not make it possible to determine whether the efforts are effective and efficient (that is, if they are the best or the most appropriate) or if the resources that are used, are used efficiently (in the best way) or if other mechanisms should be designed and applied, because in general, they only verify whether or not the actions have been performed.

Based on this analysis, a proposal was made to keep 12 indicators, to eliminate 18 and to substitute or modify 19. In certain cases the elimination proposal was accompanied by a proposal for an alternative substitution.

In the analysis described above, the operating results for 2007, 2008 and the first half of 2009 and the proposals relating to the indicators provided the basis to carry out the "Mid-Term Review and Evaluation Workshop on the Execution of the NPNPA 2007-2012" which was held in Mexico City on November 17, 2009, to jointly assess the usefulness of each of the 49 indicators by strategic approach. 21 external guests from various sectors, including universities, non-governmental organizations, and state and federal government institutions participated in the workshop alongside 29 CONANP personnel. With the results, the participants updated the descriptions of the indicators and specified measurement units and formulas, among other elements, making significant progress in the content of each indicator.

Subsequently, a "Working meeting to revise, modify, define and/or validate the goals for the NPNPA indicators that will be used 2010-2012" was held in Cocoyoc, Morelos, on December 10, 2009, where 26 CONANP executives participated.

During the meeting, the 30 indicators were reviewed and a first goal proposal was prepared for each of the regional offices. Various pending tasks were assigned related to defining indicator guidelines, updating coverage populations and definition of concepts, among others. The goals were ratified and reviewed by the regional directors with their respective NPA directors or supervisors. The list of 30 strategic indicators to be applied between 2010 and 2012 by strategic approach and subject are described in Chapter III, "Historic Overview of the Design and Operation of the SIMEC", of this publication.[44]

- **Strategic Indicators**

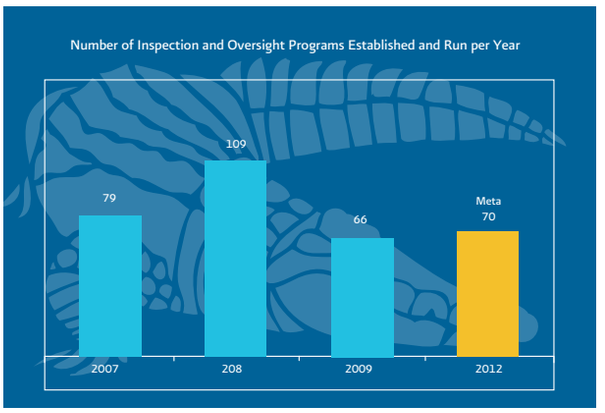
One of the SIMEC objectives is to systematize the results generated in each of the CONANP administrative units, which are linked to the 30 strategic indicators. Based on the analysis of the measurements, below is an overview of six examples of the results obtained up to 2009, according to the strategic lines established in the NPNPA.[45]

1) Protection

The protection subprogram refers to the actions designed to prevent anthropogenic activities (illegal settlements, rivers affected by the construction of homes in protected areas, land invasion close to the sea or to mangrove forests that foster the plundering of natural wealth and the habitat of wild and aquatic species, illegal logging, illegal possession and sale of endangered animals) from having a negative impact on the populations of endangered species and their habitat. It uses over-sight activities with the participation of NPA personnel and in coordination with PROFEPA and other competent authorities, with the participation of residents from surrounding

[44] *For more information about the evaluation process, please visit the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluacion*
[45] *The results of the 30 strategic indicators are available on the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluacion*

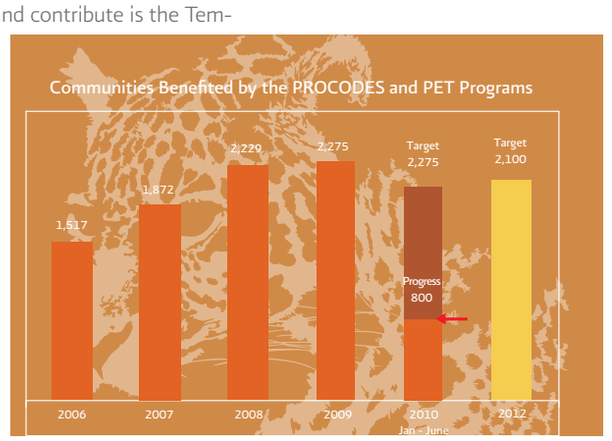
communities through participatory environmental oversight groups or committees, and takes the social conditions of the involved communities and the distribution area of the endangered species into consideration. The following graph shows the results achieved since 2007; it is important to mention that the Working Programs are approved each year with PROFEPA.



2) Management

The Conservation Program for Sustainable Development (PROCODES) is a public policy instrument that promotes ecosystem and biodiversity conservation through the direct and effective participation of the population, owners and users in land management processes, as well as in the appropriation of its resources and their protection, management and restoration, and through the economic assessment of the ecosystem services these provide to society, in such a way that they generate alternative productive opportunities and contribute to improving the quality of life for the residents within the context of the NPA and other conservation modalities.[46]

Another program through which local residents may participate and contribute is the Temporary Employment Program (PET), a tool for supporting marginal communities in order to maintain and promote sustainable management of their natural resources while simultaneously covering their current needs during low income periods. This helps to reduce environmental imbalance and to improve the wellbeing of families living in extreme poverty. Likewise, a large part of the work supported by the program is used to build infrastructure and to create the conditions for setting up productive projects in the NPA.[47]

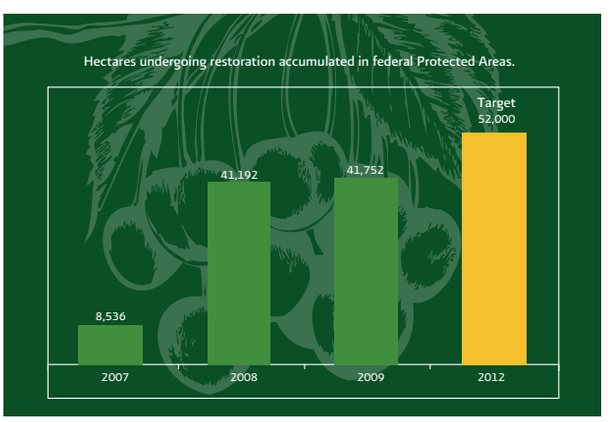


The results obtained through these two programs are shown in the following graph, and an annual growth may be observed in the number of communities that participate in carrying out various conservation activities both in the PAs and in other conservation modalities. For 2010, the orange bar represents progress towards the goal in the January-July period, and represents 800 communities.

3) Restoration

One of the relevant CONANP strategies is the restoration[48] or recovery of disturbed soils or land. In this sense, progress in executing these activities is measured through the indicator "Hectares undergoing restoration accumulated in federal Protected Areas". Coordination with CONAFOR and collaboration with other partners such as non-governmental organizations has proved essential to achieve the expected annual results.

The following graph indicates the land area restored each year in various NPA. In 2009, 41,752 hectares were restored. The restoration activities included reforestation of forest areas, wetland recovery and reef rehabilitation.



[46] *For more information, please visit the CONANP portal at http://www.conanp.gob.mx/acciones/procodes.php*
[47] *For more information, please visit the CONANP portal at http://www.conanp.gob.mx/acciones/pet.php*
[48] *The restoration process is initiated by humans to recover the environmental conditions (vegetation, flora, fauna, climate, water, soil and microorganisms) or a disturbed ecosystem. Ecosystem recovery is one task that must not be postponed; restoration is one of the main activities to rehabilitate the sites that are affected by clearing, land use changes, forest fires, forest pests, and the introduction of exotic species, among others.*

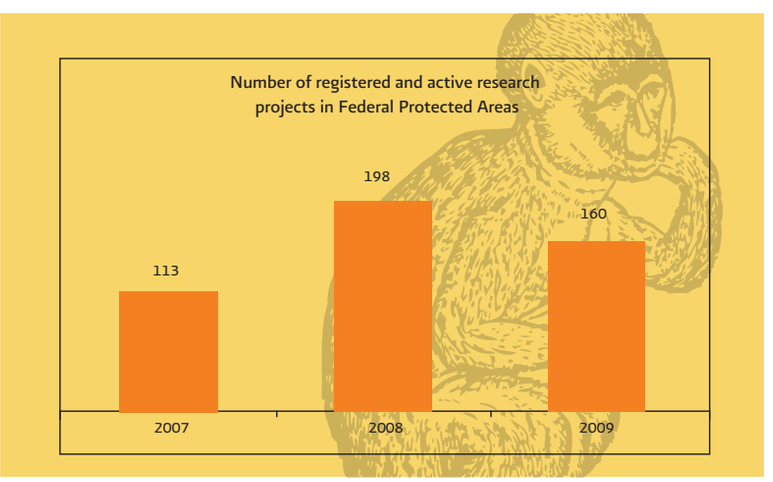
4) Knowledge

Moving forward in conservation requires knowledge – data, studies, assessments and biological, geographic, ecological, social and economic records that are systematized, available and up-to-date – in order to make crucial decisions. Basic and applied scientific research is essential to improving our understanding of the dynamic and functioning of complex ecological and social systems, as well as their interactions.[49]

Carrying out research projects in PAs is essential, because these generate information for:

- Fostering increased scientific knowledge about areas to be protected.
- Support comprehensive administration of the area and adaptive management of the ecosystems and their biodiversity.
- Increase the added value of the areas and the positioning of the ecosystem and the country as an important scientific destination on the local, regional, national and global levels.
- Contribute to raising awareness in society about aspects relating to the value con tributed by natural heritage in PAs and other conservation modalities, once this information is disseminated.

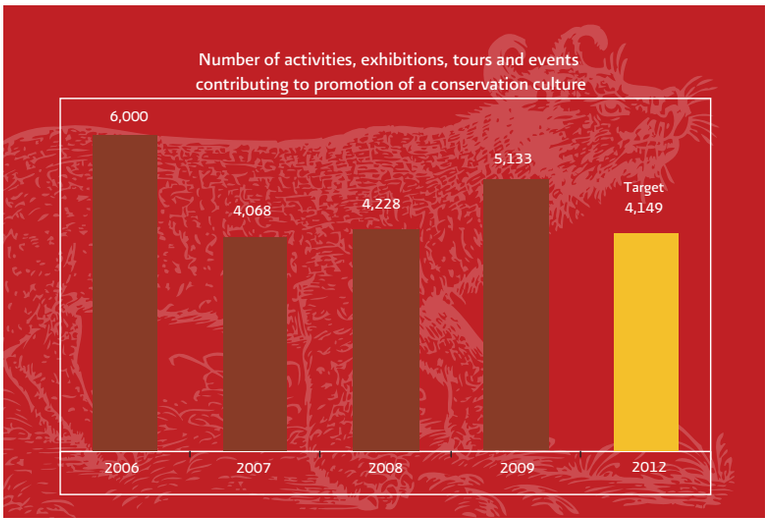
In order to measure this knowledge generation in PAs, the indicator "Number of registered and active research projects in Federal Protected Areas" was established. Both national and international academic institutions and research centers participate in these projects. It is important to clarify that the results recorded in this indicator are those research projects of which CONANP is aware; it does not necessarily reflect the total amount of research developed in PAs nationwide, because unfortunately, not all researchers coordinate with personnel in these areas.



5) Culture

Ecosystem conservation must not be the sole responsibility of government institutions. Society's participation is essential in order to maximize this effort. In this sense, the activities developed by the CONANP designed to foster a culture for conservation in society are a key element in the successful achievement of the proposed objectives and strategies.

[49] *Programa Nacional de Áreas Naturales Protegidas 2007-2012 (PNANP).*



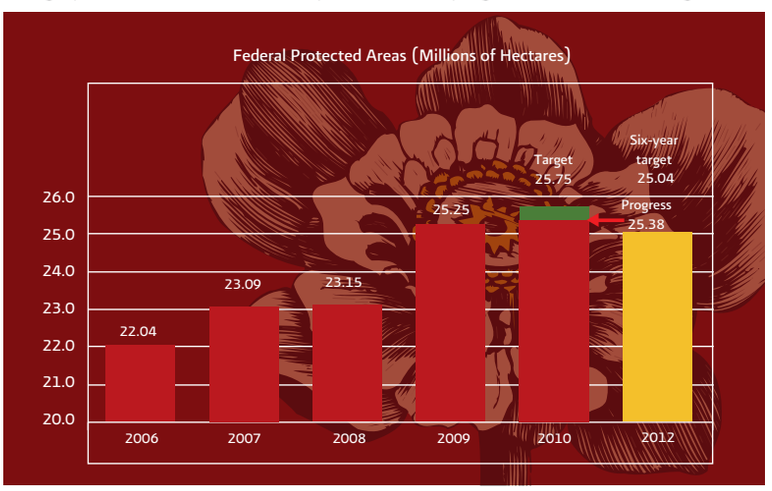
The various actions involving society that are promoted by the CONANP, mainly during National Conservation Week, since 2002 celebrated during the last week of November, are quantified through the indicator "Number of activities, exhibitions, tours and events contributing to promotion of a conservation culture per year".

6) Administration

The indicator "Decreed Federal Protected Areas" is considered a measurement of results, recording the successful incorporation of land areas characterized by a high level of biological diversity and a good state of conservation, into the national registry of federally protected areas. This seeks to broaden the level of representation of different ecosystems, as well as biodiversity, in an amount that ensures their long-term duration, since partial or total degradation processes are taking place in the country, leading to loss of biodiversity.

Currently, there are 174 PAs with a combined surface area of 25,384,818 hectares, equivalent to 12.92% of the national territory. The current administration committed to the target of adding 3 million further hectares of federally protected areas to be incorporated into the area in federally-protected lands. A total of 3,554,130 hectares were decreed, representing a 118.46% fulfillment of the six-year goal.

In the graph, the red bar for 2010 represents 98% progress of the annual target.



- **Gap Analysis in Land, Marine and Coastal Ecosystem Conservation Sites**

In March, 2004, the Seventh Conference of the Parties to the Convention on Biological Diversity (CBD) was held in Kuala Lumpur, Malaysia. The Programme of Work on Protected Areas of the Convention on Biological Diversity was approved during the forum.

The Parties recognized that protected areas represent a vital contribution to the conservation of the world's natural and cultural resources; the overall purpose of the Programme of Work is "to support the establishment and maintenance by 2010 for terrestrial areas and by 2012 for marine areas of comprehensive, effectively managed and ecologically representative national and regional systems of protected areas that collectively, inter alia through a global network, contribute to achieving the three objectives of the Strategic Plan of the Convention, the Plan of Implementation of the World Summit on Sustainable Development, the Millennium Development Goals, and the 2010 target, to significantly reduce the current rate of biodiversity loss at the global, regional, national and sub-national levels, and to contribute to poverty reduction and the pursuit of development".

The countries pledged to formulate targets designed to obtain results in terms of extension, representativeness and effectiveness of their national systems of protected areas, with each country committing to translate the actions proposed in the program into their own targets.

Within this context, an analysis was made of the gaps and omissions in conservation sites in terrestrial, marine and coastal ecosystems. To generate an updated and complete vision of the gaps and omissions in conservation in protected areas in Mexico, the CONABIO and the CONANP, in collaboration with numerous institutions and specialists, formed a task force in order to carry out this evaluation using robust and technical criteria. Below is a brief description of the results achieved through the analysis.

1) Gap analysis in conservation sites in terrestrial ecosystems [50]

A multi-pronged, multi-scale analysis was carried out to detect priority sites for conservation of different groups of species and environments. As a result, out of 96 terrestrial ecoregions in Mexico, 11 lack protection and 50 are underrepresented in the PA systems of the three levels of government. Some bias was observed, since a higher proportion of highlands (more than 2,800 meters above sea level) are protected, in comparison with the rest of the country. The intermediate altitude areas (between 1,000 and 2,000 meters above sea level) are underrepresented in the PA systems. In terms of types of vegetation (both primary and secondary), the lowest protection levels are seen in tropical dry forest, the spiny shrubland of Tamaulipas and pine-oak forests; the highest levels of protection correspond to humid tropical jungles and mesophilic forests, which only possess a remnant of their original coverage. These analyses provide a general framework for conservation planning on a regional scale.

2) Gap analysis in conservation sites in marine and coastal ecosystems[51]

To analyze the gaps and omissions in marine and coastal ecosystem conservation sites, 105 priority sites for protecting Mexico's marine and coastal biodiversity were identified using digital thematic mapping, databases of georeferenced samples of marine wildlife, and a list of conservation targets. The analysis showed a low level of representation by surface area within the federal system of protected areas. It is important to mention that many of the coastal federal PAs were selected because of their terrestrial ecosystems, which barely adjoin or leave out altogether the coastal water bodies and the littoral. This analysis showed that 78 priority sites are represented with less than 20% coverage in the protected areas system. Of these, 21 sites are coastal and on the continental shelf, and all of the deep sea sites lack protection. This exerci-

[50] *Details from this analysis are available in the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluación/gapterrestre*

se provides a frame of reference for decision making and identifying priorities related to marine ecosystems for the knowledge, conservation and sustainable management of marine resources.

- **External Evaluations of Subsidy Programs**

Evaluation of subsidy programs is an instrument that promotes change and efficiency in public policy. The main benefit of an external evaluation is that it allows us to verify whether or not the functioning and the effects of a program are aligned with the targets to be met. Thus, it becomes a decision making tool to improve future planning, operations and accountability. It is a systemic process that allows us to place a value on the results of a program's operations and to quantify the magnitude of their benefits; it examines the unforeseen effects in the beneficiaries and in the sites where the program is operating; it proposes action reorientation measures, improves the functionality of the processes and in general, increases effectiveness and efficient resource application to achieve its objectives.

In 2007, the federal government committed to contracting various types of external evaluations for the subsidy programs. The different types of evaluations are determined and supervised by the National Council for the Evaluation of Social Development Policy (CONEVAL), and the Ministries of Finance and Public Credit and of Public Administration. All of the external evaluations include terms of reference, and are carried out by academic institutions with a good domestic and international reputation.

To date, the following evaluations have been commissioned:[52]

- 2007 Consistency and Results Evaluation of the Regional Sustainable Development Program (PRODERS), performed by the Interdisciplinary Marine Science Center of the National Polytechnic Institute (CIIEMAD-IPN).
- In 2008 and 2009, the Coverage and Focus Strategy Evaluation was carried out for the Conservation Program for Sustainable Development (PROCODES) by the Nor thwest Regional University Center – Autonomous University of Chapingo (CRUNO-UACH)
- Evaluation of Design of the Vaquita Marina Program

- **Ecological Integrity Assessment Scorecard**

This is an initiative sponsored by the Environmental Cooperation Commission (CCA) as part of the Strategic Cooperation Plan for the Conservation of Biodiversity in North America. It identified 28 sites as priority conservation areas that are equivalent to 8% of the total surface area comprised of the exclusive economic zones of Canada, the United States and Mexico. The 28 sites are considered essential to safeguarding marine biodiversity in the region known as Baja to Bering (B2B). The North American Marine Protected Areas Network (NAMPAN) has identified seven marine ecology regions within the corridor running from Baja California to the Bering Sea (B2B). Two of these seven regions, the Pacific Region of Southern California and the California Gulf Region, include part of Mexico's territorial waters. In the case of the Pacific Region of Southern California, more than 80% is in Mexico, while the California Gulf Region belongs to Mexico in its entirety. These regions contain 15 Marine Protected Areas (PMAs).[53]

In coordination with its partners, the CCA held various workshops to structure and implement the project "Toward a comprehensive bio-monitoring system of the marine ecosystems in the B2B region". Representatives from the three countries participated in the workshops, and

[51] *Details from this analysis are available in the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluación/gapmarina*
[52] *The results from each of the abovementioned evaluations are available in the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluación*

highlighted the following issues:

- The monitoring that has been developed by each country is "similar, but different" (it is difficult to make direct comparisons).
- The indicators must be organized around common themes.
- Current monitoring of the PMAs does not reflect the large-scale history of the B2B region.
- Monitoring efforts are focused on management issues within the PMAs, not on issues with a broader scope.
- The monitoring programs have different parameters; they are not designed to achieve uniformity among the PMAs.
- In most cases, monitoring does not involve citizens and principle decision makers.

- Budget limitations impedes long-term monitoring or only allows for recording the main parameters.

The objectives established were: 1) to apply a robust and homogeneous method to report on the health of the PMAs within the B2B region and 2) to learn from the feedback of the people who implement it and use this to adapt the method.

The main themes upon which the evaluations of each site would be carried out were also defined, as well as 12 key questions that were divided among three themes in the following manner:

- Water quality
  1. To what degree do human activities impact water quality and flow, and how are such flows changing?
  2. To what degree do alterations in nutrient loads affect ecosystem health, and how are such loads changing?
  3. To what degree do water conditions pose a risk to human health, and what changes are being observed to these conditions?
- Habitat
  4. To what degree do human activities impact habitat extension and quality, and what changes are being observed to these activities?
  5. To what degree does habitat conversion – including modifications in the extension and distribution of the main types of habitat – affect ecosystem health, and what changes are being observed to this conversion?
  6. To what degree do the contaminants that are present – in the habitat – affect biolo gical resources or water quality, and what changes are being observed to these contaminants?
- Biological resources
  7. To what degree do human activities impact the quality of marine biological resources, and how are these changing?
  8. What is the condition of biodiversity and how is it changing?
  9. What is the state of economically-exploited species and what changes are apparent?
  10. What is the state and condition of the key species, and what changes are apparent?
  11. What is the state and condition of the endangered species, and what changes are apparent?
  12. What is the state of the exotic species and what changes are apparent?

It is important to mention that the answers are "pre-set", so that the valuation description may help to ensure uniformity and to eliminate bias.

The methodology also takes scientific evidence and expert opinions into account to identify conditions and trends in each of the themes. To this end, a workshop was held for each site

[53] *For more information about this process, please visit the CCA portal at http://www.baja2bering.net*

in which participants answered the 12 key questions and filled in the Ecological Assessment Scorecard. The roundtable included monitoring and science, as well as community and traditional knowledge (the best knowledge available) to answer the questions. The answers to the questions were recorded in a grid which allowed the evidence to be set out and the gaps that needed to be documented to be identified. Subsequently, the grid was transformed into scores to produce an answer. At the end of the workshop, the ecological fact sheet for the evaluated MPA was produced, along with supporting documentation to back up the answers.[54]

To date, Mexico has carried out these evaluations for seven PMAs, which are listed below:

- Upper Gulf of California and Colorado River Delta Biosphere Reserve (Baja California and Sonora).
- San Pedro Martir Island Biosphere Reserve (Sonora).
- Loreto Bay National Park (Baja California Sur).
- El Vizcaino Biosphere Reserve (Baja California Sur).
- Cabo Pulmo National Park (Baja California Sur).
- Espiritu Santo Archipelago Marine Zone National Park (Baja California Sur).

Below is an example of the results of the evaluation process for Cabo Pulmo National Park (Baja California Sur).

The Cabo Pulmo National Park is one of the most important areas in the Gulf of California because of the great number of marine species that make their home there. It shelters the only live coral reef in the northernmost section of the American continent, which is estimated to be approximately 25,000 years old. It is the only hard coral reef in the entire Baja California peninsula, and one of only three remaining live reefs in all of North America. The park hosts the most extensive area of coral coverage in the Gulf of California and is home to 11 of the 14 species of hermatypic coral that have been reported in the Gulf. In terms of its ichthyological community, 226 reef species have been observed of the 875 species that are listed for the Gulf of California. The mollusk group is well represented in the reef; cones, snails, and mother of pearl are all commercially important. 15 percent of the fish species reported in the reef fall within the visitor category because they do not depend on it exclusively; rather, they visit it to feed. The same occurs with the migratory species and others that fall under a protected or endangered category, like the turtles, whose nesting area is very close to building projects that have invaded the maritime-terrestrial federal zone (terrestrial section of the park). The marine birds are common throughout the Gulf. There is a small non-reproductive colony of sea lions, dolphins, and humpback, finback and minke whales. The park is sparsely inhabited; however, maritime passageways pass through the park and nautical traffic is quite heavy because of its proximity to Cabo San Lucas; in addition, the Bay hosts different types of deep, medium and shallow draft vessels in La Ribera and Buena Vista (in the northern section of the Park).

Below are some examples of the results from the question-answer process for the three themes (water, habitat and live resources) that reflect the ecosystem health of the national park. It is important to mention that the results are not only based on expert opinions; scientific information supports the status and trend assessments for each answer.[55]

[54] *Ibid.*

[55] *The results of the Cabo Pulmo National Park Scorecard are available in the CONANP portal at http://www.conanp.gob.mx/SIMEC/subsistemaevaluación.*

WATER		
Factors	**Status**	**Trend**
1. Human activities	**Good**	**Declining**
There are productive activities focused along the length of the park's coastline that may impact water quality: tourist services, dredging, fecal waste and hotel construction. There is little scientific evidence that measures its potential impact. During the years of the "El Niño" current, the sea level rises, flooding some wastewater deposits and causing coliform bacteria concentrations in the coasts near the town of Cabo Pulmo. The accelerated tourist development in surrounding areas favors the trend for a rapid decline in water conditions, added to the local current pattern that easily transports and disseminates contaminants.		

WATER		
Factors	**Status**	**Trend**
2. Effect of the nutrients	**Superior**	**Declining**
There is no evidence in the park of a discernible increase in the amount of nutrients or of excessive algae blooms because this blooming is naturally controlled by the invertebrate fish. There is no record or memory of a local red tide in the area or of similar phenomena, nor was an excess of algae biomass detected after the coral death caused by the effects of "El Niño". Therefore, the system is able to regulate the aforementioned increases. However, this system may be affected by the increase in the contribution from land, which over the long term is negative in terms of garbage and waste from tourist developments. • Monitoring and documenting the nutrient increase caused by anthropogenic activities is necessary.		

HABITAT		
Factors	**Status**	**Trend**
3. Human activitiess	**Acceptable**	**Declining**
The park has a scarce malacofauna presence as a result of the suspension of the exploitation of commercial species. The sub-aquatic activities and the inexperience of visiting divers has a detrimental effect focused on the habitat, as do the remains of fishing lines, nets and anchors that are still found in the park and that damage the coral reef. Anthropogenic activities along the coastline affect the nesting areas for sea turtles and birds, and combine with increased CO2 in the Earth's atmosphere and acidity of the ocean to gradually weaken the physical structure of the reef, resulting in damage to the quality and extension of the habitat. • Zoning and monitoring the intensity and recreational use of areas and park resources, as well as determine its load capacity is required.		

HÁBITAT		
Factors	**Status**	**Trend**
4. Extension and distribution	**Acceptable**	**Undefined**
The coral reef and its environment show modifications in its composition and quality. It no longer has a large mother-of-pearl population because of unregulated commercial exploitation. The "El Niño" currents, the acidification of the sea and cyclones have led to an infestation of opportunistic species such as polichaetes, meaning the reefs are in a condition very far from pristine; increased CO2 caused a reduction in coral coverage and bleaching of the reefs. The coastline loss due to construction and use of 4x4 vehicles damages vegetation, nesting areas and carves up the sand. There is insufficient scientifically-documented evidence on the trend to establish a rate of change; however, there are very clear grounds for concern. • It is necessary to study sediment loss on beaches caused by anthropogenic activities (gabions, cementing-over of springs, dredging, marinas) and the speed at which it occurs.		

LIVE RESOURCES		
Factores	**Estatus**	**Tendencia**
7. Human activities	**Good**	**Declining**
There has been a significant recovery of large carnivore species ever since the prohibition of commercial fishing, the absence of aquaculture, oversight and the reduction in waste discharge, anchors and water ballast. The Cabo Pulmo fish community appears to be healthy since biological monitoring does not show changes. Humpback whales are seen with greater frequency than in the recent past (5-10 years). Whale-watching takes place seasonally and causes low impact. However, tourist activity is increasing and there is a higher risk of impact on the turtle and bird nesting areas, as with some marine species that may be bothered.		

LIVE RESOURCES		
Factors	**Status**	**Trend**
8. Biodiversity	**Superior**	**Increasing**
The documentation and comparison of populations of existing species in studies carried out from 1980 to the present indicate that the park has recovered in the last 10 years. The condition of the birds and cetaceans is superior, with few exceptions. There are four species of turtles in the area, two nesting and two migratory, which while still encompassed by the Official Mexican Standard, the trend is towards a greater or lesser degree of improvement, depending on the species. The community structure of the reef is in good condition, and species of varying trophic levels may be observed, as well as abundance and different sizes in all of the organisms. The improving trend in biodiversity may be impacted by the growth and intensity of human activities; however, the implementation of management programs in the park must also be taken into consideration, in the sense of preventing risks and reducing impacts.		

LIVE RESOURCES		
Factors	**Status**	**Trend**
10. Key species (cetaceans, sardines, porgy, cabrilla) and indicators. Top predators: tiger shark, bull shark, white pointer shark .Invertebrates: Gorgonia, stone coral and filter feeder mollusks. Cetaceans: dolphin or tonina and hunchback whale Focus: Leatherback and Olive Ridley turtles, hunchback whales and tonina.	**Good**	**Increasing**
The Park shows evidence of the good condition of predator species, such as sharks and invertebrates including gorgonias, stone coral and filter feeder mollusks, unlike that of the coral, which has declined from a pristine to good condition due to natural causes such as the "El Niño" current. The humpback whale has increased its presence within the park and the Megaptera species and the two turtle species that nest in the Park have upgraded from good condition to superior. The entire system, with the exception of the coral and the Olive Ridley and black sea turtles, is improving.		

Management Effectiveness Evaluation

The success of the PAs as a conservation tool is based on the assumption that they are managed to protect the values that they contain. In order to be effective, management must be tailored to the site's specific demands and characteristics, because each PA possesses a variety of biological and social characteristics, pressures and uses. Achieving effective management is not a simple task; it requires adopting control targets and adequate systems of governability, as well as the proper resources to execute the control strategies at the right time. It is unlikely that it may be completely achieved without employing reflective and analytical management, which seeks to understand how effective the current management system is, and how it may be improved.

It is important to mention that there are various methodologies at the international level that may be used to plan, monitor and evaluate the effectiveness of management of PAs. The choice of and/or modification of the methodologies depends on the aims these evaluations seek to achieve. This section only described the methodology used as a frame of reference; the case study contains a description of other methodologies that are being applied in the PAs.

The frame of reference for the World Commission on Protected Areas (WCPA) of the IUCN was prepared by Hockings et al. (2000);[56] they developed a guide for evaluating management effectiveness in protected areas that establishes three components to be included:

1) Suitability of the design for the protected area.
2) Suitability of the management systems and processes.
3) To what degree is the protected area/system meeting the targets for which it was established.

Under these three components, the evaluation should cover six important steps or elements for the management cycle and evaluation: 1) current context or situation; 2) planning (where do we want to go); 3) inputs (what resources are available or what do we need; 4) processes (how will it be done); 5) products (what was done); and 6) impact (what did we achieve, meeting the targets). These comprise a framework that will become the base or structure for designing an evaluation system for a specific area or a system of protected areas.

The following example describes the interrelationship between the different types of methodologies and planning to evaluate management effectiveness in a PA:

[56]*Hockings, M., Stolton, S. and Duley, N. 2000. Evaluation effectiveness: A framework for assessing the management of protected areas. IUCN. Gland. Switzerland and Cambridge, UK. X + 121pp..*

Example: Comprehensive Monitoring Program for the Isla San Pedro Martir Biosphere Reserve (Sonora)

The island of San Pedro Martir and its surrounding waters were established as a Biosphere Reserve by Presidential Decree in the Official Gazette of the Federation on June 13, 2002.[57] Isla San Pedro Martir is considered one of the best preserved sites in this great archipelago because the island is one of the most isolated from the Gulf of California, making the area difficult to access; therefore, it has a much lower degree of human disturbance than the rest of the islands in the northwest region of Mexico.

The island is located in the middle section of the Gulf of California, 61 kilometers from the port of the Bay of Kino in the state of Sonora and 64 km from Punta San Gabriel in San Francisquito Bay on the Baja California Peninsula. The range of its geographical coordinates fall between 28°18' and 28°28' north latitude and 112°13' and 112°23' west latitude, covering a total surface area of 30,165 ha, corresponding to approximately 29,867 ha and 280 ha of marine and land surface area, respectively.

Isla San Pedro Martir is an extremely unique and biologically rich site, with 292 marine and terrestrial wildlife species that have been recorded to date. Of these, 42 species are listed in the Official Mexican Standard NOM-059-SEMARNAT-2001,[58] 30 species are on the red list compiled by the International Union for the Conservation of Nature (IUCN) and 36 are mentioned in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The richness of both marine and terrestrial biodiversity in Isla San Pedro Martir has been recognized in two planning efforts for the country's conservation: it is included within Mexico's Marine Priority Regions (Insular Complex of Baja California, Area No. 13)[59] and in the Areas of Importance for Bird Conservation (AICA No. 27)[60] that were established by the National Commission for the Knowledge and Use of Biodiversity (CONABIO). It is also recognized as a RAMSAR site in the Convention on Wetlands and is included on the list of World Heritage Sites and as a Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Background

In 2002, once the Reserve had been decreed, Comunidad y Biodiversidad A.C. (COBI), an NGO, selected five indicators from the manual "How is your MPA doing?" to evaluate management effectiveness in the reserve and began to determine guidelines; however, the monitoring was suspended until the MPA had a basic budget for its own operation and for a management program. Meanwhile, personnel from the reserve began the preparation process for the Conservation and Management Program (CMP) in coordination with COBI by implementing strategic planning based on the ZOPP[61] methodology. They prepared a logical framework to serve as a base for structuring the various management and subprogram components. One of the basic CMP components is strategic planning and updating the conservation and management program in order to consider feedback from this guiding document, in addition to practicing adaptive management.

In 2006 COBI and WWF-Gulf of California Program jointly decided, along with other partners, to carry out another planning process facilitated by the Foundation of Success (FOS),[62] in which the three institutions agreed on a common vision according to the needs and capacities and defined a strategic route to support the reserve's consolidation. This plan has been the base for involving other partners and collaborators in the reserve's conservation.

In order to register the progress achieved in the implementation both of the CMP as well as the Joint Strategic Plan (SP), a monitoring program was designed to incorporate indicators that evaluate management effectiveness of the reserve. It used the methodology established in the manual "How is Your MPA Doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness".[63] There were 37 management indicators selected: nine were biophysical, 12 socioeconomic and 16 related

[57] *Federal Executive Power. 2002a. Decree through which the region known as Isla San Pedro Martir, located in the Gulf of California off the coast of the Municipality of Hermosillo in the State of Sonora, with a total surface area of 30,165-23-76.165 hectares, is declared a Natural Protected Area as a Biosphere Reserve. Official Gazette of the Federation, June 13, Mexico City, D.F.*

[58] *SEMARNAP.2000. Programa de manejo area de Protección de Flora y Fauna Islas del Golfo de California, México. Protected Area Wildlife Management Program for the Islands in the Gulf of California, Mexico. 1st Edition. National Commission for Natural Protected Areas, Mexico, DF. 262 pp.*

[59] *Arriaga Cabrera, L., E. Vázquez Dóminguez, J. Gonzalez Cano, R. Jiménez Rosenberg, E. Muñoz López, V. Aguilar Sierra (Coordinators). 1998. Regiones marinas prioritatias de Mexico. Priority Marine Regions in Mexico. National Commission for the Knowledge and Use of Biodiversity. Mexico. (http://www.conabio.gob.mx).*

[60] *Target-Based Project Planning (Ziel Orientierte Project Planung)*

[61] *This is part of the Conservation Measures Partnership (CMP), which developed the Open Standards that propose an adaptive management focus to help teams to plan their projects systematically, in order to determine the extent to which the actions are working and to diagnose why some actions succeed while others do not, and which adjustments need to be made, through the application of five phases that comprise the Project Management Cycle: 1) Conceptualize; 2) Plan Actions and Monitoring; 3) Implement Actions and Monitoring; 4) Analyze, Use, Adapt; and 5) Capture and Share Learning.*

[62] *Pomeroy R. S., Parks J. E., Watson L. M. 2006. How is your MPA doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness. IUCN.*

to governability; these indicators will be explained in detail below, in the section "Methodology of the Process".

As the implementation of activities from both programs progressed, and recognizing that several of these activities are carried out in coordination with other entities and organizations, the participants identified a series of necessities and opportunities to link and align the reserve management and monitoring that was being carried out on the indicators that are reflected in different plans, initiatives, strategies and programs of a local, regional, national and international character. They defined a series of premises, listed below, that should be covered in the "Comprehensive Monitoring Program".

- It is a basis for adaptive management and for evaluating reserve management effectiveness.
- It is the basis for revising and, if needed, adapting the Conservation and Management Program.
- It aids in understanding the status of the site's conservation targets.
- It aids in documenting and evaluating the restoration of the insular ecosystem and its ecological processes.
- It promotes and strengthens the technical capacity of local residents who participate in monitoring.
- It promotes the recovery and use of empirical knowledge to be used in decision making.
- It promotes institutional synergy through the exchange of data, feedback and capabilities.
- It is the basis for reporting the observance of various international commitments in which the reserve is involved (RAMSAR, World Heritage, MAB, Baja to Bering from the Environmental Cooperation Commission, RARE and the Convention on Biological Diversity, among others.).

Habitat	**Marine**	**• Coastal rocky reefs • Deep waters • Sargasso beds • Black Coral forests • Pelagic habitat • Rhodolite algae**
	Terrestrial	**• Cardón cactus forest**
Ecological Processes	**Terrestrial**	**• Progressive divergence (endemisms) • Reproduction and rearing California sea lions • Marine fowl nesting and reproduction**
Species	**Marine**	**• Black turtle • Sperm whale • Finback whale**
	Marine and Terrestrial	**• Absence of exotic, alien species**

- It contributes to the institutional targets established in the NPNPA.

Methodology of the Process

Phase I: Conceptualize (specify conservation targets, identify and prioritize main threats).

a) Select conservation targets for the Isla San Pedro Martir Biosphere Reserve [64]

b) Direct threats identified[65]

The main threats identified that affect these targets in the reserve include: 1) overfishing caused by sport and riparian fishing; 2) illegal turtle and sea cucumber fishing; 3) high impact tourism; 4) navigation routes and potential oil spills; 5) the presence of exotic species, and 6) human presence on the island (military, fishermen, tourists, etc.).

Criteria					
Threat	**Area**	**Intensity**	**Urgency**	**Total**	**Priority**
Riparian fishing	**8**	**10**	**8**	**26**	**2**
Sport fishing	**10**	**8**	**8**	**26**	**3**
Deep sea and pelagic fishing*	**9**	**9**	**10**	**28**	**1**
Presence of exotics	**6**	**8**	**6**	**20**	**4**
Illegal sea cucumber fishing	**1**	**6**	**8**	**15**	**5**
Illegal turtle fishing	**1**	**5**	**8**	**14**	**6**

[63] *The development and use of conservation targets implies the identification of a representative group of ecosystems and/or species that the project will follow long term to evaluate the status of biodiversity, on-site resources and the impact that the actions are having.*

[64] *Direct threats are mainly human activities that directly affect the conservation targets.*

[65] *To define the project focus, the threats were prioritized according to three criteria:*
1. Area: the relative importance of the threat in relation to the total area of the Reserve that it affects. Greater area represents greater importance.
2. Intensity: Relative importance of the threat in relation of its seriousness per surface unit
3. Urgency: Relative importance of the threat in relation to the urgency of stopping it.

c) Prioritizing threats[66]

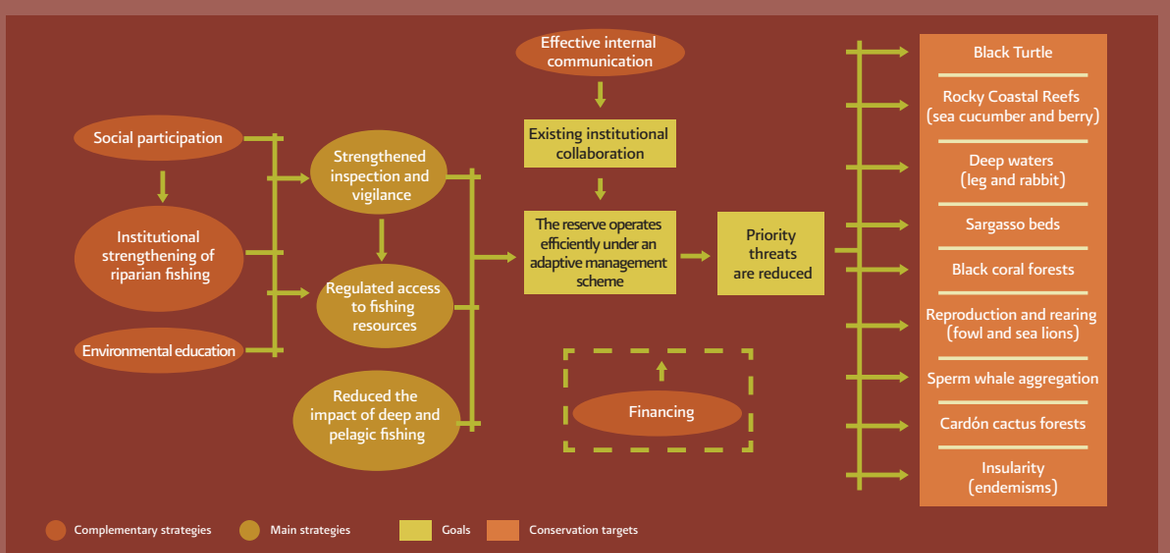
As may be observed, the priority threat is fishing, in all of its forms, followed by the presence of exotics on the island and the illegal harvesting of sea cucumbers and turtles.

Phase II: plan actions and monitoring

a) Strategy development

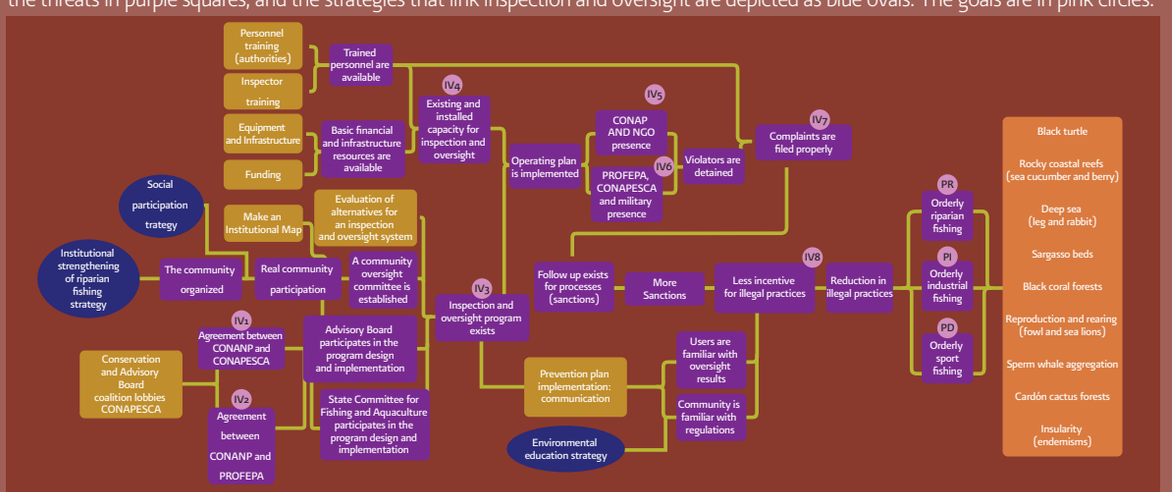
As a joint effort with the partners, and being aware of their interest in the marine area of the reserve, we proposed, prioritized and developed different strategies to mitigate,[68] them, which were included in the Joint Strategic Plan for the Reserve, based on the main threats that were identified in Phase I. For the Strategic Plan, the strategies were prioritized based on criteria such as the number of threats they mitigate, cost-benefit and interest, as well as the physical, financial and human capacities of the institutions.

According to this prioritization, the strategic plan contemplates three main strategies: 1) strengthening inspection and oversight; 2) regulating access to fishing resources, and 3) reducing the impact of deep and pelagic fishing. To these three main strategies, five transversal strategies are added directly connect to the main strategies: 4) institutional strengthening of riparian fishing users; 5) strengthening



social participation in reserve management; 6) environmental education; 7) ensuring long-term funding and 8) continuous monitoring.

Once the strategies were determined, we began to prepare their chains of results (for the SP and for the CMP). It is important to mention that the goals of the chains of results[69] from the SP are the same for the CMP in similar strategies. To illustrate this process, the following diagram shows the inspection and oversight strategy, where the conservation targets are located on the far right in orange, the threats in purple squares, and the strategies that link inspection and oversight are depicted as blue ovals. The goals are in pink circles.



[66] *Pelagic fishing is considered a potential threat*

[67] *A strategy is a group of actions with a common focus that work together to reduce threats, capitalize on opportunities or restore natural systems. Strategies include one or more activities and are designed to achieve goals and specific objectives.*

[68] *A chain of results is a tool that clarifies assumptions related to how the conservation strategies are believed to contribute to reducing threats and achieving the conservation targets. Each chain has a limited number of key results that absolutely must be reached so that the assumptions underpinning a strategy may be maintained, and goals are established for each one of them.*

[69] *The first group was comprised of the project team, CONANP at the regional and national level and through them, the international entities that were involved, and all of the local partners require extensive information about the project's progress. Therefore, a report will be prepared on the site's condition and effectiveness evaluation in Spanish and English. The second group, comprised of fishermen, users of Kino Bay, the Kino Bay community, non-governmental organizations and the foundations that fund them, require a simple, accessible and summarized outline of the results of the evaluation, so a fact sheet will be prepared on the ecological, socioeconomic and governability evaluation in Spanish and English.*

Strategy 1. Strengthening inspection and oversight

For each chain of results, an action and monitoring plan was prepared that described the goals of the strategy, its indicators (performance) and the related activities as shown in the following table as a complement to the chain of results from the inspection and oversight.

b) Develop a formal monitoring plan

In this phase of the project cycle two different processes were carried out; one to select the performance indicators and the other to select the management effectiveness indicators, following the two first steps of the "How is your MPA doing" guidebook, as described below.

Step 1. Choose the indicators

For the management effectiveness indicators, we followed the suggested steps from the guidebook for selecting indicators, which implied comparing and relating the targets and goals of the planning instruments for the Reserve mentioned previously with a catalogue of goals and generic objectives that are presented in the guidebook.

Marine Biophysical Indicators	**1. Focal species abundance (commercial species and under some protective status)** **2. Focal species population structure (commercial species and under some protective status)** **3. Habitat distribution and complexity** **4. Community composition and structure (diversity and abundance of species)** **5. Type, level and yield of the fishing "effort"** **6. Water quality** **7. Area showing signs of recovery** **8. Area receiving little to no human impact**
Insular Biophysical Indicators	**1. Focal species abundance** **2. Focal species population structure** **3. Community composition and structure (diversity and abundance of species in the Cardón cactus forests)** **4. Exotic species absence** **5. Area showing signs of recovery** **6. Area receiving light to no human impact**
Socioeconomic Indicators	**1. Local marine resources use patterns** **2. Local values and beliefs related to marine resources** **3. Level of understanding of the human impact on resources** **4. Perception of availability of fish and seafood as food** **5. Perception of non-market and non-use value** **6. Material lifestyle** **7. Distribution of family income by sources** **8. Home occupational structure** **9. Number and type of markets** **10. Natural history knowledge from interested groups** **11. Distribution of formal knowledge in the community** **12. Percentage of group members who are interested in leadership positions**
Governability Indicators	**1. Resource conflict level** **2. Existence of a decision making and management entity** **3. Existence and adoption of a management plan** **4. Local understanding of NPA norms and regulations** **5. Existence and adaptation of laws that make the NPA viable** **6. Availability and allotment of NPA administrative resources** **7. Existence and application of scientific research and inputs for the NPA** **8. Communal organization(s) existence and activity level** **9. Degree of interaction between administrators and interested parties** **10. Proportion of interested parties who are trained in sustainable use** **11. Level of training provided to interested parties during their participation** **12. Level of participation and satisfaction of the interested parties in terms of management** **13. Level of participation of interested parties in oversight activities** **14. Clearly defined application procedures** **15. Application coverage** **16. Information dissemination**

Conservation objectives		Indicators								
		Abundance of focal species	Population structure of key species	Habitat Distribution and Complexity	Community Composition and Structure	Type, level and return of fishing effort	Water Quality	Areas Showing Signs of Recovery	Areas with Reduced or no Human Impact	Absence/Presence of Exotic Species
Marines	Black Coral Fores			x				x	x	
	Rocky Coastal Reefs	x						x	x	
	Rocky depths	x	x		x	x		x	x	x
	Sargasso Beds	x	x	x	x			x	x	x
	Rhodolite algae	x	x	x				x	x	
	Pelagic Habitat	x	x		x	x		x	x	
	Finback Whale	x	x							
	Sperm Whale	x	x							
	Black Turtle	x	x		x					
	Water						x			
Insular	Cardón cactus Forest				x					x
	Progressive Divergence (endemisms)	x	x							x
	Sea Lion Reproduction and Rearing	x	x							
	Marine Fowl Nesting and Reproduction	x								x

Selected Indicators for the Isla San Pedro Martir Biosphere Reserve

Once the indicators were selected, a workshop was held for experts (from non-governmental organizations and academic institutions) to clearly define the biophysical indicators that would be used to determine the status and trend of each conservation target.

Step 2. Planning the evaluation

The resource needs were evaluated to determine the guidelines and to prepare monitoring protocols for the indicators. We also identified the audience groups who would be informed of the results of the evaluation.[70] The decision was made to carry out the evaluation with an interdisciplinary and multi-institutional group, and also involve users from the community.

Finally, a timetable and work plan was developed to determine the guidelines for all of the indicators. The guidelines were determined for the socioeconomic and governability indicators, and the process for the biophysical guidelines is still underway.[71]

Phase III: Implement actions and monitoring

Since 2006, the Reserve has been allotted a federal budget for its operation and management; this has enabled several actions and strategies considered in the CMP and the Strategic Plan to be carried out.

The steps that have been followed for implementing the monitoring program are:

1. Finish determining the guidelines for all of the indicators.
2. Finish preparing the monitoring protocols for all of the indicators.
3. Communicate the guidelines for the indicators and the status of the conservation targets.
4. Evaluate periodically, providing follow-up to the chains of results, assumptions and proposed goals.
5. Evaluate management effectiveness five years after the CMP has been published (2015).
6. Revise the CMP based on the results of the effectiveness evaluation from the data generated by the comprehensive monitoring program.
7. Communicate the results of the evaluation and analysis.

Phases IV and V: "Analyze, Use, Adapt" and "Capture and Share Learning"

These last two phases will be carried out on a general level as the Reserve's management effectiveness evaluation is concluded. The fourth phase is closely related to review, and if needed, the update of the CMP. However, just as the chains of results for each strategy show a series of goals with indicators throughout the process, their follow-up and periodic evaluation is essential in order to apply the adaptive management model. This is the only way to analyze, use, adapt, capture and share knowledge in an ongoing manner.

[70] *For more information about the results of the guidelines, please e-mail the personnel at the Isla San Pedro Martir Biosphere Reserve at afiguero@conanp.gob.mx*

[71] *The Landsat 7 sensor showed a fault on May 31, 2003, and the Scan Line Corrector option had to be switched off (SLC off). This means there is no information for certain lines in images taken after this date.*

- **Land Use Change Areas**

Change in land use is an issue that CONANP has dealt with at a number of different stages. The established methodology is the satellite images analysis using Landsat[72] sensors, and more recently including those from the SPOT sensor, thanks to the availability of images distributed by the Mexican Receiving Station of the SPOT constellation (ERMEXS). This analysis is supported by vector data from the Land Use and Vegetation maps, Series III (INEGI, 2002), drawn up by the National Institute for Statistics and Geography (INEGI).

SPOT images are processed by ERDAS program to enable geometrical correction, using the INEGI's 1:50,000 scale Digital Elevation Model (DEM). This also takes into account factors such as the position of the satellite at the moment of capturing the SPOT images, which allows faster processing of orthorectification tasks and provides a better result compared to georeferencing.

Orthorectified SPOT images are subject to automated classification, whereby the pixels are ordered into a range of values using a decision rule that employs a mathematical algorithm of maximum probability. Automated classification is backed up by visual interpretation on the screen; this allows exploitation of the power of visual analysis and interpretation (including criteria of context, texture, complex forms that the interpreter can identify), together with the flexibility and power of digital treatment (orthorectified images, optimized visual appearance, digitalization of information on the screen, etc.). Effectively it is a computer-assisted photographic interpretation that eliminates a number of phases of classical visual interpretation (restoration, inventory). The land use and vegetation map is validated by field observations made by NPA technical personnel.

The coverage obtained from image classification is processed by the ArcInfo program, and through use of the interdependent interpretation model historical layers are generated from images taken at different dates. This data provides information about the dynamics of conversion, on the basis of which a transition matrix is developed, showing a value for each category that has undergone change (more dynamic) and indicating those that have not been modified (more stable).

Types of land use and vegetation are categorized into forested and unforested in order to calculate the habitat conversion index according to the equation used by the FAO.[73]

Where:
δ = rate of change.
S1 = forested area at start of period.
S2 = forested area at end of period.
N = number of years.

$$\delta = 1 - \left(1 - \frac{S1 - S2}{S1}\right)^{1/n}$$

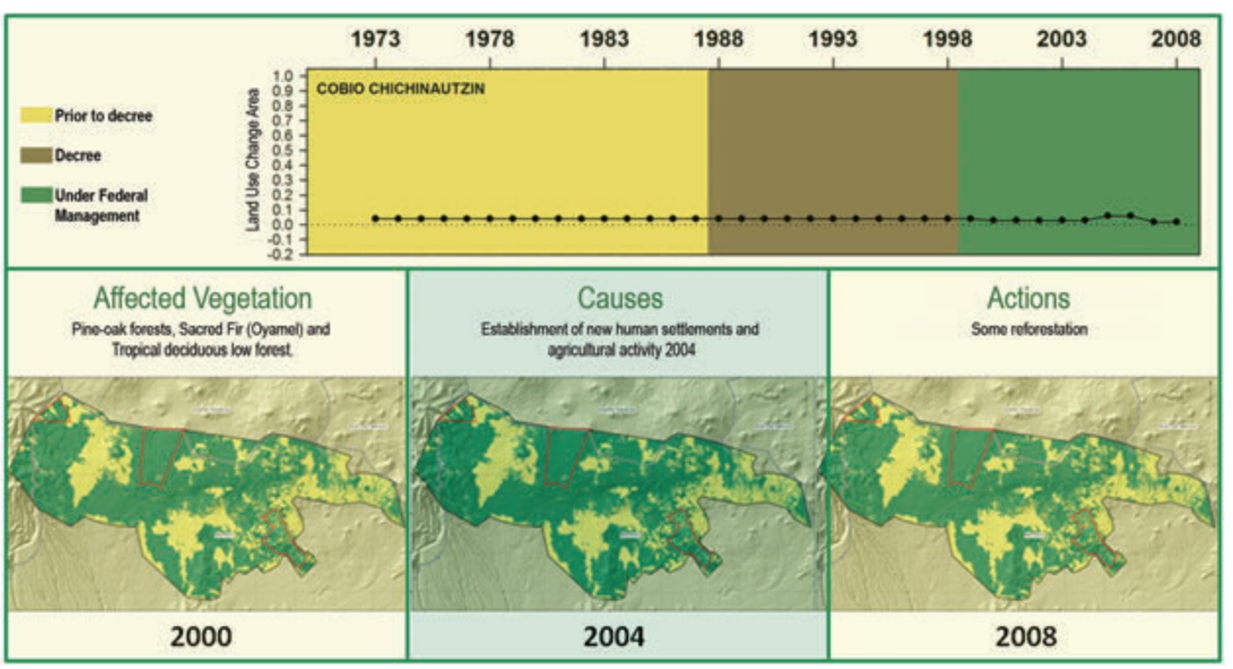
[72] *The Landsat 7 sensor showed a fault on May 31, 2003, and the Scan Line Corrector option had to be switched off (SLC off). This means there is no information for certain lines in images taken after this date.*

The results obtained are shown below.

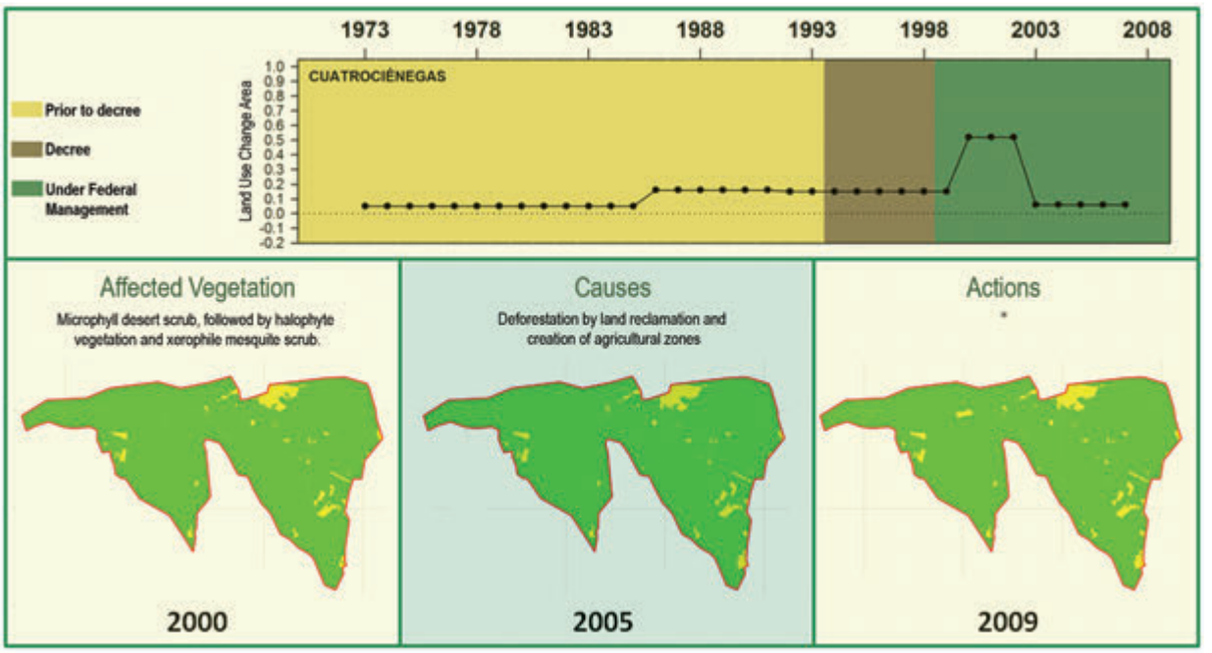
NPA	Time period* / percentage change / hectares				
Chichinautzin Flora and Fauna Protection Area (APFF) – El Tepozteco NP and Lagunas de Zempoala NP	1973-1989	1989-2000	2000-2004	2004-2007	2007-2008
	0.04%	0.04%	0.03%	0.06%	0.02%
	308 ha	192 ha	52 ha	75 ha	8 ha
Cuatrociénagas Flora and Fauna Protection Area (APFF)	1973-1986	1986-1992	1992-2000	2000-2005	2005-2009
	0.05%	0.16%	0.15%	0.09%	0.08%
	521 ha	778 ha	1020 ha	365 ha	240 ha
Sierra de Álamos and Río Cuchujaqui Flora and Fauna Protection Area (APFF)	1976-1990	1990-2000	2000-2005	2005-2008	
	0.01%	0.16%	0.12%	0.01%	
	138 ha	1424 ha	536 ha	27 ha	
La Encrucijada Biosphere Reserve	1975-1987	1987-2000	2000-2005	2005-2008	
	0%	0.36%	0.94%	-0.40%	
	89,025 ha	3308 ha	3121 ha	-780 ha**	
Selva el Ocote Biosphere Reserve				2000-2005	2005-2009
				0.04%	-0.03%
				155 ha	-11 ha**
La Sepultura Biosphere Reserve				2000-2005	2005-2009
				0.12%	0.10%
				894 ha	589 ha
Information obtained from the assessment "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP", coordinated by the CONANP and the FMCN, 2009.					
* Time periods vary according to availability of the images ** A negative sign before the percentage change and number of hectares changed means land area was recovered.					

The NPAs described in the above table showed a reduction in the percentage of habitat change over the period of the project; indeed, two showed restoration of coverage (La Encrucijada and El Ocote).

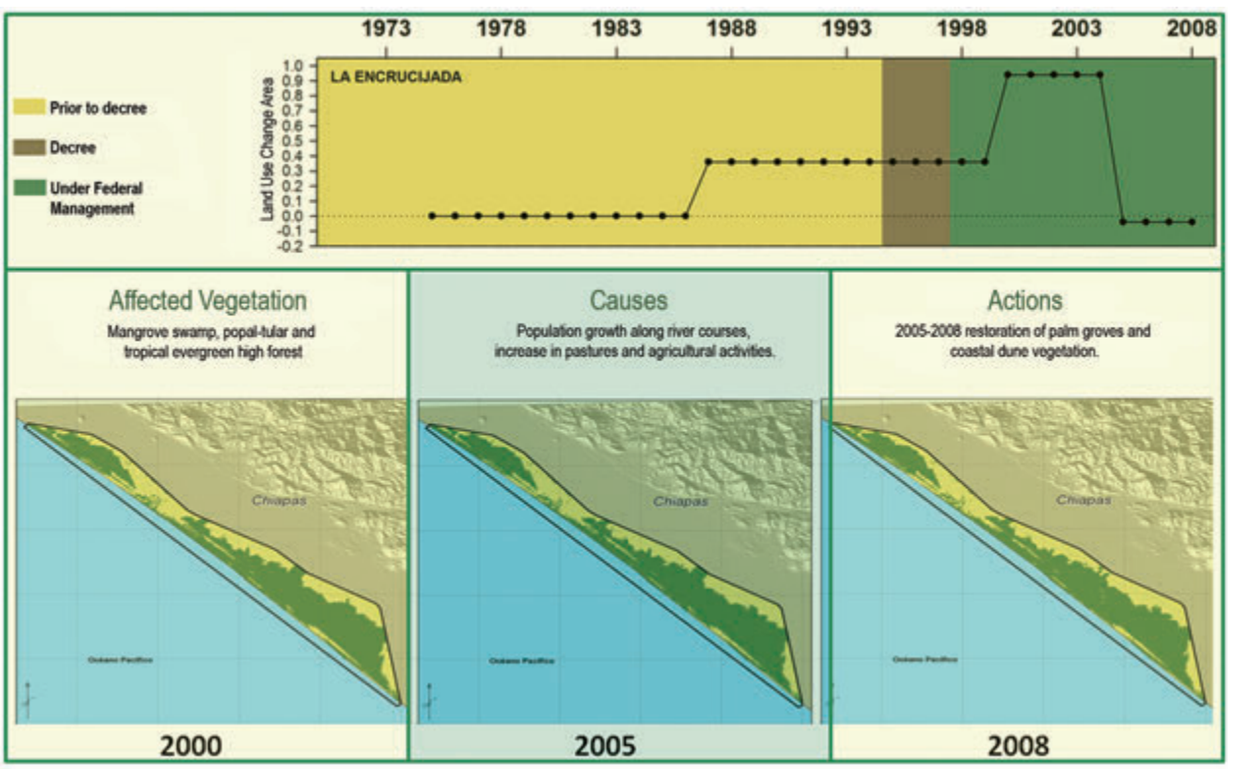
The next pages shows the profiles of the rates of habitat change for the five NPAs and one complex, together with maps of forested and unforested areas, allowing change over time to be seen. Areas colored green identify zones where forest cover has been maintained, while yellow denotes areas that have undergone transformation, due to a number of causes such as forest fires, natural events, anthropogenic activities and others. The figures identify the causes of the changes that have been identified for each site.



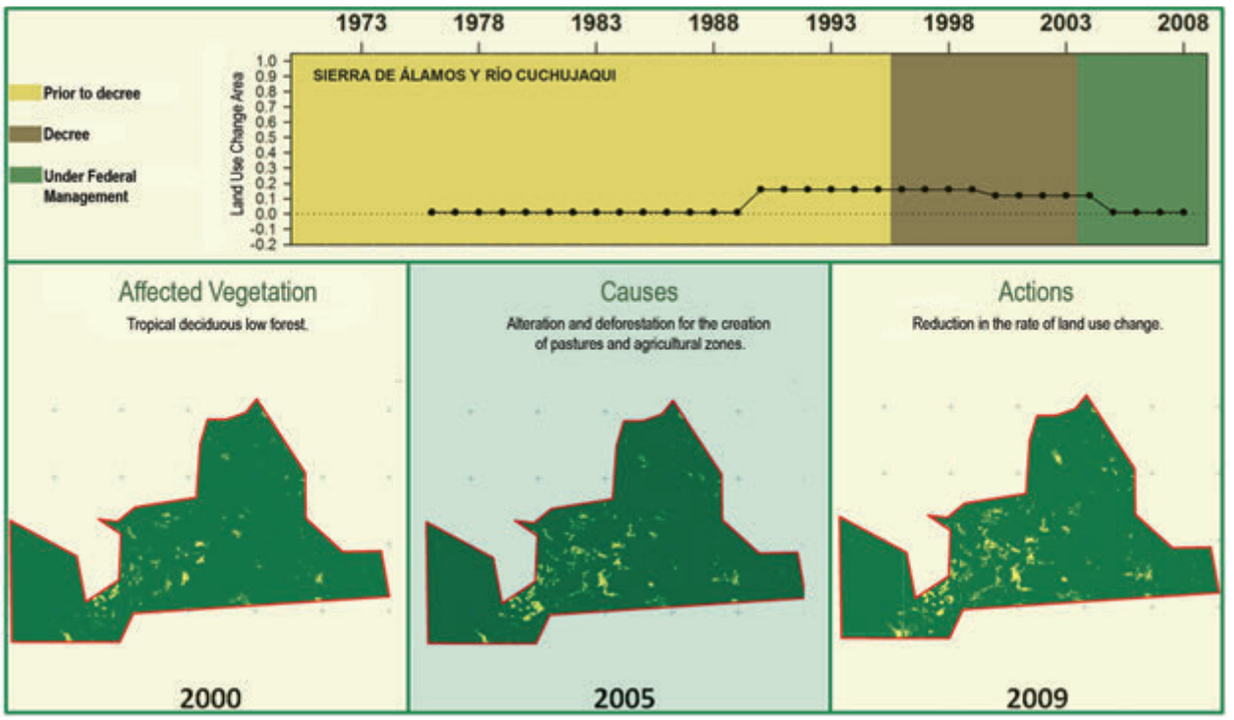
Land Use Change Area of the COBIO Chichinautzin Flora and Fauna Protection Area (APFF) – El Tepozteco NP and Lagunas de Zempoala NP (Morelos, Mexico State and Federal District). Source "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP". Maps (below): Green = Forest cover; Yellow = zones that have undergone transformation; the red line indicates the nucleus area.



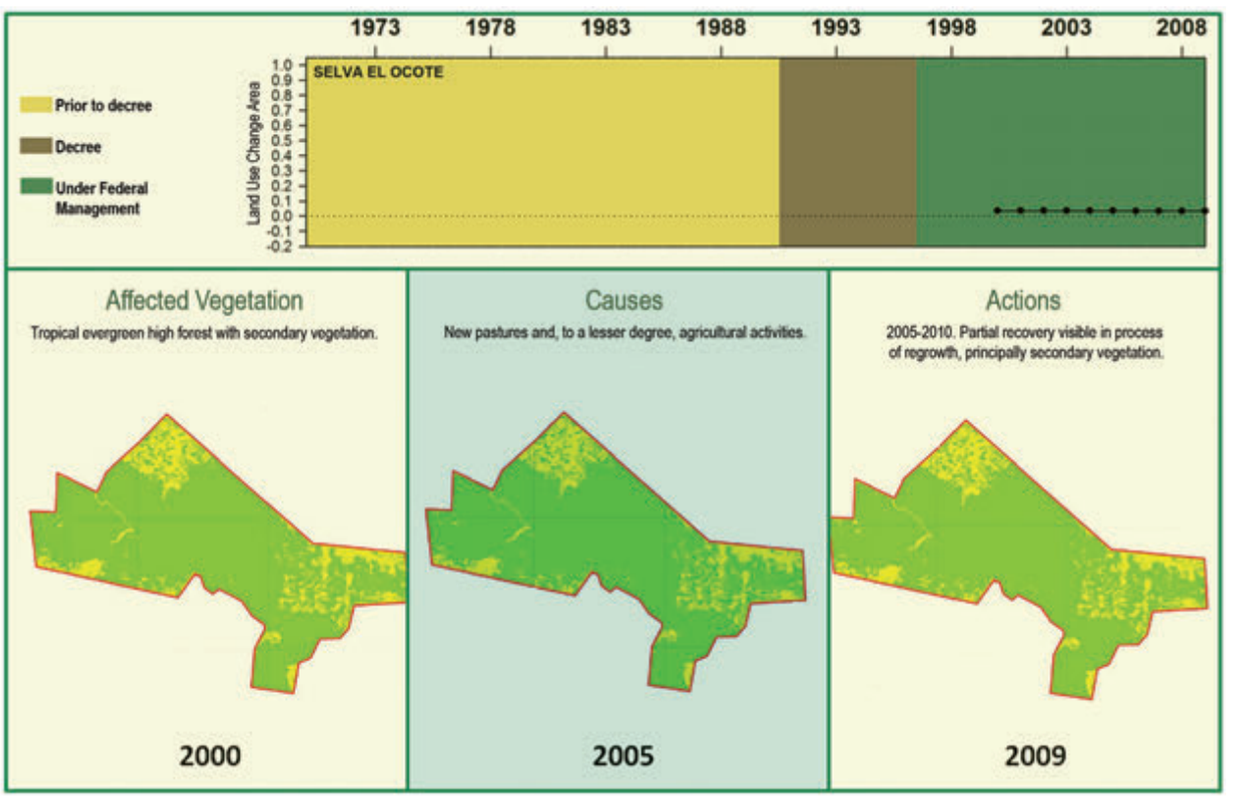
Land Use Change Area of the Cuatrociénegas Flora and Fauna Protection Area (APFF) (Coahuila). FSource "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP". Maps (below): Green = Forest cover; Yellow = zones that have undergone transformation; the red line indicates the limits of the relevant area.



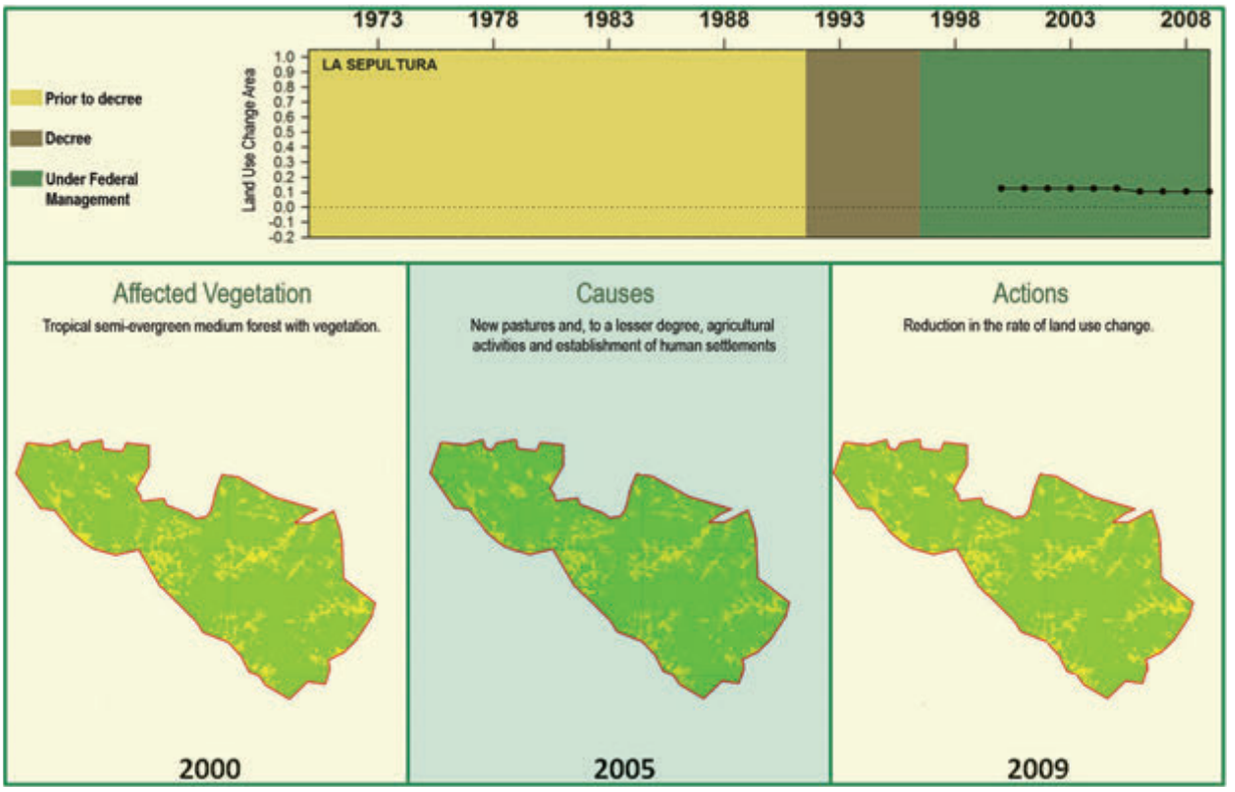
Land Use Change Area of the La Encrucijada Biosphere Reserve (Chiapas). Source "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP". Maps (below): Green = Forest cover; Yellow = zones that have undergone transformation.



Land Use Change Area of the Sierra de Álamos and Río Cuchujaqui Flora and Fauna Protection Area (APFF) (Sonora). Source "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP". Maps (below): Green = Forest cover; Yellow = zones that have undergone transformation; the red line indicates the limits of the relevant area.



Land Use Change Area of the Selva el Ocote Biosphere Reserve (Chiapas). Source "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP". Maps (below): Green = Forest cover; Yellow = zones that have undergone transformation; the red line indicates the limits of the relevant area.



Land Use Change Area of the La Sepultura Biosphere Reserve (Chiapas). Source "Estimation and Updating of the Rate of Habitat Change of Natural Protected Areas SINAP 1 and SINAP 2 of the FANP". Maps (below): Green = Forest cover; Yellow = zones that have undergone transformation; the red line indicates the limits of the relevant area.

The work carried out over the last few years has permitted adjustments to the method for working out the change in land use and vegetation, making it possible to obtain the rate of habitat change in PAs. The maps obtained from the classification of satellite images is being used as a planning tool and has been included in the conservation and management programs. It has also been used to draw up maps of areas at risk from fire in PAs. Meanwhile, the rate of habitat change allows us to understand the impact of social programs on the natural resources found in PAs.

Finally, it is hoped that this method can be optimized, making it possible to obtain data about the change in land use and vegetation more quickly and to apply it to a larger number of PAs, representative of the country's protected ecosystems.

VII. LESSONS LEARNED

The lessons learned during the design, development and implementation of the SIMEC are many, and as such only a handful will be mentioned here. The first to consider is SIMEC represents a significant institutional challenge, that might be described as a spiral of knowledge that is built from the sum of learning of those participating in the process.

We are conscious that there are no perfect systems, and each of the subsystems has been designed with a specific objective in mind. The implementation of the SIMEC has provided feedback to improve its operation, capitalizing on errors made along the way as areas of opportunity.

We have learned it is fundamental to generate knowledge within organizations in a systematic manner through planning, monitoring and evaluation processes, and to provide ourselves with feedback from the results.

Another lesson to highlight is at the start, unnecessary information was collected that required a lot of effort and wasted time. To avoid such a situation, a diagnosis of institutional capabilities was undertaken to define the objectives that are being sought with the SIMEC.

A further important lesson not to be forgotten is about a periodic review of the institution's strategic planning, as this allows improvements to the measuring system to be made. Furthermore, each strategic indicator currently being measured represents a different source of knowledge thanks to the information it generates, the parties responsible and the time periods or geographical areas where the measurements are made, all offers data that allows us to verify and evaluate the path to take.

Monitoring should be treated and internalized as a tool for evaluating institutional programs that makes it possible to establish the effectiveness of the actions undertaken in pursuit of the CONANP's mandate, conservation of ecosystems and biodiversity in natural protected areas. The knowledge generated by monitoring should be sufficiently robust to be able to take decisions regarding management and conservation of ecosystems and species in these sites.

The implementation of the General System of Annual Operating Programs (SGPOA) meant a reduction in data entry times, standardization of projects and quarterly reports, faster systematization of the results of strategic indicators, together with an improvement in the quality of information. The process of generating annual operating programs has become institutionalized.

Greater transparency in public policy and governmental administration has been sought, such that what was opaque has been made clear and what lacked a clear aim has found one.

The CONANP made great efforts to sustain and maintain the monitoring and evaluation system. The World Bank highlights six aspects that all such monitoring and evaluation systems should possess: 1) demand; 2) structure; 3) trustworthy and reliable information; 4) responsibility; 5) motivation and 6) capability. The SIMEC fulfills all of these..

VIII. FUTURE CHALLENGES

While substantial advances have undoubtedly been made during the first ten years of the SIMEC, much remains to be done, above all with regard to the evaluations that have been proposed at a national, regional and PA level. A number of the steps that should be taken in each of the subsystems are set out below.

Information Subsystem

1) Keep the databases about the issues available in this subsystem on the CONANP webpage up to date.
2) Continue consolidation of the flow of internal information to ensure this is ready on time.
3) Improve controls to validate information quality.
4) Reinforce links with other sources of information available on the Internet.

Monitoring Subsystem

1) Maintain the review, updating and implementation of biological monitoring protocols.
2) Continue to train technical personnel responsible for carrying out monitoring of different issues.
3) Promote unification of monitoring species protocols found across several different PAs.
4) Negotiate long-term financial support to continue with monitoring activities.
5) Reinforce information systematization, reducing data-entry times.
6) Reinforce alliances with academic and research institutions and with non-governmental organizations interested in monitoring.
7) Increase the number of monitored species, and augment habitat monitoring.
8) Maintain and reinforce alliances with our partners to facilitate dialogue between parties involved in biological monitoring and evaluation, and support complementary monitoring capabilities in order for this to become an ongoing activity with a solid basis.

Evaluation Subsystem

1) The information resulting from the strategic indicators has been used to attempt to resolve some of the questions that arise in the field of conservation. Some of these are simple to answer, but most are highly complex, and as such it has been a challenge to develop databases in order to have enough raw data to answer them objectively. A number of these questions are outlined below:

a) What is the state of PA ecosystems and their biodiversity conservation?
b) What is the rate of change undergone by PAs?
c) What are the most serious anthropogenic pressures affecting biodiversity?
d) What is the relative contribution of human activity to the future state of biodiversity?
e) What answers have we developed to slow deterioration of biodiversity?
f) Are the measures being taken effective?
g) What is our capacity for setting up and maintaining an indicator and a monitoring system, and undertaking analysis of information and results as part of conservation policy?
h) How does the work of the CONANP contribute to the conservation of ecosystems and their biodiversity?

2) Encourage use of the results obtained from evaluations to improve decision-making. These should also help to improve the processes used in the CONANP. As such it is important to carry out independent evaluations in areas such as effectiveness of PA management, the MPA Scorecard, etc.

3) At the end of the current federal administration it will be essential to carry out an analysis of the implementation of the NPNPA to use as a base for drawing up the strategic plan for the following six-year period.

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