

# DIAGNOSIS

## OF APOLOBAMBA INTEGRATED MANAGEMENT NATURAL AREA



OCTOBER 2005

PARK PROFILE  
*Series*





ParksWatch was created in 1999 as a program of Duke University's Center for Tropical Conservation to document the state of protected areas throughout the Tropics, many of which present a dearth of information concerning their biological riches and the problems they face.

Through partnerships with in-country NGOs and individuals, ParksWatch conducts on-the-ground evaluations of protected areas, which analyze threats to their conservation viability, identify strategies for overcoming those threats, and help government agencies, NGOs and community groups succeed at the ultimate goal of strengthening parks in their role as the world's primary instrument for the protection of biodiversity.

The publication of this report was made possible by a grant from the Critical Ecosystems Partnership Fund (CEPF) and the contributions of anonymous donors.

## PARKS WATCH BOLIVIA

ParksWatch-Bolivia is member of the ParksWatch network of NGOs, headquartered at Duke University, North Carolina, USA. ParksWatch has other active programs in Mexico, Guatemala, Venezuela, Peru, Brazil, and Argentina, and plans to initiate new programs in other countries and continents.

*Published by ParksWatch-Bolivia, San Miguel, Bloque D, Calle Capriles, N° 13, La Paz, Bolivia*

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# Acknowledgements

This Park Profile was written by Stéphane Pauquet, Research Associate at ParksWatch. Data collection was undertaken by a team composed of Mr. Pauquet, Dimitri de Boissieu (Ecologist), Stéphane Doizon (Geographer), Pierrick Jean (Agronomist), and Menuka Scetbon-Didi (Photographer and Ethnologist).

In parallel to our field observations, this report is based primarily on interviews and discussions with the staff and managers of Apolobamba Integrated Management Natural Area and the Bolivian park administration (SERNAP) in La Paz, as well as individuals assisting the park independently or as employees of non-governmental organizations.

The author is extremely grateful to all the above-mentioned persons for the information, views and insights that they shared and for their comments on the draft report. Informants were speaking in their personal capacity and their views may not be the official policy of the organizations they represent. Many other individuals have kindly contributed information included in the report and the author would like to extend his thanks to them as well. The author has made his best effort to ensure the accuracy of the information contained in this report and apologizes for any inadvertent errors.

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Citation: Pauquet, S. 2005. Diagnosis of Apolobamba Integrated Management Natural Area. ParksWatch Park Profile Series [[http://www.parkswatch.org/parkprofiles/pdf/apna\\_eng.pdf](http://www.parkswatch.org/parkprofiles/pdf/apna_eng.pdf)].

An interactive version of this report is available in two languages (English and Spanish) at the following URL: <http://www.parkswatch.org/parkprofile.php?l=eng&country=bol&park=apna>

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October 2005

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# List of Acronyms and Abbreviations

- AECI** Agencia Española de Cooperación Internacional
- AIGACAA** Asociación Integral de Ganaderos en Camélidos de los Altos Andes
- AIP** Apolobamba Integrated Project
- AMNH** American Museum of Natural History
- ARMVA** Asociación Regional de Manejadores de Vicuña de Apolobamba
- asl** Above Sea Level
- IADB** Inter-American Development Bank
- BiRD** Biodiversity and Regional Development
- BR** Biosphere Reserve
- CECI** Canadian Center for International Cooperation and Studies
- CI** Conservation International
- CIT** Centro de Innovación Tecnológica
- CITES** Convention on the International Trade of Endangered Species
- COBIMI** Conservación de la Biodiversidad para un Manejo Integrado
- CONSAQ** Consejo Agrícola de Suyus, Aymaras y Quechuas
- COSUDE** Agencia Suiza para el Desarrollo y la Cooperación
- CSUTCB** Confederación Sindical Unica de Trabajadores Campesinos de Bolivia
- DNCB** Dirección Nacional de Conservación de la Biodiversidad
- D.S.** Decreto Supremo
- FAN** Fundación Amigos de la Naturaleza
- FAO** Food and Agriculture Organization
- GEF** Global Environment Fund
- GTZ** Gesellschaft für Technische Zusammenarbeit
- ha** Hectare or hectares
- HAM** Honorable Alcaldía Municipal

- ICIB** Instituto para la Conservación e Investigación de la Biodiversidad
- IMNA** Integrated Management Natural Area
- INFOL** Instituto Nacional de Fomento Lanero
- IPADE** Instituto de Promoción y Apoyo al Desarrollo
- JICA** Japanese International Aid Agency
- KfW** Kreditanstalt für Wiederaufbau
- LIDEMA** Liga de Defensa del Medio Ambiente
- MAS** Movimiento Al Socialismo
- MEDMIN** Medio Ambiente, Minería e Industria
- MHNNKM** Museo de Historia Natural Noel Kempff Mercado
- NGO** Non-governmental organization
- NP** National Park
- PIA** Programa de Investigaciones Agrarias
- PA** Protected Area
- POA** Plan Operativo Anual
- RGAP** Reglamento General de Áreas Protegidas
- SEDAG-LP** Servicio Departamental Agropecuario de La Paz
- SEREDES** Servicio Rural de Electrificación y Desarrollo Sostenible
- SERGEOMIN** Servicio Geológico de Minas
- SERNAP** Servicio Nacional de Áreas Protegidas
- SNAP** Sistema Nacional de Áreas Protegidas
- TCO** Tierra Comunitaria de Origen (Communal Lands)
- TNC** The Nature Conservancy
- UNDP** United Nations Development Programme
- UNESCO** United Nations Educational, Scientific and Cultural Organization
- VABC** Vilcabamba-Amoró Biological Corridor
- WCS** Wildlife Conservation Society
- WWF** World Wide Fund for Nature



# Objectives and Methods

ParksWatch is a non-profit organization headquartered at Duke University's Center for Tropical Conservation in Durham, North Carolina, USA. Its mission is to protect biological diversity by collecting, analyzing, and disseminating up-to-date information on the state of protected areas.

ParksWatch works through partnerships with individuals and local organizations in seven Latin American countries (Mexico, Guatemala, Venezuela, Peru, Brazil, Bolivia and Argentina) to conduct on-the-ground evaluations of protected areas, assessing their levels of implementation and identifying threats. Results of each evaluation are compiled into cross-disciplinary diagnostic reports called "Park Profiles."

Each Park profile prescribes actions to abate or remove the most serious threats and lists recommendations to improve each area's management. These reports are posted on our website ([www.parkswatch.org](http://www.parkswatch.org)) and printed copies provided to government agencies, conservation organizations, and other stakeholders involved in the park's management. Based on the results of our findings, our partners undertake a variety of activities to support park management and raise awareness among conservation specialists and the general public. Such activities may include the organization of forums, meetings, and workshops or involvement in media campaigns, production of video documentaries and the publication of newspaper articles.

With their journalistic style, widespread distribution, and photographic documentation, our park profiles are also meant to inform citizens of existing threats to their nation's protected areas. Our ultimate goals are to help improve political support, foster adaptive management, promote the adoption of best practices, and instigate the level of implementation needed to guarantee effective biodiversity conservation inside protected areas.

Along with other studies, our reports contribute to the baseline information available for each protected area, against which future evaluations and monitoring activities can be compared in order to measure conservation outcomes. Furthermore, the use of a standardized methodology allows us to draw comparisons between different protected areas within one country or between different countries. Alas, we intend to revisit each park every three or four years to update our database and measure changes in conservation status from a selection of key indicators.

## Description of this evaluation

This evaluation began with the compilation of all the available reference material in the libraries of the Bolivian Park Service (*Servicio Nacional de Areas Protegidas*, SERNAP), Conservation International, LIDEMA (*Liga de Defensa del Medio Ambiente*), and Trópico (databases, technical and scientific reports, journal and newspaper articles, etc.).

After this first revision, a series of interviews and field visits to the park's most relevant sites were organized with the protected area director (Juan Carlos Gómez, now head of SERNAP's Environmental Division), after which most of the field work was carried out in company of park rangers, investigators and/or local residents.

The interviews (mostly semi-structured) made to these and other stakeholders were based on ParksWatch's standardized survey form, a Scorecard-based questionnaire that considers a broad range of aspects related to park management and focuses on both direct threats (such as land invasions, deforestation, and oil exploration) and indirect threats (such as budget shortfalls, lack of personnel, political interests, and macroeconomic forces). The data obtained in this way were incorporated to the ParksWatch database (available to interested parties) and were summed to the results of our literature review for the elaboration of the present report.

Below is a brief description of the interviews conducted and sites visited, in chronological order:

## August 2003

- **Qotapampa (access gate to the protected area):** Interview with the park ranger in service.
- **La Cabaña Liaison Office:** Interview with the park ranger in service and assessment of facilities. Interview with Alfonso Casilla, in charge of the vicuña management component of the Araucaria Program, funded by the Spanish Agency for International Cooperation (*Agencia Española de Cooperación Internacional - AECI*).
- **Ulla Ulla and Hichocollo Station:** Visit of the community and interview with the park ranger in service at the station. Visit of surrounding prairies and wetlands (locally called "bofedales") in the company of a park ranger.
- **Pelechuco Station:** Interview with the three park rangers in service and assessment of facilities. Visit of the village and hike along an old trail leading down the valley, which some local residents want to habilitate for vehicular access. Visit of the Levanderán Mines (5 km above Agua Blanca), whose sediments and mercury waste contaminate the Pelechuco river, and the Santiago Mines (above Pelechuco), which also contribute to river contamination, but where a waste management program has been implemented. Interview of local inhabitants, including a local leader representing the mining sector within the protected area's Management Committee. Visit of the first section of the trail to Curva to evaluate its ecotourism potential.
- **Antaquilla:** Participation in a garbage clean-up operation (organized by the Araucaria Program) and visit of an annual trade fair taking place during that week. Interview of the fair's organizers.
- **La Cabaña:** Interview of other park rangers and some community guards (people paid by the PA administration to implement regulations). Participation in a vicuña census in the environs of Ulla Ulla.
- **Pelechuco:** Passive participation in a Management Committee meeting, chaired by the PA director.
- **La Cabaña:** Interview with Andrea Morales, a biologist for WCS in charge of a community fauna management program, and meeting with three students from the Universidad Mayor de San Andrés working on their graduation theses (two geographers - Helder Catari and Ruben Fernandez - who are completing the PA's Geographic Information System and

compiling a database on the distribution of vicuña in the area; and a biologist - Veronica Caballero - who is studying the influence of capture and shear processes on the vicuña's movements in the pampas.

Meetings with other PA management stakeholders and interview with the PA director (Juan Carlos Gómez).

- **Charazani Station:** Interview with the park rangers in service, assessment of facilities and review of the contents of the *Carpa Verde* (Green Tent), an educational tool designed by Conservation International. Visit of the community and meeting with a group of villagers in one of the local schoolteacher's homes.

- **Charazani-Apolo Road:** Visit of the eastern side of the protected area (the lowlands). Under urging from delegates of the AECI, this area was incorporated to the protected area 2000. It is still the first stages of implementation, and the construction of the first ranger stations is waiting the arrival of funds. Meeting with inhabitants from several communities, including Camata, Shiata, and Puyo Puyo.

- **Apolo-Mapiri-Guanay-Caranavi Road:** Visit of the PA's extreme eastern edge, where communities are isolated because of poor vehicular access.

## 2005

- **La Paz:** We conducted three interviews with the PA director to update our data and fill in any gaps.



# The National System of Protected Areas of Bolivia

Despite the creation of the first protected area in 1939 (Sajama National Park), Bolivia's National System of Protected Areas (SNAP) is one of the youngest in Latin America. Established in 1992 through the Law of the Environment, its fundamental objectives are the conservation of representative samples of the country's major ecosystems and it is administered by the Servicio Nacional de Áreas Protegidas (SERNAP), under the jurisdiction of the Ministry of Sustainable Development and Planning (MDSP). The SERNAP is responsible for defining and enforcing the laws and regulations pertaining to the management of the country's genetic and biological resources, as well as to administer and implement the Convention of Biological Diversity signed by Bolivia at the Rio Conference (1992) and ratified in 1994.

Although generally supportive of the creation of protected areas, the Bolivian government does not support them financially. As a matter of fact, the management of the SNAP relies almost entirely on international funding (GEF, Dutch government, KfW, IADB, etc.) and on the manpower and additional resources provided by non-governmental organizations (NGOs) (CI, WCS, GTZ, TNC, CARE, WWF, FAN, Trópico, etc).

At present the SNAP is composed of twenty nationally recognized protected areas, covering approximately 16.8 million hectares (15.3% of the national territory) and divided into National Parks, National Reserves, Biosphere Reserves (a category still not recognized by the national legislation), Wildlife Reserves and Integrated Management Natural Areas (equivalent to Multiple-Use Zones). In parallel to the SNAP, there is a growing contingent of protected areas of lesser hierarchy, such as Forest Reserves, Watershed Protection Areas, and Departmental, Regional, and Municipal Parks and Reserves. Another important zoning category is the Reserva Natural de Inmovilización, which corresponds to a temporary ordinance until a final status is defined based on the area's values and characteristics.

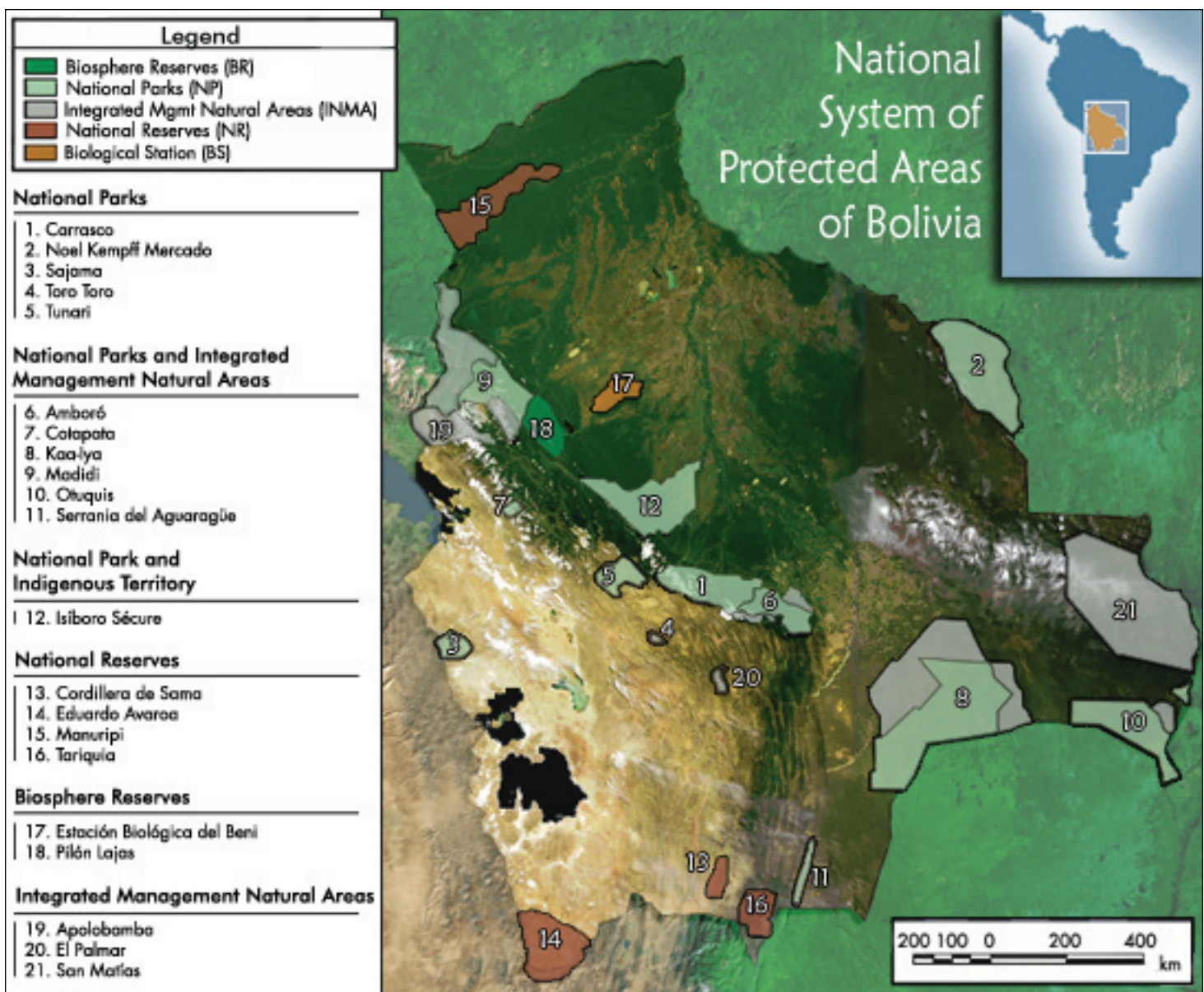
Each national or departmental protected area must form a Management Committee inviting spokesmen of the various cultural groups inhabiting its territory or surrounding area to participate in the decision-making process.

Since the creation of the Bolivian SNAP, significant achievements have been made in the following management areas:

- (i) planning;
- (ii) design and implementation of a monitoring and evaluation system;
- (iii) establishment of operational protection corps;
- (iv) development of a training program for both park rangers and administrative staff;
- (v) adoption of a set of policies for the public use of protected areas, and;
- (vi) participation of local stakeholder groups in park decision-making.

## Protected Areas of Bolivia

Management Category	Number	Area (Ha)
National Park	5	2,592,029
National Park and Integrated Management Natural Area	6	7,133,336
National Park and Indigenous Territory (or Communal Lands)	1	1,236,296
National Reserve	4	1,887,332
Biosphere Reserve	2	535,170
Integrated Management Natural Area	3	3,450,217
<b>TOTAL</b>	<b>21</b>	<b>16,834,380</b>



SERNAP's policies and strategic agenda are presented in Appendix 1.

# Apolobamba Integrated Management Natural Area



<b>Date of last field evaluation</b>	April 2004
<b>Name</b>	Apolobamba
<b>Category</b>	Integrated Management Natural Area*
<b>Year created</b>	1972, extended in 2000
<b>Area</b>	483,743 ha
<b>Main objectives</b>	<ul style="list-style-type: none"> <li>- Conservation of biological diversity;</li> <li>- Improvement of the living conditions of native communities;</li> <li>- Protection of local cultural heritage and recovery of local traditional knowledge (see Appendix 2)</li> </ul>
<b>Location</b>	In the northwest of the La Paz Department, in the provinces of Bautista Saavedra, Franz Tamayo and Larecaja
<b>Ecoregions</b>	Montane Humid to Perhumid Evergreen Forest, Puna and Dry Mesothermic Valleys
<b>Habitats</b>	Yungas humid forests, cloud forest ridges, yungas Paramo, high Andean wetlands called "bofedales" and peat-dominated wetlands or peat bogs called "turberas," glacial lakes, humid high-altitude Andean grasslands, and snow-capped peaks

\* See definition in Appendix 2.

# Summary

## Description

Apolobamba Integrated Management Natural Area (IMNA) is located in the western side of the Department of La Paz, bordering Peru to the west and Madidi NP-IMNA to the north. It was created in 1972 to protect high-Andean ecosystems and one of the country's largest populations of vicuña (*Vicugna vicugna*). In 2000, Apolobamba IMNA was increased in size from 240,000 to 483,743 ha in order to include the eastern slope of the mountain range and to establish a strict protection zone. It encompasses a remarkable altitudinal gradient, including both high Andean environments - such as the Puna grasslands - and lower altitude ecosystems - such as the Yungas montane cloud forests. The protected area is part of the vast binational Vilcabamba-Amoró Biological Corridor, which spans across the most biologically diverse hotspot in the world.

## Biodiversity

More than 800 plant species of an estimated 1,800 have been recorded for the protected area. In terms of fauna, 296 vertebrates have been documented, including several threatened species like the vicuña (*Vicugna vicugna*), spectacled bear (*Tremarctos ornatus*), Peruvian guemal (*Hippocamelus antisensis*), giant coot (*Fulica gigantea*) and Andean goose (*Chloephaga melanoptera*), as well as several local endemic species.

## Threats

Gold mining is the principal threat to Apolobamba Integrated Management Natural Area. There are 27 gold mining cooperatives operating in the zone, and many more small-scale gold washing units, which results in a heavy pollution of rivers by mercury and sediments affecting both fish and human populations downstream. Other threats include inadequate agricultural practices in different vegetation types and ecosystems, poaching, solid waste accumulation, and the building of roads or improvement of existing ones. Even though the protected area has important strengths, we have classified Apolobamba Integrated Management Natural Area as **vulnerable** because of these existing pressures and threats.



The western highlands show signs of overgrazing on extensive areas. Photo MSD

Criteria	Current situation
<b>CONTEXT</b>	
Legal status	
National policies	
PA regulations	
Regulation enforcement	
Protected area boundaries	
Land tenure	
Scoring scale	
<b>PLANNING</b>	
PA Objectives	
PA design	
Management Plan	
Zoning	
Operational Plan	
Financial Plan	
Biodiversity inventory	
Natural and cultural resource inventory	
Scoring scale	
<b>INPUTS</b>	
Staff numbers	
Staff training	
Operational budget	
Financial security	
Research	
Scoring scale	
<b>PROCESS</b>	
Enforcement activities	
Management of budget	
Personnel management	
Equipment	
Maintenance	
Controlling access and use	
Stakeholder engagement	
Environmental education and awareness	
Commercial tourism	
Acceptable change standards	
Monitoring and evaluation	
Scoring scale	
<b>OUTPUTS</b>	
Visitor facilities	
Fees	
Scoring scale	

[Adaptation of the WWF Tracking Tool]

RATING: 61/96



# Description

## Geographic location

Apolobamba IMNA is located on the far western edge of the Department of La Paz, in the mountainous region of Apolobamba. To the west, it borders Peru, and to the north, Madidi NP-IMNA. It extends between 14°40' and 15°10' latitude South and 68°30' and 69°20' Longitude west, covering approximately 483,743 ha distributed among five municipalities (Pelechuco, Curva, Charazani, Guanay and Tacacoma) in to three distinct provinces (Bautista Saavedra, Franz Tamayo and Larecaja).

## Access

The La Paz-Apolo Highway is the protected area's principal access route. There are approximately 220 km between the city of La Paz and the area's entrance gate at Qotapampa . This road was built between the 1970s and 80s and paved only about halfway. The lack of bridges over the Suches river limits the access from Peru to just a few locations. There is a landing strip in Ulla Ulla, but there is no regular flight service to the area.

## Physical description

Biogeographically, the area is part of the High-Andean Puna and Humid Montane Yungas Cloud Forest Subregions. Its geomorphology is characterized by mountainous relief, with steep slopes and a considerable altitudinal range, spanning more than 5,000 m (from 800 to 6,200 m). It harbors an exceptional diversity of ecosystems, including humid montane cloud forests forests, cloud forest ridges, yungas paramos, high Andean wetlands (*bofedales*), peat-bogs (*turberas*), glacial lakes, humid high Andean grasslands (or tundra), glaciers and and snow-capped mountain peaks (Cordillera Real).





The Apolobamba mountain range divides the area in two: the western highlands, locally called “*pampa*” (between 4,200 and 4,800 m), formed by high-Andean plains (*meseta*) that are part of the endorheic Altiplano basin; and the eastern slope (between 800 and 3,600 m) that forms part of the Yungas Valleys and belongs to the Amazon Basin (Loayaza, 2000).

## Hydrography

Apolobamba IMNA extends over three basins, including:

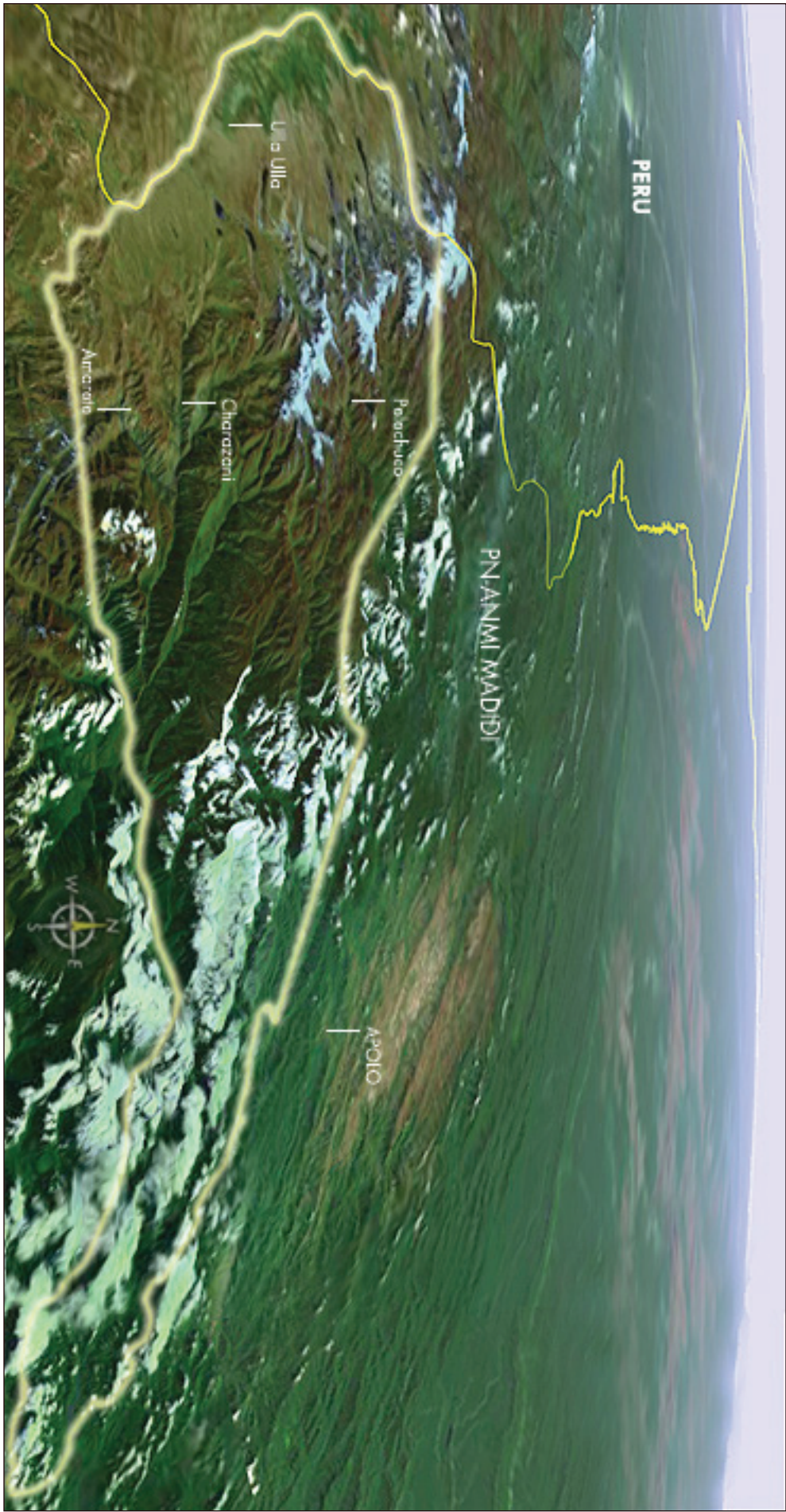
- Suches river basin, which forms part of the endorheic Altiplano basin, and is Lake Titicaca’s main water source on the Bolivian side;
- Mapiri river basin, whose major tributaries are the Charazani, Calaya, and Kellhuacota rivers, and;
- Tuichi river basin, whose main tributaries are the Pelechuco, Hilo Hilo, and Sunchully rivers.

Also worth mentioning are a large number of small water bodies and high-Andean wetlands (*bofedales*) fed throughout the year by melting snow and glaciers (including notable ones such as the Katantika and Akamani glaciers).

## Climate

Large differences in elevation and the area’s rugged relief determine several distinct climatic conditions across the protected area, from the snow-capped peaks of the Cordillera Real to the hot and humid tropical lowlands with mean annual temperatures reaching 26°C and rainfall 1,900 (SERNAP, 2001). In the western highlands (between 4,100 and 4,800 m altitude), covered by dry Puna grasslands, annual average temperature is a mere 4.5°C, with less than 500 mm precipitation per year, concentrated between November and March. There are frequent torrential downpours, which on occasion concentrate 5% of the annual precipitation in a 24-hour period (Aramayo, 2000).

The area’s two main valleys, the Pelechuco and Charazani valleys, feature very distinct climates: while the former has relatively elevated annual rainfall and exuberant vegetation due to the proximity of high peaks, the latter displays a semi-arid climate and xerophytic vegetation with just 300 mm of annual rainfall.



3D satellite view of Apolobamba IMNA (EarthSat/Google Earth)

## Biodiversity

Topographic and climatic variability result in a great diversity of habitats, which in turn favor high species diversity. A vegetation map of the area is provided in Appendix 3.

### a) Flora

To date, more than 800 species have been recorded for the protected area. However, it is believed that additional inventories of unstudied areas, like the Yungas cloud forests, would increase that number to approximately 1,800 species.

On the western meseta and on the highest reaches of the eastern slope, the vegetation is dominated by semi-humid, high-Andean vegetation, as described below:



High-Andean wetland (bofedal) in the western meseta.

Photo: MSD



Montane cloud forest ridge in the Pelechuco valley. Photo: MSD

Above 4,700 m asl, in areas covered by snow during several months of the year, vegetation is sparse and composed of plants adapted to low temperatures and scarce humidity. Common vegetation includes some grasses (*Poa chamaeclinos*), lichens and small shrubs (*Valeriana pynantha* and *Senecio* sp.). The high-Andean grasslands (between 4,100 and 4,700 m asl) is dominated by gramineous species (*Deyeuxia filosofia*, *Festuca* sp., *Agrostis* sp., *Bromus* sp., *Stipa ichu*, *Calamagrostis* sp., *Bidens andicola* and *Rumex acetocella*) and rosette plants (*Hypochoeris* sp., *Lachemilla* sp., *Pycnophyllum* sp., *Azorella* sp.). The bofedales developing on waterlogged soils are small and highly productive wetlands and peat bogs composed of spongy grasses and mosses, such as *Distichia muscoides*, *Plantago tubulosa* and *Oxycloe andina* (see photo).

The Yungas paramo (between 3,500 and 4,200 m asl) forms belts and patches of grass and scrub formations, fed with nearly permanent horizontal precipitation. The most common genera include *Stipa*, *Festuca*, *Brachyotum*, *Satureja*, *Mutisia*, *Chuquiraga*, *Baccharis*, *Calceolaria* and *Gnaphalium* (Pacheco et

al, 2003). Other notable species include communities of *Puya raimondii* and many species of the Ericaceae family.

The eastern part of the protected area, which corresponds to the eastern slope of the Andes, harbors cloud forest ridge ecosystems and extensive montane cloud forests. The cloud forest ridge (between 2,400 and 3,500 m asl) represents the upper limit of the montane cloud forest (Yungas) and is composed of low arboreal vegetation, among which some threatened species such as *Polylepis* (*Polylepis racemosa*, *Polylepis* sp.), nogal (*Juglans* sp.), mountain pine (*Podocarpus* sp.), aliso (*Alnus acuminata*), chachacoma (*Escallonia myrtilloides*), coca cocas (*Hesperomeles ferruginea*, *H. lanuginosa*), aliso colorado (*Myrica pubescens*), guayabilla (*Clusia pseudomangle*), arrayán (*Randia boliviana*), limachu (*Myrsine coriacea*), cori cori (*Clethra revoluta*), sauco (*Sambucus peruviana*), cardo santo (*Solanum acuminatum*); as well as Lauraceae species of the *Ocotea*, *Aniba* and *Nectandra* genera, coloradillo del monte (*Byrsonima indorum*), quina (*Cinchona officinalis*), quina quina (*Myroxylon balsamum*), isigo or coloradillo (*Protium bangii*), isigo (*Tetragastris altissima*), and bilka (*Anadenanthera colubrina*). Other notable species include *Meliosma* sp., *Brunellia boliviana*, *Bocconia frutescens*, *Thibaudia crenulata*, *Gaiadendron punctatum*, *Prunus brittoniana*, and *Baccharis conwagi*.

## b) Fauna

Due to the unique faunal assemblage characterizing its western portion, Apolobamba IMNA is an extremely important refuge for species communities absent from other Andean protected areas or underrepresented in Bolivia's National System of Protected Areas (SNAP). For example, Apolobamba shares only nine mammal species (21% of its total number of mammal species) with Sajama National Park (in Oruro) and only five (12%), with the Eduardo Avaroa National Fauna Reserve (DNCB-CECI, 1997).

There are 296 vertebrate species registered in the protected area, including species categorized as threatened, such as the vicuña (*Vicugna vicugna*), spectacled bear (*Tremarctos ornatus*), Peruvian



**The Andean mountain cat (*Oreailurus jacobita*), one of the highland predator species. Photo: Terrambiente**

guemal (also known as the Andean deer - *Hippocamelus antisensis*), white-tailed deer (*Odocoileus virginianus*), Southern viscacha (*Lagidium viscacia*), Andean cat (*Oreailurus jacobita*), puma (*Puma concolor*), giant coot (*Fulica gigantea*), Andean goose (*Chloephaga melanoptera*) and birds such as *Leptasthenura andicola*, *Agriornis andicola*, *Asthenes humilis*, and *Grallaria erythrotis* (endemic to the region). There are reports of primates of the *Lagothrix* genus, potentially a new species to science, in forests surrounding the area. There are also unconfirmed reports of guanacos (*Lama guanicoe*) in isolated parts of the Cordillera (SERNAP, 2001).

# Management

## Background

The Ulla Ulla National Fauna Reserve - which today is part of Apolobamba Integrated Management Natural Area - was created in 1972 with an extension of 240,000 ha. Its principal objective was to protect the local vicuña populations and high-Andean ecosystems. In 1977, UNESCO declared it a Biosphere Reserve, but this international recognition has done little if anything to bolster external support for the protected area and is not even mentioned in recent publications.

From 1977 on, vicuña protection was delegated to INFOL (*Instituto Nacional de Fomento Lanero*) under terms specified by a World Bank project titled “Ulla Ulla Integrated Rural Development.” After several years of rather unsuccessful management, the protected area’s administration was transferred to the Bolivian Institute of Agricultural Technology (*Instituto Boliviano de Tecnología Agropecuaria*).

In 1994, through the National Directorate of Biodiversity Conservation (*Dirección Nacional de Conservación de la Biodiversidad* - DNCB) supervised the signature of a co-administration agreement between the Ministry of Sustainable Development and Environment (*Ministerio de Desarrollo Sostenible y Medio Ambiente*) and the Canadian Center for International Cooperation and Studies (CECI). Valid for four years, the agreement’s mission was to create and progressively transfer the administration of the protected area to a Management Committee. In 1996, CECI’s role was redefined in a new four-year agreement signed by the Franz Tamayo and Bautista Saavedra Peasant Federations - and the Alpaca Project was launched, also with a four-year duration. In 1999, once the agreement expired, SERNAP, created in the meantime, assumed the management of the protected area. During those years, a Management Plan was drafted by a consortium of organizations composed of the Institute of Ecology of the Universidad Mayor de San Andrés, the National Herbarium, the Institute of Hydraulics of La Paz, the Ethnography and Folklore Museum, and the Bolivian Fauna Collection - with CECI funding.

In the year 2000, with urging and support from the Spanish Agency for International Cooperation (*Agencia Española de Cooperación Internacional* - AECI) as part of its Araucaria Program, the reserve’s



Park rangers on patrol in the Pelechuco valley. Photo: MSD

current size, category,<sup>1</sup> and name<sup>2</sup> were established through D.S. N°25,652.

The main reasons for increasing the size of the protected area include:

- incorporation of the area into the binational Vilcabamba-Amboró Biological Corridor (VABC), which includes neighboring Madidi NP-IMNA and Pílon Lajas Biosphere Reserve and Communal Lands (BR-TCO), and Peru's Bahuaja-Sonene NP and Tambopata-Candamo Natural Reserve (NR);
- adaptation of the area's limits to natural features in an effort to facilitate enforcement and management activities;
- inclusion of representative samples of well-conserved, eastern Andean forest ecosystems characterized by extremely high levels of biodiversity;
- incorporation of yet unprotected parts of the Tuichi river basin (comprised in great part within Madidi NP-IMNA);
- extension of the area's coverage of undisturbed ecosystems in order to establish a strict protection zone.



**View of the densely forested low mountains which were incorporated to the protected area with the extension of the Ulla Ulla National Fauna Reserve. Photo: MSD**

In addition, by incorporating large extensions of extremely biologically diverse Amazonian forests, reserve designers hoped to increase their chances of securing funding for the area, since its actual budget only covers minimum management needs. However, it is worth noting that the ex-director did not share this opinion, and rather considered that instead of contributing to realistic conservation objectives, this surface extension lead to the dilution of already very limited management capacity over an area inhabited by people traditionally fiercely opposed to governmental control and conservation initiatives.

1 In order to ensure compatibility with the Protected Areas General Regulations Act (*Reglamento General de Áreas Protegidas - RGAP - D.S. N°24,781 of July 31, 1997*), the Integrated Management Natural Area category was found to be the most appropriate for the reserve since native indigenous communities reside and carry out productive activities throughout much of the area.

2 The name was changed from Ulla Ulla to Apolobamba (commonly used for the region since pre-colonial times) after repeated requests from the local communities. They felt that Ulla Ulla was too restrictive and too closely referred to the community of Ulla Ulla and the protection of the vicuña populations and Puna grasslands, overshadowing other important aspects.



## Administration and staff

Apolobamba IMNA was created in January 2000 to protect the natural, cultural and landscape values of an area representative of high-Andean ecosystems.

Within Bolivia's SNAP, Integrated Management Natural Areas (IMNAs) are intended to harmonize the conservation of biological diversity with the sustainable development of local communities. In addition, since the region has a long history of human occupation and is ethnographically diverse, Apolobamba IMNA was also conceived to protect the local cultural heritage.

Placed under SERNAP's jurisdiction, the area relies on a reasonably staffed management team, composed of a director and chief ranger based in La Paz and 29, generally native park rangers. There is also currently a team of three technicians in charge of elaborating the new Management Plan, funded mostly by Conservation International. The protection corps carries out law enforcement and surveillance activities in accessible areas and according to vehicle availability, which is made highly variable by the disbursement irregularities of GEF-II Fund, the PA's major source of funding. Occasionally, special patrols are made to less accessible areas.

The fact that the existing Management Plan expired in 2002 greatly limits the work of the protection corps. What is more, this document only applied to the original Ulla Ulla Reserve and did not include the nearly 250,000 hectares incorporated in 2000. While it did consider a possible surface increase, its different management programs focused exclusively on the western part of the area. Finalizing the new Management Plan (planned for March 2006) is therefore extremely important, although its strategies and management programs are already partly being implemented.

## Zoning

The 1997 Management Plan defined seven zoning categories:

- Core zone (conservation of pristine or nearly pristine ecosystems, scientific research)
- Strict protection zone of hydrographic basins (allowing tourism and scientific research under certain restrictions)
- Internal buffer zone
- Extensive sustainable extractive use zone (regulated resource management)
- Intensive extractive use zone (regulated management, use, and "intensive" use of resources)
- Recovery or restoration zone (areas degraded by human activities, such as the *Polylepis* forests in the Pelechuco valley)
- Special use zone (public utility infrastructure)

Nonetheless, this zoning should be reconsidered for two reasons: First and foremost, the area's size has increased since this zoning was originally proposed. Moreover, the general lack of local consultation during the zoning process has generated resentment among the local communities.

Therefore, any new attempts to rezone the area must work to reach consensus among the various stakeholders. This aspect is apparently being considered by the team responsible for elaborating the new Management Plan.



**Hichocollo ranger station, in the western meseta. Photo: MSD**

As was previously mentioned, the protected area is divided into an “implemented” part (highlands and valleys) and a part that is in the process of consolidation (lowlands), which lacks management presence and infrastructure. Constructing two stations in this area (in Shiata and Yuyo) depends on external financing and improved relations with local communities.

Concerning transportation, the area’s road network is relatively dense. There are two main roads: one that crosses the entire western meseta before diving into the Pelechuco valley across the Apolobamba Cordillera, and another that follows the Charazani valley all the way to the remote town of Apolo, which is regularly damaged by landslides. In addition, there are several secondary routes connecting most of the communities and mining cooperatives. There are also many trails and footpaths interconnecting the highlands with the foothills in a west-east direction. An important trail, recently adapted for vehicular transport, begins in Pelechuco and connects the communities of Queara, Mojo, Puina, and Pata before reaching Apolo.

## Participation

Apolobamba IMNA was the first conservation unit within the SNAP to have an operational Management Committee. This Committee was constituted in May 1995, shortly after the promulgation of the Law of Popular Participation (Law N°1,551), which gave local communities the opportunity to exercise direct administration over their territorial jurisdictions.

Reshaped in 2000 and again in 2005, there are now two regional Management Committees in the PA’s highlands and lowlands. These include:

## Infrastructure

In addition to the two existing Liaison offices (La Cabaña and Charazani) and ranger stations (Qotapampa, Hichocollo, Suches, Pelechuco, Puyo Puyo, Challhuani, Curva and Siatha), three new stations were inaugurated in 2004 (Antaquilla, Huancarani and Paján) with support from AECL. In addition, the COBIMI Project (Biodiversity Conservation for Integral Management) is providing funds to build an interpretation center in Hichocollo.

As was previously mentioned, the

- representatives from central and local governmental agencies, including SERNAP, the PA administration, national governmental institutions, and the Municipal governments of Charazani, Curva, and Pelechuco;
- local authorities;
- social organizations from the Franz Tamayo province, including the provincial Mallku, local delegates and representatives from the Central mining cooperatives;
- social organizations from the Bautista Saavedra province, including the provincial Mallku, local delegates and delegates from the Yungas sector;
- one representative for national NGOs;
- one representative for international organizations working inside the PA.



Transportation of members of the Management Committee with a vehicle provided by the Spanish Cooperation Agency

Activities are being organized according to the Management Plans and Annual Operating Plans of the three Municipal governments. Management and environmental planning workshops have been carried out with the Apolobamba Inter-Municipal Association with support from WCS.

## Vicuña Management in Apolobamba IMNA

Vicuña (*Vicugna vicugna*) conservation, together with the conservation of high-Andean flora and fauna assemblages of the Northern Altiplano, was the main reason for the creation of the Ulla Ulla National Reserve in 1972. At that time, the species was on the brink of extinction from overhunting for its fur, used to make luxurious vicuña wool.

In 1997, part of the vicuña population was placed on CITES Appendix I, which generally prohibits all commercial international trade. It had originally been placed on CITES Appendix II in 1964, which allowed regulated trade in vicuña fiber (wool) originating from live animals.<sup>3</sup>

Vicuñas, as with other high-Andean camelids (llama and alpaca), have adapted to high altitude ecosystems that are not easily accessed by other mammals of its size, so that it is the largest herbivore throughout most of its distribution range and has very few natural predators. However, pumas (*Puma concolor*) and Andean foxes (*Pseudalopex culpaeus*) can have notable impacts

<sup>3</sup> The recent prohibition of the sale of vicuña fiber is more of a hindrance than help when it comes to this species' protection, considering that 90% of local inhabitants are barely meeting their basic needs and the vicuña compete with domestic cattle for scarce grazing lands.



**Apolobamba IMNA harbors the country's largest protected vicuña population. Photo: MSD**

population (or approximately 15,000 individuals) is comprised within protected areas. With 10,694 individuals,<sup>4</sup> Apolobamba IMNA harbors by far the largest vicuña population in the entire SNAP system, representing more than 70% of all vicuñas placed under some form of protection, and approximately 18% of this species' estimated contingent in the country. Furthermore, despite facing continued pressures such as poaching, predation by shepherd dogs, theft from Peruvian nationals, a variety of pathologies (including scabies), and competition with domesticated camelids, Apolobamba's vicuña population has dramatically recovered over the years (97 animals 1965; 1,139 in 1979 and 6,536 in 1996).

Considering that a large part of Apolobamba's western meseta has been greatly affected by overgrazing due to the high densities of domesticated llamas and alpacas, the vicuñas distinguish themselves for their low-impact browsing (their upper lip is formed in such a way that it can cut the leaves without pulling the plant from its roots) and their relatively low contribution to soil erosion (they have soft padded toes that do not compact or damage



**Throughout the western meseta, large herds of llamas and alpacas compete with the vicuñas for scarce forage. Photo: MSD**

<sup>4</sup> 2003 Vicuña census, in which ParksWatch participated. Vicuña censuses are organized on an annual basis by PA staff in close coordination with ARMVA. Results are published in the Apolobamba ANMI's Official Newspaper, First Edition, October 2003.

soil as is the case with other ungulates' hooves). This species is thus a key component in the conservation of the protected area's highlands, who are also home to other large vertebrates, such as the Andean cat (*Oreailurus jacobita*), the Peruvian guemal (*Hippocamelus antisensis*) and the Andean condor (*Vultur gryphus*).

Started in 1999 with funds from the AECI and the GEF-II Project, the Vicuña Management and Conservation Program (*Programa de Manejo y Conservación de la Vicuña*) promotes sustainable capture and shearing practices (i.e., that do not result in the animals' death) in order to generate economic benefits from sale of their quality wool, which is highly valued on the international market and can yield between US\$ 400-500 per kilogram (SERNAP, 2003). Under this program, capture and shearing is carried out at a certain time of year (from September to October, sometimes through December) under the supervision of park rangers, and all animals are later released. This benefits not only the vicuña but also the ranchers who supposedly rely on a sustainable source for income.

According to the regulations established by the Vicuña Conservation and Management Act (D.S. 24,529),<sup>5</sup> communities located in the Ulla Ulla Conservation Unit were grouped into communal management areas. Together, these form the Regional Association of Apolobamba Vicuña Managers (ARMVA), which unites 27 communities and is about to be legally incorporated in order to "carry out training, management, and harvest activities and to guarantee equitable distribution of benefits among rural farmer communities" (ARMVA, 2003).

In comparison with similar initiatives in other protected areas, the level of implementation of this pilot program is exemplary; yet, it faces a series of problems that not only put the completion of activities at risk, but also weaken the protected area administration, briefly described below:

- At the time of the project's officially closing and the departure of the technical support team, the communities still don't have all the necessary equipment (such as corrals) to carry out capture and shearing,<sup>6</sup> nor enough economic resources to strengthen the ARMVA.
- Given the nature of the market, a large quantity of wool has to be stored until a buyer can be found, which is why, at the time of writing, 300 kilograms of wool valued at \$60,000 had been stored at the Ulla Ulla storage center since 1998, and have yet to produce benefits for the communities.
- By allowing only certain communities to harvest vicuña wool (1,200 families are affiliated with the pilot centers in the Ulla Ulla Vicuña Conservation Unit), inhabitants from communities neighboring the protected area without use permits feel wronged and threaten to retaliate if

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5 The 1997 Vicuña Conservation and Management Act (Reglamento para la Conservación y Manejo de la Vicuña) contains two main clauses: a) grant rural farmer communities custody of the vicuñas in order to protect them and help their populations recover; and b) grant the communities exclusive rights to use the vicuñas and harvest their wool.

6 Nonetheless, it should be noted that the area has one of the best storage centers in the country, equipped with two vaults, a loom weaving room, a meeting room, a museum, and an administrative office (Juan Carlos Gómez, pers. comm.).

the situation is not rapidly changed.

Given these factors, the successful implementation of the Vicuña Management Program - elaborated in 2003 by ARMVA with technical support from the Institute for Biodiversity Conservation and Research (*Instituto para la Conservación e Investigación de la Biodiversidad* - ICIB) with funding from the Dutch Agency for International Cooperation -, depends on additional financial support before self-sufficiency can be achieved. Immediate needs involve the publication of technical manuals on wool fiber management and building a quarantine center to combat scabies and safeguard abandoned young.



In the middle of the highland plains, the new vicuña fiber storage and treatment center (funded by AECI) and the La Cabaña liaison office. Photo: MSD

# Human Landscape

## Human occupation

Archeological remains discovered in the area indicate that human settlements existed since pre-Incan times (possibly the Tiwanaku culture). Nonetheless, the Inca's settlement patterns determined today's territorial occupation, since the main populated centers were established during that time. The first three centuries of the colonial era were characterized by a significant human population reduction, associated with the arrival of national and foreign capitalists during the nineteenth century and the forced auctioning of communal lands which ensued in 1866. These wealthy landowners, who earned significant revenues by exploiting the local workforce, occupied the area until the Agrarian Reform of 1953, when lands were returned to their original owners and the communal property system which is still in place today.

Human settlements are mostly located along the area's two major valleys, but a relatively large population of peasants is dedicated to raising camelids in the western highlands (SERNAP, 2001).

The area's total population is estimated at 18,500 inhabitants (corresponding to more than 3,500 families) distributed in 76 communities. The largest population centers, which are all located in the valleys, are:

Population center	Number of inhabitants
<b>Southwest:</b>	
<b>Amarete</b>	<b>4.000</b>
<b>Charazani</b>	<b>1.800</b>
<b>Curva</b>	<b>800</b>
<b>Northeast:</b>	
<b>Pelechuco</b>	<b>1.200</b>

However, the most densely populated region is the western meseta, where inhabitants are spread out in many small communities (Joco, Ulla Ulla, Hichocollo, Antaquilla, Suches, and Challhuani, among others). Almost all these inhabitants are of Quechua and Aymara origin, since the region is home to the Kallaway culture (in the areas of Curva, Charazani, Chari, and Chajaya), renowned for its traditional medicinal practices.

At the Inchari Medicinal Center, natural products are prescribed for a variety of ailments. For example, Vilaya is prescribed for coughing, Tapayo to cure vision problems, Ocorore to help both vision and the kidneys, Tola to prevent colds, and Chuchuco is a powerful anti-inflammatory. Unfortunately, as is true in many other parts of the world, this traditional knowledge is being lost with time, and unless serious efforts are made to document and disseminate the information, it is quite likely to fall into oblivion in the near to medium future.

## Social characteristics and organizational aspects



The little village of Charazani, in the valley of the same name.  
Photo: MSD

Most communities lack basic infrastructure and services. The only town with electricity is Charazani; medical attention is very limited because of difficult access and lack of equipment; education indicators are below national levels; and sanitary infrastructure is extremely precarious, although some improvements exist with the recent launch of the Apolobamba Health Network (*Red de Salud Apolobamba*), which includes sanitary posts in Amarete, Charazani, and Pelechuco. Above all, water scarcity is a prevalent problem across a large proportion of the area's highlands (AECI, 1998).

The Pelechuco valley boasts one of the lowest human development indexes in Bolivia's highlands and is clearly behind nearby communities, such as those of the Charazani Valley. Its isolation is the main contributing factor to this situation. Consequently, in addition to the tourism activity that is expected to be generated with the habilitation of the trail to Curva (Curva-Pelechuco Trek) and the recent inauguration of a tourist accommodation center in Agua Blanca, part of the population believes that only the construction of a road to Apolo can bring some prosperity to the valley. In order to prevent the irreversible and unavoidable damages related with the opening of a vehicular road, the PA administration has been busy trying to convince residents to instead opt for a pedestrian trail large enough to use donkeys and other cargo animals for transportation.

Landownership in the highlands is communal. After the 1953 Agrarian Reform, communities settled on large plantations. The original communities (without landowners) and even some indigenous communities organized themselves into agrarian unions, grouped in subcentral and central unions. The central agrarian unions correspond mostly to the canton political divisions and are grouped into a provincial federation. The provincial federations in turn are grouped in departmental federations, and these in a National Confederation, affiliated with Bolivia's largest campesino organization, called CSUTCB (*Confederación Sindical Única de Trabajadores Campesinos de Bolivia*) (ARMVA, 2003).

The promulgation of the Popular Participation Law and the Administrative Decentralization Law in 1994 has driven a profound restructuring process of the local native population, which is returning to traditional *ayllus* and *markas* as organizational structures.<sup>7</sup> In the case of the

<sup>7</sup> The ayllu is the rural social unit of Andean culture based on kinship organization. It has survived the colonization and imposition of republican principles, to the point that it is now indistinguishable with that of the community.



IMNA, several agrarian unions have proceeded to restructure themselves in native communities, affiliating themselves with CONSAQ and following their own organizational patterns in which SERNAP and the protected area's managers have no say (ARMVA, 2003). It should be noted that during this restructuring process, these traditional units have experienced strong divisions and internal strife, resulting in overexploitation of natural resources due to changing values and lack of communal control. This is particularly visible in the western part of the protected area, where overgrazing by alpaca has become a serious problem, and in some portions of the Charazani valley, where division of the land into small agricultural plots has intensified. This in turn drives a strong external migratory trend towards the cities, which some have begun to call rural exodus (CIT, 1998).

As was previously mentioned, as part of its support to the PA's management, WCS organized environmental planning workshops with the four relevant Municipal governments (Pelechuco, Curva, Charazani, and Apolo) as well as the Apolobamba Inter-municipal Association to which they pertain.

While the protected area's regulations prohibit the creation of any new settlement by outsiders, internal migration is allowed and has grown in importance as the quality of life in certain highland communities deteriorated. Throughout the lowlands, the absence of park rangers makes effective control and law enforcement impossible. Here, illegal settlers (estimated at 150 families, or approximately 500 people) are established and all indications suggest that it could be a difficult situation to resolve, especially in areas where coca production for the drug trade is taking hold.

In addition, new miners regularly arrive in the area, and some of them stay despite the fact that it is illegal for them to do so. Precise data on numbers of temporary and permanent miners are unfortunately unavailable.

## Economic activities and natural resource use

With regard to natural resource use, the area's three subregions (pampa, valleys, and lowlands) display distinct production systems. Until recently, the systems were highly complementary under a system of intracommunal reciprocity and intercommunal exchange.<sup>8</sup> Unfortunately, these subsidiary practices are slowly eroding. Following is a discussion of the economic activities and natural resource use per subregion.

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The recurrent request for the creation of ayllus in the country's large cities shows the validity and vitality of the ayllu community organizational system. A marka is a collection of ayllus. The communities of Agua Blanca, Cololo Altarani, Puyo Puyo, Antaquilla and Nube Pampa recently united to form the Marka Copacabana de Antaquilla Communal Lands.

<sup>8</sup> Highland herders used to exchange their products with farmers from the Pelechuco and Charazani valleys, and there were interchange channels from the Yungas to Juliaca in Peru. Annual international fairs are part of this barter system that lives on today.



Livestock raising is the basis of the area's western highlands economy.

Photo: SP

changes after the Agrarian Reform, raising camelids has become the only productive activity in the zone, where natural grasslands and wetlands cover approximately 47,000 hectares. Despite the area's innate potential for camelid production, high densities of animals (up to 150 individuals per household) have caused conflicts between the ranches and there are serious overgrazing and disease problems.

### a) Highlands

The economy of the highlands (which includes the high-Andean zone and humid tundra called "*pampa*") is based entirely on camelid (llamas and alpacas) and sheep raising. Wool is sheared twice a year (between January-February and October-December) and fiber production is divided between commercial purposes and domestic uses under a communal management regime.

Because agricultural activities ended with land ownership

### b) Valleys

The economy in the valley is based on subsistence agriculture on terraces, with small-scale cattle and sheep ranching. Inhabitants often supplement their income with seasonal migrations to cities and mining centers to find work. In the Charazani valley, agricultural production is highly organized, specialized in the following crops: a) between 2,800 and 3,600 m asl: chilies, fruit, yucca, corn, wheat, and peas; b) between 3,600 and 4,000 m: tubers, barley and broad beans (DNCB/CECI. 1997).



Terraced agriculture in the Charazani valley. Photo: MSD

### c) Lowlands

In the lowlands, the colonial settlers practice slash-and-burn agriculture and cultivate typical tropical crops (plantain, yucca roots, maize, rice, coffee, and citrus trees, among others). In practicing this type of agriculture, farmers often leave fragile soils on steep slopes exposed to heavy rainfall, resulting in severe erosion and landslides. It seems that logging for commercial purposes has come to an end, probably because the valuable timber species from accessible areas have been exhausted.

Among the economic activities practiced throughout the entire area, the most relevant ones are gold mining and aquaculture.<sup>9</sup> Although the area harbors several valuable mining resources (such as gold, arsenopyrite, and to a lesser degree silver, lead, zinc, pewter, and limestone), the prevailing activity is gold mining, reaching back far into pre-Columbian times. Gold mining in the area (mostly at higher elevations) really became important in 1985 when the state mines closed and thousands of miners lost their jobs and were left without any alternative in the labor market. This essentially small-scale activity, which takes place mostly in underground mines, is generally practiced at the community level (in communal gold washing units) or under a cooperative system with machinery or partners generally coming from outside the area.



**Slash-and-burn agriculture in the lowlands results in strong erosional processes due to the rugged terrain and the numerous land clearings on steep slopes. Photos: MSD**

<sup>9</sup> Aquaculture, by which fish populations of high-Andean lakes are reproduced in hatcheries installed in the valleys, is one of the major accomplishments of the Araucaria Program. “Biologically” produced trout (without any additives) are sold mostly in local fairs, but some residents have started selling their products in La Paz, where they successfully compete with the fish from Lake Titicaca.

## Local attitudes towards the protected area

In general, highland and valley communities have good relations with Apolobamba IMNA's administration. They acknowledge the existence of the protected area, and have already benefited from it in a variety of ways.

On the other hand, the lowland communities oppose strong resistance to the PA's conservation goals and to its implementation. One reason for this is the lack of consultation during the revision of the PA's limit, which involved only a small selection of community leaders. In addition, most of the residents are colonists eager to maintain open access to the land and resources.<sup>10</sup> In addition, there is a tendency to establish coca crops in the area, and the relation of the promoters of this crop with the drug trade generates conflict. Given this tense situation and the present lack of dialogue, the PA administration decided to transfer the financial resources budgeted for activities in this part of the IMNA to highland communities instead.

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<sup>10</sup> At the time, leaders sought timber extraction rights for approximately 3,000 board feet per family, but this plea was categorically rejected by the PA administration.

## Tourism

Apolobamba's tourist situation can be summed up in the following terms: it is the place that everyone wants to see but where no one goes.

The area's beautiful landscape is almost unparalleled in the world: majestic snow-capped peaks and glaciers like Akamani and Katantika dominate a landscape of rolling tundra prairies and thick cloud forests. Numerous glacial lakes dot the expansive native grasslands freely grazed by wild vicuñas and herds of domesticated llamas and alpacas. For tourists looking for adventure, there are innumerable climbing routes as well as white-water rivers ideal for rafting. For those seeking tranquility and seclusion, there are Pre-Columbian trails (with more yet being restored)<sup>11</sup> and numerous archeological and historic sites, such as Pre-Incan irrigation systems and beautiful colonial buildings. The region is also home to the Kallawayá culture, known for its traditional medicinal practices. Finally, thermal baths can be found throughout the area (in Curva, Charazani, Chullina, Chari, and Chajaya) (Ribera, 1999).



The glaciers and ice fields of the Cordillera Real are renowned among mountain-climbers, but are still only rarely visited.

Photo: MSD

Despite these very favorable assets and a relatively easy access when compared to other Bolivian protected areas (only 5 to 7 hours ground transportation from La Paz), tourist affluence is very low, on average only 300 visitors annually. According to the area's Tourism Ordinance Plan (*Plan Mínimo de Ordenamiento Turístico*), this situation is essentially due to lack of infrastructure and services coupled with insufficient promotion of the area in tourism agencies (Sáinz, X. 2002). Furthermore, because the few tourism operators working in Apolobamba do not include local services in their packages, local communities hardly benefit from this activity.

Several recent initiatives seek to remedy this situation, such as the recent opening of tourist lodges in Lagunillas and Agua Blanca, sign posting, and publication of pamphlets and informative brochures. However, a coordinated program promoting tourism is needed for the area that includes community input and long-term vision for future planning. A step in the right direction is the recent hiring of a communications expert by the PA administration, responsible for publicizing Apolobamba IMNA by producing documentaries and other promotional products.

<sup>11</sup> The COBIMI Program (*Conservación de la Biodiversidad para una Gestión Integral*) and UNDP are working together to open hiking routes that connect the highlands and the valleys, especially between Kotapampa and Charazani.

## Conservation and Research Programs

The area corresponding to the former Ulla Ulla National Reserve has been the site of many investigations and assessments since it was created in 1972. These are synthesized in the 1997 Management Plan.

Between 1996 and 1999, the Alpaca Project of the CECI provided funds to implement the protected area, and has promoted sustainable camelid management ever since. At one time, support for camelid raising was provided by the Integrated Association of Camelid Herders of the High Andes (*Asociación Integral de Ganaderos en Camélidos de los Altos Andes - AIGACAA*) and the ISQANI organization, but these initiatives failed due to poor management. Today, there are several students conducting thesis research on the area's vicuña populations.

Like herding, another issue gaining attention over the years is mining. Gold mining has brought the MEDMIN Foundation to the area with a project to promote gold amalgamation techniques that do not use mercury (especially in the Sunchully mines). In addition, Conservation International conducted a study on river pollution from mining operations as part of their "*Biodiversity in Regional Development*" (BiRD) project.

The following discussion lists the principal, active projects in the area.

WCS's Living Landscapes Project, in collaboration with the Institute of Ecology in La Paz, focuses on the following activities:

- Study of the distribution, abundance and ecology of a selection of species, called *landscape species* (such as the spectacled bear,<sup>12</sup> Andean condor, and vicuña) and identification of priority areas for their conservation;
- Standardized botanical inventories in spectacled bear research sites (with the National Herbarium);
- Ornithological studies;
- Evaluation of the real impacts of so-called crop pests (foxes, bears, rodents, and parrots). Using this research as a base, measures were developed to mitigate damages and are being implemented in three communities (Paján, K'apna, and Wayrapata, in the municipality of Curva), as are methods to reduce the number of domesticated animals lost to predation around the Curva and Pelechuco communities. In addition, a guide has been produced to help park rangers and community members identify the cause of death of domestic animals, and several park rangers have been trained in the use of this guide.

Aside from these research and resource management projects, WCS is also supporting the Management and Interinstitutional Coordination Committees, and is promoting environmental planning in the various municipalities of the Apolobamba Inter-Municipal Association (Pelechuco,

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<sup>12</sup> There is one published thesis on the area's spectacled bears: Paisley, S. 2002. *The Spectacled Bear in Apolobamba, Bolivia: the Conservation of a Culturally Salient Species*. Kent University, Canterbury, UK.

Curva, and Charazani).

The COBIMI project involves the collaboration of several organizations, including the National Natural History Museum, the Bolivian Fauna Collection, the Noel Kempff Mercado Natural History Museum (MHNNKM) and the American Museum of Natural History (AMNH, based in New York). Besides training biologists and evaluating the country's conservation status, this project is supporting several small community-based ecotourism initiatives. For example, COBIMI has helped build cultural interpretation centers in Lagunillas, Agua Blanca, and Kotapampa. Additional cultural centers are planned for Kaluyo, Charazani, and Chari (with support from UNDP). The last cultural center will also include a tourist trail that will connect it with Kotapampa.

To date, the project with the farthest reach has been the Apolobamba Integrated Project (*Proyecto Integral Apolobamba*), carried out by the Spanish International Cooperation Agency (AECI) within its broader Araucaria Program.

This project, which lasted 6 years from 1998 to 2004, centered on the following three main components:

- Support to the protected area management by supporting BOLHISPANIA (a national NGO) in a co-management relationship with SERNAP as counterpart. This project involved constructing park ranger stations, providing office equipment, and hiring four specialized park rangers with expertise in the following fields: environmental education, ecotourism, eco-aquaculture, and vicuña management.
- Support to the sustainable harvest of vicuña by creating and consolidating the Regional Association of Vicuña Managers, and by providing support during capture, shearing, and storing of vicuña fiber. In addition, the project participated in annual vicuña censuses and organized environmental education workshops in collaboration with Conservation International.
- Support of socioeconomic development by providing financing to Development Promotion and Support Institute (*Instituto de Promoción y Apoyo al Desarrollo - IPADE*), the Rural Electrification and Sustainable Development Service (*Servicio Rural de Electrificación y Desarrollo Sostenible - SEREDES*) and the Agrarian Research Program (*Programa de Investigaciones Agrarias - PIA*). This support included aquaculture, ecotourism (construction of two tourism accommodation centers and sign posting) and pro-



Members of the ParksWatch team participating in the 2003 vicuña census. Photo: MSD

moting traditional Kallawayaya medicine.

UNDP played a role in certain project activities, such as training in the community-based hostels in Agua Blanca and Lagunillas and promoting the Kallawayaya Culture by financing a crafts and art museum in Chari and a traditional medicine cultural center associated with a medicinal plant transformation center.

The United Nations Food and Agricultural Organization (FAO) has several projects approved, including camelid management, fish management, and ecotourism, but is waiting for the municipal counterpart in order to implement the projects.

Regarding environmental education, several programs stand out, including Conservation International's Green Tent Project (*Carpa Verde*), which is a set of portable teaching materials provided to various park ranger stations for use and demonstration in local schools; and the ICIB (*Instituto para la Conservación e Investigación de la Biodiversidad*) whose work ended in June 2004. Recently, the organization SAVIA started a teacher training program with local teachers focusing on solid waste disposal, ecosystem management, and environmental education.

Other institutions active in Apolobamba IMNA include the Departmental Agriculture Service of La Paz (*Servicio Departamental Agropecuario de La Paz - SEDAG-LP*), which conducts agricultural



The Green Tent (*Carpa Verde*) introduces the area's school-children to its biological features and to the importance of conserving them.

research and provides agricultural extension services; Armonia, which carries out research and monitoring of the area's avifauna; the United States Peace Corps, which occasionally sends volunteers to the area to work on different projects; and Colorado State University, which conducts scientific research.

It should be noted that community members and park rangers alike complain that they rarely receive any information regarding research results, despite the fact that these results have been promised to them. This is actually a common problem; many research and conservation projects create false expectations, thereby generating mistrust that may actually compromise progress achieved to date and jeopardize future research and conservation efforts.



# Pressures and Threats

Principal pressures and threats to Apolobamba IMNA include:

## Pressures

- Gold mining
- Agricultural practices
- Poaching
- Solid waste accumulation

## Threats

- Road construction and colonization

## Pressures

### Gold Mining

While gold mining has been carried out in Apolobamba IMNA since Pre-Columbian times, the activity only started to gain real importance in 1985 when state and private mining companies closed and mining cooperatives were formed. Since then, 46 concessions have been granted to 27 cooperatives operating mostly with external capital. In addition, there are communal gold washing units where villagers pan and wash gold alone or in groups and individual gold panners (*barranquilleros*), who function like unmechanized cooperatives and may at times be their predecessors.

Most active mines are located in the northern portion of the protected area, in the watershed of the Suches lake (on the western slope of the Apolobamba Cordillera), the Pelechuco valley (eastern slope), and in the Sunchully-Sorapata sector. There are also active mines located in the Charazani valley and close to Camata (located close to Apolobamba's southern border). Throughout the area, there are also unexploited deposits of platinum, tungsten, antimony, vanadium, lead, silver, and pewter.

Gold mining is the cause of many problems in the area. First, many of the miners are not from the region and have no real sense of responsibility towards the communities or local authorities. They also use rudimentary and inappropriate technologies that lead to river pollution (with mercury and sediments), localized air pollution, and a high incidence of work-related accidents

and injuries. The most highly contaminating technique, employed empirically because of lack of technical assistance or training, is the mercury-based amalgamation process, which involves the mixing of mercury with gold slurries and then heating the mixture in open vessels to separate them (Gordillo, 1997).

The cooperatives responsible for the some of the worst pollution are Flor de Nevado and Santiago. On the other hand, there are several cooperatives putting forth efforts to reduce environmental contamination such as Suches and Cerro Hermoso. These cooperatives not only operate with official environmental licenses, but also use sedimentation pools and restore landscapes in affected areas.

Due to the problems generated by the 1985 mining crisis and subsequent economic difficulties in the country, in 1994 the Bolivian government implemented the Integrated Environmental Management in Small-Scale Mining Program (*Programa de Manejo Integrado del Medio Ambiente en la Pequeña Minería - MEDMIN*) sponsored by the Swiss Agency for Development and Cooperation (SDC). The program consisted in raising the awareness of small-scale miners' of the environmental impacts of their operations and promoted techniques that allowed them to obtain more gold at lower financial, sanitary, and environmental cost. Unfortunately, due to a lack of resources and a general feeling of mistrust among miners, the program had limited results in Apolobamba. Only two cooperatives received low-pollution gold separation systems. Another effort that has yet to produce tangible results is a study of mercury pollution carried out by Conservation International as part of the BiRD Project. At the time of writing, no results had been communicated to the mining communities, the study's intended audience.

In general, minerals from Apolobamba IMNA are extracted from rocky material in open mines using dynamite. In some cooperatives, gold veins are manually tapped and others use air compressors and pneumatic perforators. Generally, extraction does not advance systematically; only gold-rich portions of the vein are extracted and poorer parts are left in place. When compared to open-air mines, environmental impacts from this type of mining are lower (Evia and Molina, 1997).



Two mining camps in the northeastern part of the protected area: Left: Levanderán mines, exploited by the residents of Agua Blanca; Right: Santiago mines, above the town of Pelechuco. Photos: MSD

The gold extraction process is conducted in several different ways. The most rustic approach consists in manual crushing with a sledgehammer, followed by grinding in crude stone mills (called *quimbaletes*) with or without water. During the last stage, mercury is added to the batch to start the amalgamation process. Amalgamated gold is later separated out using washing troughs. In mechanized processes, jaw crushing and wheel grinders (called *trapiches*) or ball grinders are used, followed by several stages of gravimetric concentration. Mercury is often used in the *trapiches* or in the ball grinders to simultaneously grind and amalgamate.

Because mining is practiced in the open and there are no waste collection systems in place, the use of mercury results in both air and water pollution. During the intense amalgamation in the grinders, most of the mercury is atomized and forms “mercury flour,” which is no longer viable for amalgamating gold. Miners are forced to use new raw material, dumping the useless mercury flour along with other tailings directly into the river.

A large proportion of the mercury used in gold mining is also emitted into the atmosphere, which directly impacts miners’ health and results in the pollution of terrestrial ecosystems through rainfall deposition. As a result, locally emitted mercury may travel large distances and is actually already found throughout the Amazon Basin. In aquatic ecosystems, microbial activity converts mercury into methyl-mercury, a persistent, lasting form that accumulates in animal tissues and moves up the food chain to contaminate both fish and its consumers, including the human populations relying heavily on fish (Fundación MEDMIN, 2001).

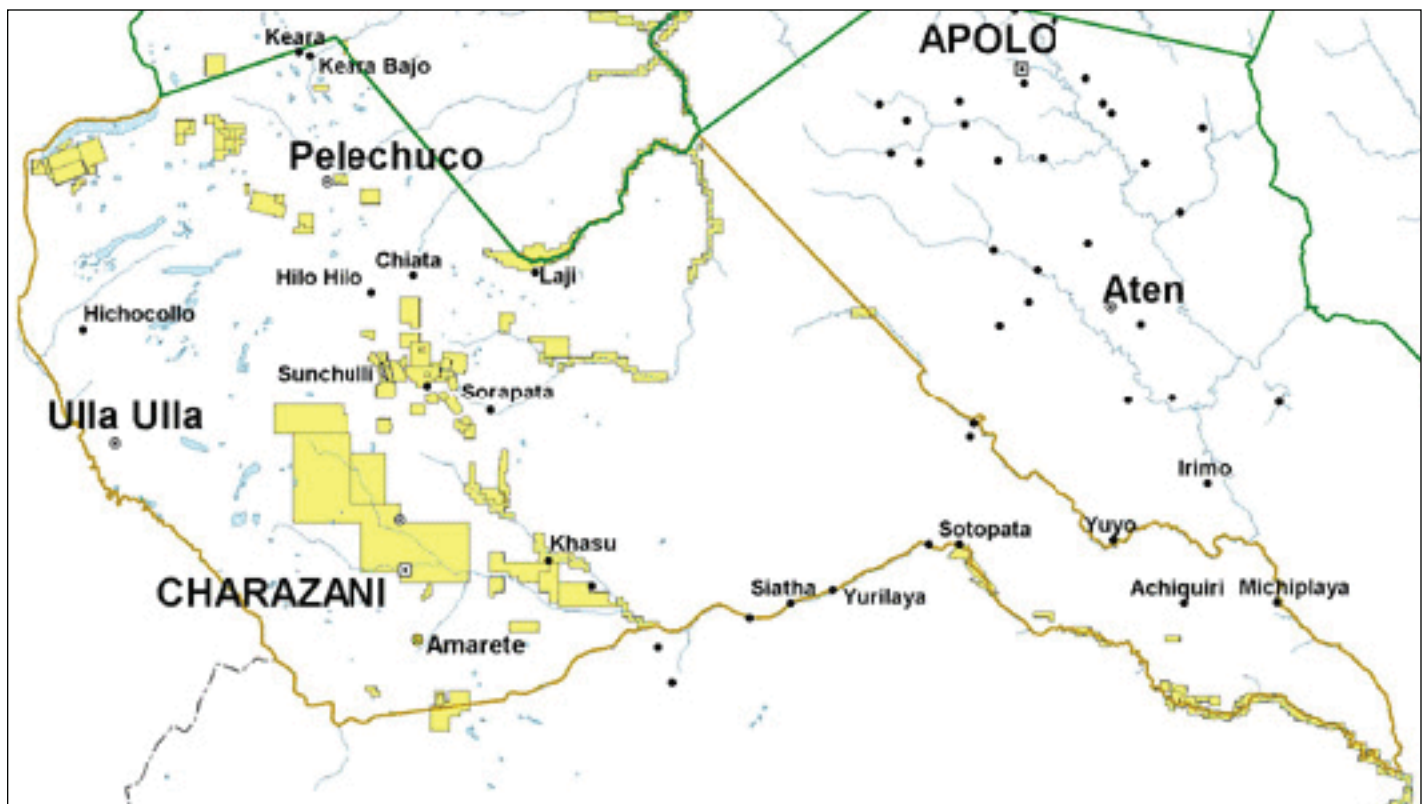


**The precarious working conditions, and in particular the use of mercury without any protection nor recovery, are the source of both health and environmental hazards. Photos: MSD**

Another negative environmental impact from gold mining is related to dynamite use. When miners use dynamite to open access to gold veins, they tend to destabilize nearby glaciers (such is the case with Katantika glacier, for example), which can cause erosion, avalanches, and important landslides.

Immigration is yet another problem associated with gold mining in the region. In fact, there is a constant influx of new miners, many in search of temporary work (although some end up staying), who have very little respect for the environment and even less for the protected area's regulations. They open up trails, hunt and fish indiscriminately, throw garbage into the rivers, extract gold from veins outside of their concession areas, and abandon obsolete machinery and other waste when they leave their camps. This generates numerous conflicts with communities, who are starting to reject this highly destructive activity from which they reap no benefits. Whoever tries to explain these problems to the miners often meets with indifference, if not outward aggressiveness (Gordillo, 1997).

Perhaps even more worrisome than current levels of environmental damage from gold mining are the number, size, and distribution of concessions granted in the area (see map), which will eventually affect a large portion of the protected area's surface area if they are indeed brought into operation, which may very well happen if and when mineral prices start climbing. This is already happening in the case of gold.<sup>13</sup>



Map of mining concessions in Apolobamba IMNA. Source: WCS, 2004

13 Currently, only about 5% of the area's estimated gold deposits are being exploited.

Despite its detrimental nature, mining is not legally incompatible with the IMNA protection category,<sup>14</sup> and under the Mining Code (which is much stronger than the General Protected Areas Regulations - RGAP, D.S. N°24,781 of July 31, 1997) the government continues to grant concessions expeditiously in this and many other protected areas in the country. Not only that, but the protection corps cannot enforce mining regulations stipulated in this code because they lack capacity and the legal means to do so. For example, they are unable to ensure that each mining operation has obtained an environmental operating license as required by law, which are granted only after the operation presents an environmental impact assessment that establishes that their activities will not contravene the protected area's objectives.<sup>15</sup>

The fact that delegates from the Japanese Agency for International Cooperation (JICA) recently conducted a geological study of this and other protected areas in the country (in early 2004) provides evidence that Apolobamba's mineral resources are being coveted by international interests with substantial political power. As a result, it can be assumed that the mining threat to the protected area will grow in the future.

## Agricultural and livestock grazing practices

Agricultural activities and their related impacts in Apolobamba IMNA vary according to their location, and can be divided geographically as follows:

### a) Highlands and valleys

In the highlands and valleys, burning is the traditional way to restore pastures, clear lands, and fertilize soils. It is part of local custom and its use is widespread. At times, fires are set to keep foxes and other harmful animals away, or even as a distraction for children. The biggest problem associated with burns, which are most intense during July and August, is subsequent erosion when they are set on steep slopes. In addition, it is not uncommon for burns to get out of control and affect neighboring vegetation. Some burns thus quickly become wildfires and spread uncontrollably over entire hills destroying all vegetation in their path. Even more worrisome than these agricultural burns is the fact that certain communities opposed to the PA administration are intentionally setting wildfires in order to destabilize it.

Most of the Puna grasslands in the western meseta, where camelid raising prevails, are overpopulated with llama and alpaca and suffer from overgrazing, which eventually decreases the area's grazing potential because of the gradual replacement of natural grass communities by less palatable species (Ribera, 1995).

While concern over lack of pastures is obvious, the cattle herders, whose social status is directly related to the number of animals they own, refuse to recognize the excessive density of animals and tend to declare false numbers to the authorities in an effort to avoid taxes. According to the

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14 Article 12 of Apolobamba IMNA's creation decree (DS N°25,652 of January 14, 2000).

15 Article 90 of the Mining Code, promulgated March 15, 1997 (Law N°1,777).



**The annual burning of pastures is a very deeply rooted habit among the area's inhabitants. Each year, large extensions of natural habitats are lost as a consequence of this practice. Photos: MSD**

source, there are thus between 60,000 (*Asociación Regional Izcani*) and 120,000 (Aramayo, 2000) alpacas grazing on the meseta. While alpaca owners are forced to move their animals to ever more remote areas to find adequate pastures, scarcity of pasture grasses also influences the behavior of vicuñas that are forced to seek forage in higher altitudes, mostly across the border, where they are frequently captured by Peruvian herders.

In addition, high concentrations of animals increase the incidence of parasitic diseases, such as scabies, that can be transmitted between alpacas and vicuñas when their populations meet. Once weakened by disease, vicuñas are easy prey for predators, especially for the area's many stray pastoral dogs.

Some herders propose building new wells and irrigation canals to alleviate drought effects during the dry season (June to September). In order to carry out these plans, certain streams would have to be diverted or water from lakes used (utilizing photovoltaic pumps), but for the most part

the area's maximum irrigation potential has already been reached. It is feared that temporarily "improving" water availability during the dry season would only result in an increase in animal densities and a worsened problem in the future.

Another significant threat in the highlands and valleys is the loss of local, native agrobiodiversity, which is one of the most relevant natural-social values in the area. For example, there are dozens of varieties of potatoes, other tubers, maize, quinoa, amaranth, and other plants. This germplasm loss is associated with the gradual change of



**The western meseta is criss-crossed by a dense network of irrigation channels. photo: MSD**

cultural values and abandonment of traditional land use systems (Ribera, M.O., pers. comm.).

## b) Lowlands

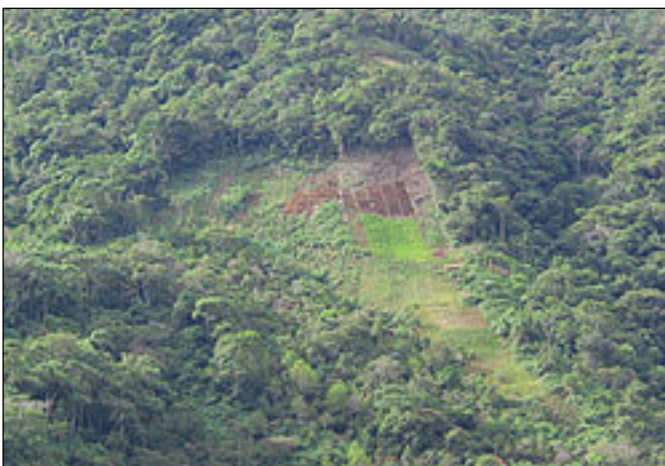
In the lowlands, new colonists, mostly from the IMNA's highlands, establish new settlements and clear land for agriculture, which due to the rugged terrain occurs mainly on steep slopes unsuitable for farming. One area particularly threatened by these colonization processes is the fragile cloud forest of Carijana, which groups of residents from Amarete and other communities have been trying to settle for several years, renewing their demands to the PA administration every year.

By employing inadequate agricultural practices, these colonists are destined to face the same, typical consequences of colonization processes conducted in the absence of any technical support: indiscriminate destruction of vegetation cover by slash-and-burn, rapid soil impoverishment and erosion, landslides, and the need to perpetually clear new lands in order to maintain acceptable harvest rates.

These processes are small-scale (parcels generally range between 3 and 5 hectares) and currently distributed along the Charazani-Apolo road, with concentrations around certain communities. However, a comparison of satellite images from 1995 and 2001 indicated that plant cover in nearly all accessible areas of the Charazani valley had already been altered. In addition, there is a growing number of coca plantations (in the environs of Sotapata, see photo), with all the negative consequences of the drug trade with which they are associated. Approximately 50 families, tied to political interests, are involved in this activity. They rejected a proposal last year financed by AECI with technical support from IPADE that would have helped them transition to alternative products (black pepper, coffee).



Land clearing on steep terrain close to the community of Siatha. Photo: MSD



Nearly all the coca leaves produced inside the area are destined to the drug trade. Photo: SP

This area is located in the region incorporated to the protected area in 2000, in a process that was conducted without any public consultation. This determined tense relations between the PA administration and local communities, which haven't improved due to a lack of communication, human resources and infrastructure. As a result, the protection corps has no official presence in the zone and even less control over its inhabitants' activities, except for those involving the shipment of large volumes of material, as is the case with

commercial logging.<sup>16</sup>

It is worth noting that indiscriminant logging in the area was widespread until just recently. It has probably diminished because valuable timber species are no longer found in accessible zones. It was also the cause of violent clashes between the area's management and loggers in 2002, when two park rangers were assaulted and their station destroyed.



Colonization front at the IMNA's northern border, along the road to Apolo. Photo: MSD

## Poaching

Protected area regulations prohibit wildlife hunting, but is tolerated outside of the core zones if done for cultural purposes (in order to use the animal's skin or feathers to decorate traditional dance costumes, for example).

Despite this prohibition, poaching is a serious problem in the area. There are several factors motivating people to hunt wildlife, including:

- Nutritional needs. Bush meat satisfies protein requirements for many inhabitants, especially the miners, whose camps are usually established above 4,000 m altitude where there is no livestock. The miners exert considerable pressure on the Southern viscacha (*Lagidium viscacia*)

<sup>16</sup> In order to reach markets, people must pass a road gate located at the Charazani park ranger station, which effectively acts as a control measure for certain illegal activities carried out in the non-implemented part of the PA.



- the Puna's most emblematic rodent. The area's various deer species are also threatened by illegal hunting in the highlands. Ironically, the populations of aquatic birds nesting in some glacial lakes are threatened by soldiers of the various "ecological battalions" stationed in the Pampa, whose external food supply is highly irregular. Pressure is not as severe in the lowlands, where livestock is more available. However, inhabitants still hunt wildlife, especially monkeys (especially *Ateles paniscus*), to complement their diets.

- Crop protection (maize, potato, oca). Farmers mostly hunt deer (*Odocoileus virginianus*) and Peruvian guemal (*Hippocamelus antisensis*) for this reason.
- Protecting livestock (ovine, bovine, camelid) from predators. Most attacks come from spectacled bears (*Tremarctos ornatus*), Andean foxes (*Pseudalopex culpaeus*), pumas (*Puma concolor*) and Andean condors (*Vultur gryphus*). It should be noted that herders rarely accompany their herds, leaving them instead roaming unsupervised.

In order to protect themselves from potential losses, farmers and herders presently kill whatever animal endangers their property, regardless of whether it is a threatened species such as a spectacled bear or an Andean condor.

The case of the vicuñas should also be mentioned: their systematic slaughter during the 1960s<sup>17</sup> brought this species to the brink of extinction, but thanks to the awareness-raising efforts of the protection corps, as well as the sustainable use and management program implemented in 1999, hunting has greatly diminished. Nowadays, community members even take turns as watchmen to prevent poaching and animal thefts, especially from Peruvian nationals.



Seized vicuña skin. Photo: MSD

## Solid waste accumulation

Because most communities in Apolobamba IMNA lack knowledge, infrastructure and equipment to manage their solid waste, it piles up in improvised dumps or scattered across the landscape. In most cases, garbage accumulation has reached unacceptable levels for a protected area.

Many communities located along the river simply dump their waste directly into the river. This situation is typical in the town of Pelechuco, whose mayor has ignored the problem for years despite offers of help from concerned institutions, including the PA administration. During our visit to the village, we were able to confirm that most inhabitants, persuaded that no one lives downriver, are totally unconcerned about the garbage's destiny. In fact, due to an entire

<sup>17</sup> According to PA personnel, using automatic rifles.



**Critical state of a bofedal wetland downriver of the Levanderán mines. This mixture of solid waste and mercury serves as grazing grounds for llamas and alpacas. Photo: MSD**

lack of environmental education, they are unlikely to change their behavior even if they knew that there are actually populations living downriver.

Garbage is also a serious problem in mining camps. The photograph demonstrates the magnitude of the situation when there is no system in place and no river to “evacuate” the waste. Garbage piles up and spreads over disproportionate areas when compared to the size of the camp or settlement. Solid waste also builds up in different points of the Peruvian-Bolivian border, where binational fairs are regularly held (in particular along markers 3 and 15).

## Threats

### Road construction and colonization

With respect to the threats posed by the various road construction projects throughout the area, we focus on the two projects which are likely to result in the most serious impacts, placing them at the forefront of management priorities in the short and medium-term:

- The main threat is posed by the population growth in the lowlands expected from projected improvements to the road leading to Apolo and the likely opening of a connection to the town of Ixiamas and the country’s expanding northern road network. The likeliness and probable consequences of this situation require special attention and the search for additional resources



**The residents of the Pelechuco and other valleys want to build roads in order to be able to take their products to the markets. Photo: MSD**

in order for the PA administration to acquire the capacity to maintain control over this area in spite of a potentially significant traffic increase<sup>18</sup>.

■ Opening the Pelechuco-Apolo trail to vehicular traffic represents the second most significant threat to the area related with road construction. This idea has periodically resurfaced over the last 60 years whenever gold mining operations have begun to decelerate as gold veins were successively exhausted. The inhabitants of Pelechuco tried to improve the first stretch by themselves, but work was stopped in 2001 due to a lack of resources (many bridges needed to be restored or rebuilt) and thanks to the PA director's active efforts to protect one of the area's few intangible zones. Work was reinitiated in 2003, but lack of financial resources led once again to a rapid stall. In addition to destroying an ancient Inca trail of great historic value, cultural relevance and tourism potential, this road would expose a nearly pristine valley of great conservation value to colonization and logging.

## Recommended Solutions

### Gold Mining

The 1997 Management Plan acknowledged gold mining as one of the area's major problems and its proposed Zoning Plan precisely defined where this activity was permitted and the conditions under which it was to be conducted. Looking back, it is obvious that these guidelines were not respected. Instead, mining interests continued operating freely, and relations with miners were not significantly improved.

As in all of the country's protected areas with mineral resources, the problem with mining in Apolobamba is due to a lack of political will to impose restrictions on this powerful sector. By establishing operating norms for protected areas, the Environmental Management for Mining Activity Act (*Reglamento de Manejo Ambiental para la Actividad Minera - RAAM*) promulgated in 1997 basically constitutes a de facto authorization for mining in protected areas.

Furthermore, the government continues authorizing concessions, the so-called "positive administrative silence" rule leading to the ad hoc approval of impact studies and granting of environmental licenses to cooperatives technically incapable of complying with regulations. Faced with this permissive policy, SERNAP has its hands tied because the National Protected Areas System (SNAP) is not backed by a formal law. Subjected to the laws of the Mining Code,<sup>19</sup> which

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18 For more information on this subject, consult our Madidi NP-IMNA profile, available at the ParksWatch website: <http://www.parkswatch.org/parkprofile.php?l=eng&country=bol&park=mdnp>.

19 Law N°1,777, passed March 17, 1997.

was designed to guarantee investment security and demands that mining operations suspended for any reason other than protection of human health, personal lives, or an “environmental emergency” (Art. 39) be indemnified, protected area management has to yield to environmentally damaging productive activities.

Due to this situation, park rangers are unable to sanction mining infractions and even less able to enforce protected area regulations. There is a legal procedure, but in order to apply it, a prosecutor from La Paz must personally go to the area, making this option unrealistic given the travel time involved. As a result, it seems that the only tools at the protection corps’ disposal currently are dialogue and collaboration.<sup>20</sup>

This very delicate situation requires solutions at several levels, from improving national legislation to enforcing protected area regulations and enhancing relations between miners, local communities, and the PA administration.

### a) National legislation

A Protected Areas Law is needed to replace the weak General Protected Areas Act (RGAP) and to provide the SERNAP a legal backing to confront the Mining Code, the Hydrocarbon Law, and other laws or regulations favoring natural resource exploitation and national industrialization. Unfortunately, the revision process, which has taken several years, has corrupted the initial law proposal from its initial purpose and provided ample time for the inclusion of clauses legalizing extractive activities in protected areas, even inside national parks. Therefore, ParksWatch recommends supporting efforts to recover the original law proposal and pass it as soon as possible.

With or without the promulgation of this law, direct coordination should be established between the PA administration and officials of the mining sector, namely the Superintendence of Mines (SERGEOMIN) and the Vice Ministry of Mines and Metallurgy to avoid the conflicts with local communities that new waves of miners are likely to generate. And, in order to prevent concessions from being granted in restricted areas (like strict protection zones), the Superintendence of Mines should be proactively informed of economic disadvantages related to these areas (for example, costs of Environmental Impact Studies and the high risk of being rejected since mining activity goes against the objectives of these restricted use zones).

Alas, the ex-director of Apolobamba IMNA (Juan Carlos Gomez, director at the time of our field evaluation) is convinced that the area’s protection would be greatly enhanced if provisions were made in the national legislation allowing protected area administrations to appeal to the General Controller’s Office of the Republic (*Controlatoria General de la República*). This Office has the authority to carry out penal procedures based on denouncements of infractions to mining and other regulations. This legal procedure has already produced satisfactory results against the

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<sup>20</sup> After a laborious legal procedure, the director of Kaa Iya NP-IMNA of the Gran Chaco successfully expelled personnel from a mining company who were carrying out geochemical prospecting operations without permission inside the protected area. This example shows that legal interventions are indeed possible, but they require serious perseverance and dedication with no guarantees of success.

opening of illegal roads inside the area.

## b) Protected area regulations

Since it would be impossible to close existing mines (making it an impractical recommendation), focus needs to be put on strictly enforcing the PA regulations and legalizing all mining operations. To do so, each cooperative must apply for an environmental license and adopt pollution reduction measures, especially with respect to mercury wastes. In supporting this process, it would be an ideal time to publicize the results of the study conducted by Conservation International and the MEDMIN Foundation about non-contaminating extractive techniques and provide incentives and resources for their implementation. In fact, many cooperatives have already stated their willingness to purchase necessary equipment. However, since many cooperatives do not have access to credit because they are greatly indebted, a special credit fund for purchasing such equipment may need to be put into place.

Another limitation that must be quickly overcome is the poor to non-existent access to technical assistance. Since the MEDMIN Foundation, which was in charge of the Environmental Integrated Management Program for Small-Scale Mining in the 1990s, changed its status from NGO to consulting firm, its consulting fees have become prohibitive. In addition, experience shows that there is no single recipe for all mining operations and each mine requires an individualized analysis to address its particular circumstances, making self-implementation of new technologies very difficult. Therefore, continued technical assistance and intense supervision are required (MMSD South America, 2002).

The exact number of active concessions and mines must be determined as well as the number of temporary workers entering the area and those who establish themselves within its borders. Once the number and location of mines are determined, periodic visits to each cooperative are needed to provide follow-up and monitoring, focusing on mining methods, amount of gold mined, mercury recovery techniques, and solid waste management, among others.

## c) Relations between the PA administration, miners, and communities

First and foremost, in order to achieve positive collaboration and coordination between these different sectors, awareness-raising campaigns should be organized to educate miners about the protected area's regulations, about the relevant environmental and mining regulations regulating their activity within the Mining Code, and about the importance of the enforcement and monitoring mining activities by competent authorities. By establishing environmental education programs, miners could be informed of the toxic effects of mercury and risks associated with its use, especially risks to their own health. In addition to implementing activities needed to raise environmental awareness, miners, gold panners and local inhabitants (mostly farmers or cattle herders) have to be brought together and trust and mutual respect must be fostered. Existing tensions between these groups will only wane by promoting dialogue, and it is probable that once informed of the impacts of their activity, many more miners would be willing to respect environmental regulations.

Our last recommendation on this topic is to provide follow-up to the "clean mining" projects implemented with funds from the Japanese Agency for International Cooperation (JICA), in

order to improve both the mining processes and miners' living conditions and to measure the project's impacts.

## Agricultural and livestock grazing practices

### a) Highlands and valleys

The most serious problems related to agricultural activities in the highlands and inter-Andean valleys are related to the wildfires caused by pasture burning and the overgrazing caused by the excessive number of domesticated camelids (llamas and alpacas).

The prevention of wildfires and the control of pasture burning are dependent upon an awareness-raising campaign which would teach farmers and herders the direct and indirect impacts of uncontrolled fires. Farmers must also be encouraged to advise protected area personnel when they plan to burn. Education on fire prevention should become a permanent program in the new Management Plan, and educators should also target tourists.

In a second step, community collaboration will be needed to identify possible wildfires and community members should be encouraged to report arsonists. As was mentioned in the threats section, some people set fires purposefully in acts of protest, and this cannot be tolerated. In addition, using fire to scare off wildlife must be prohibited entirely. This practice frequently gets out of control and is devastating to many flora and fauna species. The use of exemplar sanctions to set a precedent may be considered but should not prevail over the use of a collaborative approach aimed at fostering community autoregulation.



Overgrazing by domesticated camelids in the western highlands is essentially due to lack of grazing regulations and organization, leading to the overuse of a public resource (the grasslands), as described so eloquently by Hardin in his famous article, "*The Tragedy of the Commons*" (1968). Stopping this process requires regulating and managing use by implementing a pasture rotation system, which already has some supporters in the area. Training and education efforts could help herders implementing these types of measures already.

**The natural ecosystems of the IMNA's valleys have been profoundly altered by centuries of pasture burns. In addition to intensive firewood collection, this practice is seriously threatening one of the area's unique remnant patches of Polylepis (*Polylepis racemosa*) forest. Photo: MSD**

In order to develop measures that maximize yields while minimizing impacts, it is necessary to determine the carrying capacity of prairies and wetlands (bofedales), besides conducting

research on the amount of fallow time needed for pastures to regenerate. This could for instance be incorporated in IPADE's projected study on the grazing impacts of livestock and possible improvements in herding practices. Specifically, ParksWatch recommends analyzing the reasons for the better overall conservation status of the pastures on the Peruvian side of the border, such as: i) land tenure patterns; ii) availability of technical assistance and extension programs in the area, and; iii) genetic improvement of animals. If funding were available for ecological restoration, the most degraded areas should be replanted with native species.

Many ranchers are convinced that climate change is responsible for deteriorating pastures, materialized by tangible reductions in annual rainfall and the slow retraction of snow packs and glaciers. Faced with the need to find solutions, they support developing a canal irrigation system. ParksWatch believes that these measures are not compatible with the category of IMNA and that less damaging and more sustainable alternatives should be preferred. However, before rejecting the proposal, we recommend first researching the possible relationship between stream desiccation and existing irrigation canals and then, if the proposal moves forward, using study results when designing any new irrigation system.

After conducting the research suggested above, maximum herd sizes should be established and livestock grazing areas defined and respected. In addition, all communities should set up vigilance committees to watch their respective territories (following the model used for protecting vicuña from poaching). A system of sanctions and fines must be established by a Ministerial resolution or at least by the SERNAP, so that the PA administration could implement penalties when infractions occur. If and when this new zoning is approved, the protection corps must strictly and fairly implement the system and prohibit pasture users from violating agreed upon and established guidelines.

## b) Lowlands

In the lowlands, slash-and-burn agricultural techniques drive the expansion of the agricultural frontier, which typically results in complete soil loss from inclined slopes (there is very few flat terrain in this zone). In this part of the protected area, mechanisms must be developed to help farmers appraise and respect the capacity of their soils. Sustainable, diversified agriculture should be promoted, in which the most important crops are established as permanent, minor crops rotated, and soils constantly enriched (predominantly with manure). This requires again environmental education campaigns, training courses, and technology transfers. Markets must be identified for commercial production. And, as in the case of the highlands, once the rules of the game are established, those farmers violating the rules will have to be subjected to sanctions and/or product seizures.

Since this part of the area is experiencing population growth, a census is needed to obtain baseline demographic data and appraise its dynamics. While most of the migrants currently come from the high-Andean portion of the protected area, the apparent "availability" of land will probably attract external colonists over the medium-term. Therefore, in order to deter new immigrants, an information and environmental education campaign is needed to inform community members about protected area's goals, objectives, benefits, and limitations, as well as the risks associated with the improper use of its natural resources.

Communication between the protection corps and local inhabitants must be strengthened before locals can gradually accept the protected area and then help elaborate the Management Plan. Without their acceptance, implementing the Plan's zoning and management programs will be impossible. Meetings and workshops discussing Apolobamba's objectives and specific goals are needed to initiate the communication. These sessions could help clarify protected area regulations and norms and could result in increased community participation.

Before effective vigilance can be achieved in this zone, additional funds must be secured to build the planned park ranger stations at Shiata and Yuyo. Lack of tourist signs and infrastructure could be resolved at a low cost with community participation. This would directly involve them with the area's management and would generate a modest but important source of temporary work.

Zoning in the lower altitudes still needs to be clearly defined. According to the director, a zone specifically reserved for agricultural use is absolutely necessary to allow the economy in this area to strengthen. However, it is extremely important to base this zoning work on a solid understanding of the area's fauna and its distribution in order to protect critical habitats and provide for important migration corridors. The barrier effect created by the Charazani-Apolo Road on certain large mammals, like the spectacled bear, could worsen and affect other species if protection measures along its course are not enforced.

## Poaching

There is no easy solution to the ongoing problem of poaching. Ideally, hunting should not be tolerated because it is prohibited by the protected area's regulations. However, the reality is much more complex than simply enforcing legal norms.

One of the major difficulties is due to the fact that bushmeat is an indispensable part of the miners' diets and to a lesser degree to the diets of the soldiers stationed in the pampa's ecological battalions because livestock are not available at these altitudes. Park rangers should establish communication with these sectors to promote changes in conduct that could help alleviate hunting pressures on Southern viscachas, deer, and aquatic birds. Yet, no matter how well intended these inhabitants may become, alternative sources of protein must be considered and studied. One potential solution is to encourage inhabitants to consume dried meat from llamas, poultry, or pork and to raise small livestock at their camps. Microcredit could be made available for this purpose (as part of the Farmer Development Fund - *Fondo de Desarrollo Campesino*, for example). Another possibility is to provide incentives for inhabitants to hunt European hares, an exotic species that has turned into a plague throughout much of the western meseta, and which is comparable in size to the Southern viscacha.

Another strategy that is a surprisingly effective way to reach certain social groups is to hire charismatic leaders from these groups as park rangers. Even though miners are organized in cooperatives independent from one another, hiring a park ranger from the mining sector would still help improve relations between miners and the protection corps.

Hunting pressure is less important in the lowlands, but it is concentrated in hunting spider



monkeys (*Ateles paniscus*), which due to their low reproductive rate (interbirth intervals of over 2 years) are particularly sensitive to hunting pressure. Because its consumption is more related to dietary preference than strict dietary needs, an awareness and environmental education campaign associated with the establishment of a rational use of bushmeat resources could reduce the impacts of hunting on the range and abundance of affected species. However, more stringent and far-ranging measures will be needed in order to protect these populations in the long-term, such as the promotion of domestic cattle-raising schemes.

Different strategies are needed to resolve problems related to hunting animals that are considered to be dangerous or damaging to crops and livestock. As was mentioned in the 'Threats' section, the spectacled bear, Andean condor, fox, puma, and Peruvian guemal are considered harmful and are targets of such hunting. When the former director assumed his role in Apolobamba IMNA, herders informed him of the need to offer compensation for alpaca lost to predation by puma. From a strictly legal point of view (damages and harm to third parties), this claim, occasionally satisfied in Europe and North America with mitigated results, is not entirely irrational. Yet providing financial compensation has several drawbacks:

Apolobamba IMNA does not have funds to implement this program and is not likely to achieve sufficient resources in the future;

Every claim would have to be examined by a field expert to demonstrate irrefutably that the damage was caused by one of the protected area's wildlife species and not some other cause;

Implementing a mechanism of economic compensation in Apolobamba could generate an increase in demands throughout the entire SNAP, making it impossible to carry out, while the SERNAP is forced to maintain a certain level of consistency in the management of protected areas with the same category designations.

The director informally mentioned the idea of establishing a very controlled sport hunting system targeting these harmful species. According to this scheme, sport hunters would pay high prices to participate and the revenues would be used to compensate rural inhabitants for damages caused by wildlife. ParksWatch does not support this idea, which implies subjecting threatened species to hunting pressure within their natural range. Instead, we suggest applying the human-animal conflict resolution project promoted by WCS in Apolobamba's valleys to communities in the western highlands most affected by this type of predation to help them reorganize pastoral practices, especially those related with herding (i.e. the presence of herders and use of herding dogs) and disease prevention measures.

Vigilance committees in the framework of the vicuña management program have brought vicuña poaching under control. Nonetheless, the vicuña fiber stored since 1998 must soon be sold and the revenues distributed in order to deter renewed vicuña poaching for financial purposes. To do this, the Vicuña Conservation and Management Act must be urgently amended to allow the sale of fiber as fabric. It seems that this task has been assigned to Conservation International, which is responsible for updating the area's Management Plan.

At the time of this writing, the PA director was seriously concerned about herders' discontent with the poor quality of their llama and alpaca wool because of scabies. It seems that incidence of scabies has increased since the vicuña conservation program was implemented. We agree with

the director that studies are needed to determine what species of *Sarcoptes* is responsible for the infections, including its transmission vector, in order to provide veterinary solutions as quick as possible. In late 2004 WCS had organized teams to take samples during the next round of vicuña capture and shearing to start this necessary research.

## Solid waste accumulation

Waste accumulates in and around almost all mining camps and communities, but it appears that raising awareness in some areas will require more effort than in others. For example, in Pelechuco the Mayor's office has continued to ignore its solid waste disposal and treatment responsibilities despite various offers of help from the area's administration and delegates from AECI as part of their Apolobamba Integrated Project (which ended in 2004).

Certain mines have had success when it comes to garbage management. In Santiago Mine, near Pelechuco, miners now systematically bury their solid waste. The difference between this mine and those that have never received any sort of technical support or extension services is compelling.

With help from the Apolobamba Integrated Project (AIP), park rangers have been trained in garbage management and awareness. The PA administration now organizes clean-up campaigns in certain communities and has for several years. They also discuss the problem during meetings with the Management Committee and local leaders, and the topic has been debated during municipal environmental planning workshops and meetings organized by WCS. As a result, significant advancements have been made, such as opening a municipal dump for Charazani and surrounding communities and incorporating the topic in environmental education courses in some schools. While these improvements are important, there is still much work to be done to eliminate all problems related with solid waste accumulation inside the area.

Garbage management and environmental education efforts that began during the AIP and other projects should be followed-up and the plastic recycling pilot project in Ucha Ucha and Curva should be continued and extended to include mining camps, which are responsible for a large share of waste production.

In order for mining communities to assume their garbage disposal responsibilities, assistance must be provided in the design of efficient collection systems and the selection of appropriate sites for establishing dumps and waste storage sites that are at safe distances from rivers, tourist attractions, and human dwellings. Special care must be taken to avoid affecting fragile ecosystems, such as wetlands and peatbogs.

Regulations should be established regarding proper garbage management by tourists and these should be communicated to visitors using signs and leaflets. Ideally, visitors would carry out all their garbage when leaving the area, but regardless there's a need for disposal bins at camping sites and a collection system to manage the residual waste. As to the periodic binational fairs, which are also an important source of waste a small fee should be collected among participants in order to fund subsequent clean-up and disposal operations.

Most important, the protection corps needs to be involved in all these activities, not only to show the interest and support of the PA administration, but to help resolve ongoing and upcoming

difficulties such as lack of resources, will, or ideas. Recycling is a way to reduce the volume of garbage produced, but is not consider it a priority due to the nature of the waste produced and the lack of recycling infrastructure in the environs of the protected area.

Until the communities have the necessary systems in place and resources to entirely assume control of their waste management, regular clean-up campaigns should continue and sanctions should be considered for those communities resisting efforts.

## Conclusion

Due to its stepwise creation process, Apolobamba IMNA faces particular management challenges linked to the unequal levels of implementation of its highland and lowland areas. While infrastructure has been successfully established and management programs initiated in the highlands (with still a lot of room for progress), the challenge now will be to introduce rational and controlled use of soils and natural resources in the lowlands, where several of the area's conservation targets are concentrated.

In order to implement Apolobamba's new Management Plan, a significantly increased budget is needed, at least until all necessary investments in infrastructure, equipment, and personnel are completed.

Pressures and threats to Apolobamba IMNA are still mostly limited in scope and have not yet produced widely detrimental effects for natural ecosystems. However, this could rapidly change if the road between Apolo and Ixiamas were built - rapidly converting the region from a remote and relatively forgotten region to a lure for immigrants. Instead of conserving the area's natural and cultural treasures, the region would spiral out of control as new inhabitants race towards development.

Successes achieved to date, from the creation of regional Management Committees with the effective participation of Municipal governments to the adoption of more sustainable agricultural and livestock grazing practices in some sectors, shows that local support for the protected area is possible as long as productive activities are supported along with the pursuit of the protected area's conservation objectives (as is the case with the Vicuña management program in the western meseta). As such, a concerted proposal should be developed as soon as possible that seeks to offer attractive, alternative economic activities to the lowland communities currently against the protected area's implementation, focusing on non-extractive uses such as ecotourism and cultural tourism and aquaculture.



**Panoramic view of the Cordillera Real, dorsal spine of the protected area. Photo: SP**

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# APPENDIX 1

## Institutional Framework of the SERNAP

### 1/ Policies

The following outlines SERNAP's political framework, which forms the basis for establishing its objectives and selecting and implementing actions directed at meeting those objectives:

- o Consolidate the SERNAP as an institution.
- o Achieve financial sustainability for protected area management.
- o Conserve biological and cultural diversity in the protected areas.
- o Strengthen public participation in protected area management.
- o Promote protected area management integration in national economic and social policies.
- o Contribute to improving the living conditions of local residents.
- o Guide personal and collective values, attitudes and practices towards protected area conservation.
- o Promote protected area integration at the international level.

### 2/ Strategic agenda

The 2003-2004 Activity Report lists the following advancements in relation to the actions outlined in the 2004-2007 strategic agenda:

- o Strengthening of public participation via co-administration agreements with associations of municipalities (*mancomunidades*) and farmer organizations.
- o Joint establishment, among all SNAP stakeholders, of an effective, efficient, and transparent management model focusing on "Parks with People".
- o Promotion and implementation of tourism strategies, policies, and activities in protected areas, with tangible benefits for local people and communities.
- o Development of a conflict management and resolution system for preventive action against emerging conflicts within the SNAP.
- o Launching of a national gap analysis to guarantee representation of the country's ecosystems within the SNAP and as a principal input for the design of its Master Plan.

- o Laying the foundations for the achievement of financial sustainability and adoption of financial management policies for donor funds or internal revenues.
- o Strengthening SERNAP's interinstitutional and intersectorial relations through establishment of crosscutting principles, policies, and strategic management plan.
- o Implementing productive uses (sustainable use of natural resources, tourism, etc.) and land titling in protected areas.

**Future work includes:**

- o Continue the prevention, management, and resolution of social conflicts related to protected areas.
- o Implement the agenda of the Constitution of the National Consultative Council as a starting point for a social pact with grassroots organizations.
- o Ensure the continuity of technical and financial support provided by such organizations as MAPZA-GTZ, GEF-World Bank, BIAP-KfW and other technical/financial aid agencies, in accordance with the SERNAP policies and strategic agenda and based on the harmonization and complementation of processes.
- o Propose and approve a Supreme Decree for the institutional reorganization of the SERNAP in accordance with the reality and conditions determining the institution's current restructuring.
- o Start the elaboration of a Master Plan for the SNAP.
- o Conclude, adjust and initiate the elaboration of Management Plans in at least eight protected areas.
- o Adjust and improve public and institutional participation mechanisms in protected area management.



## APPENDIX 2

# Objectives of Apolobamba Integrated Management Natural Area

Base legal:

D.S. N°10,070 of January 7, 1972

and D.S. N°25,652 of October 14, 2000

Apolobamba IMNA is part of the National Protected Areas System (SNAP) whose objective is “to conserve biodiversity incorporating public participation to benefit current and future generations” (D.S. N° 24.781 - Protected Areas General Regulations).

Art° 4.- Objectives of Apolobamba Integrated Management Natural Area include:

- 1.- Integrate conservation of local ecosystems and sustainable development of the area's inhabitants.
- 2.- Protect and use natural resources in a sustainable way.
- 3.- Guarantee permanence of well-conserved - almost pristine - high-Andean, representative ecosystems and essential ecological processes that are crucial for the survival of regional representative species, species of conservation priorities, threatened species, range-restricted species, and endemic species, as well as genetic resources.
- 4.- Contribute to safeguarding cultural heritage and to rescuing techniques and traditional systems of natural resource use employed by native inhabitants.
- 5.- Promote sustainable natural resource use among native inhabitants in an effort to improve their quality of life and increase benefits from conserving and managing the area.
- 6.- Promote scientific research of the region's ecosystems, high-Andean flora and fauna, and socio-economic, historical, and cultural aspects.
- 7.- Promote use and recovery of traditional technologies and systems of resource use and promote alternative practices that increase production and contribute to improving the living conditions of local inhabitants.
- 8.- Promote productive activities in zones of the National Integrated Management Natural Area that incorporate conservation and sustainable development objectives and that do not damage ecosystems or their processes.

- 9.- Provide ample opportunities for nature recreation, ecotourism, environmental interpretation, and environmental education, communication, promotion, and dissemination.
- 10.- Provide opportunities for scientific research and ecological monitoring.

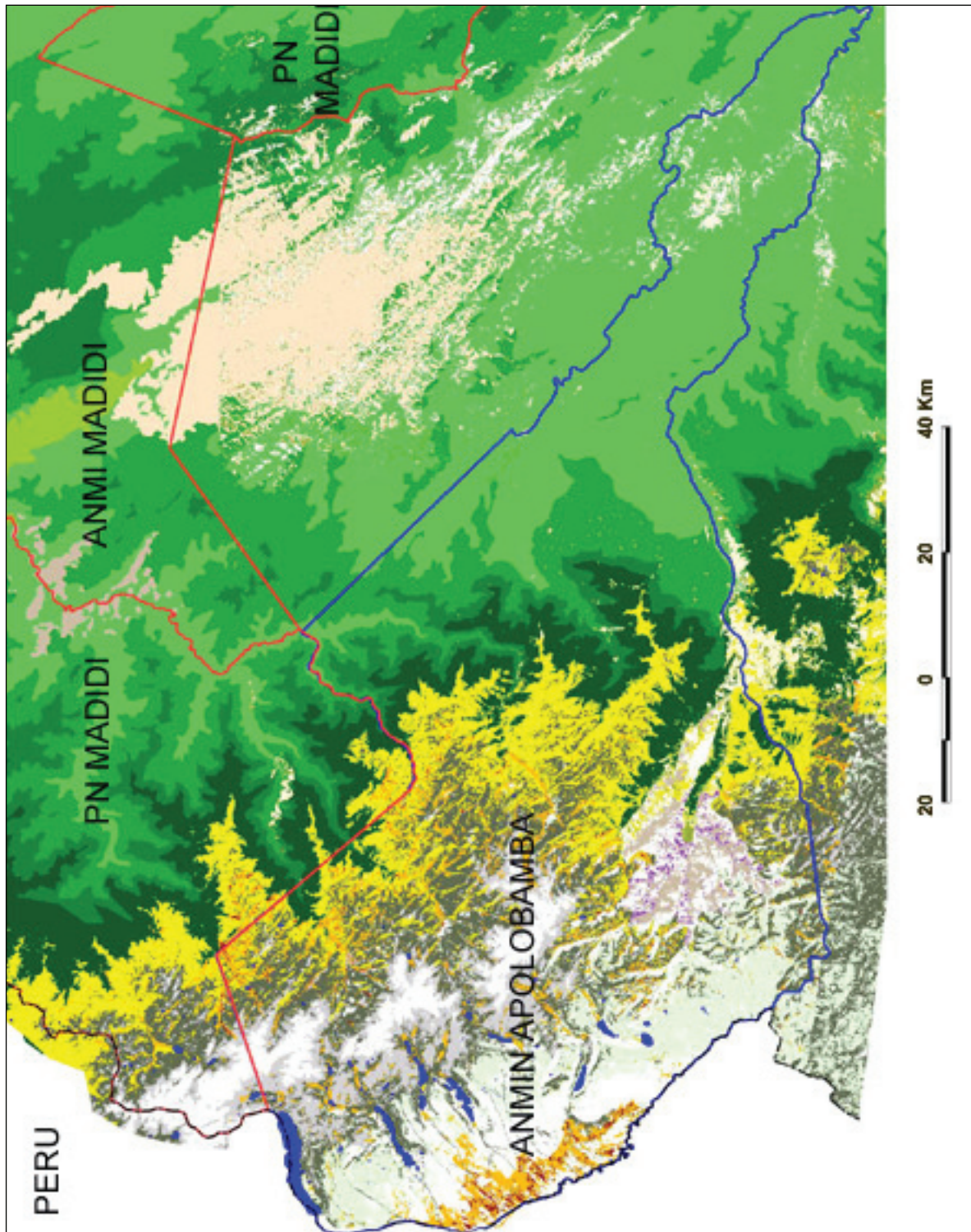
## What is an Integrated Management Natural Area?

D.S. N° 24,781, 07.31.1997

Art° 25.- The Integrated Management Natural Area (IMNA) category is meant to harmonize the conservation of biological diversity with the sustainable development of the local population. It constitutes a mosaic of land uses, including representative samples of ecoregions, biogeographic provinces, natural communities or plant and animal species of special importance, traditional land use systems, multiple-use zones, and strict protection zones (Art. 25).

# APPENDIX 3

## Vegetation map of Apolobamba IMNA



Vegetation map of Apolobamba IMNA. Source: WCS-Bolivia, 2004