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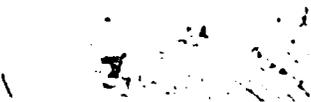
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State of the Environment
and Natural Resources

A Field Study
Executive Summary



Bolivia

State of the Environment
and Natural Resources

A Field Study

Executive Summary

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Preface

This environmental profile of Bolivia is the first field study of a series that AID is commissioning for the AID-receiving countries. In a process termed environmental profiling and similar in many ways to sector assessments, initial desk studies are followed by field reconnoissances of the kind that are reported in this document. The companion desk study titled *Draft Environmental Report on Bolivia*, was prepared for AID in June 1979, by the Library of Congress. That study is for the most part superceded by the present report, however it contains a useful and detailed compendium in English of laws and legislation concerning natural resources and the environment, which complement the present report.

The scope of work for this study was developed jointly by the AID Mission in Bolivia and the Environmental Coordinator for the Bureau for Latin America and the Caribbean. The need within the Bolivian government for a comprehensive review of the state of the environment and natural resources was anticipated, however. It is hoped that this report therefore will assist in furthering policies and actions on these fronts, as well as in orienting AID's work in Bolivia. This profile was prepared by the following persons:

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A warm vote of thanks goes to the AID Mission in Bolivia, especially to Mr. Michael Deal, Mr. Peter Bittner, and Mr. Malcolm Butler.

Table of Contents

	<i>Page</i>
List of Tables	vii
List of Figures	viii
Summary and Recommendations	x
Summary	x
Summary of Recommendations	xi
Recommendations to AID	xiii
Chapter 1 – Introduction	1-1
Objectives and Scope	1-1
Methods	1-1
General Environmental Characteristics and Problems	1-1
Chapter 2 – Wildlands and Wildlife	2-1
Introduction	2-1
Wildlife in Bolivia	2-1
Parks and Equivalent Reserves	2-5
Evaluation	2-11
Foreign Assistance and Cooperation	2-12
Recommendations	2-12
Chapter 3 – Natural Forests	3-1
Introduction	3-1
Generalized Forest Descriptions	3-1
Forests by Life Zone	3-1
Estimates of Total Area in Forest	3-5
Demands Upon Forest Lands and Resources	3-7
Forest Management	3-9
Foreign Assistance	3-12
Principal Forest Management Problems	3-13
Recommendations	3-16
Chapter 4 – Plantation Forests	4-1
The Status of Plantation Forestry	4-1
The Need for Forest Plantations	4-5
Constraints on Progress	4-6
Recommendations	4-7
Chapter 5 – Soil Erosion and Watershed Conditions	5-1
Introduction	5-1
Knowledge of the Soils Resource	5-1
Extent and Nature of Erosion	5-2
Governmental Actions to Control Erosion	5-6
Watershed Conditions and Watershed Management	5-8
Recommendations	5-9

Table of Contents (continued)

Chapter 6 – Altiplano Range	6-1
Introduction	6-1
Range Characteristics and Potential in the Altiplano	6-1
Present Situation of the Altiplano Range	6-8
Recommendations	6-9
Chapter 7 – Pollution and Health Impacts	7-1
Introduction	7-1
Institutional Framework	7-1
Principal Problems and Their Health Consequences	7-2
Recommendations	7-6
Chapter 8 – Institutional Perspective	8-1
Introduction	8-1
Institutions Concerned with Pollution	8-1
Institutions Concerned with Natural Resources	8-2
Environmental Policy and Planning Institutions	8-4
Evaluation	8-5
Acronyms	A-1
List of Persons Interviewed	B-1
Bibliography	C-1

List of Tables

<i>Table</i>		<i>Page</i>
2-1	Endangered Species in Bolivia	2-2
2-2	Primates Shipped Live to the United States from Bolivia, 1978	2-4
2-3	National Parks and Wildlife Conservation Areas	2-6
3-1	Potential Forest Lands of Bolivia	3-5
3-2	Areal Extent of Forest Vegetation Types by Departments as Determined by GEOBOL's Interpretation of Recent Satellite Images	3-6
3-3	Timber Products in Quantities Harvested and Produced and Their Values for the Year 1976	3-8
3-4	Secondary Forest Products in Quantities Harvested and Produced and Their Values for the Year 1976	3-8
3-5	Professional and Technical Forestry Personnel in Bolivia	3-10
3-6	Forest Reserves in Bolivia	3-11
4-1	Hectares of Forest Plantations Established from 1960 Through 1975	4-1
4-2	Hectares of Forest Plantations Required Annually to Meet the Demands for Wood Products	4-6
5-1	Conversion of Land System Units to Levels of Erosion Susceptibility	5-2
5-2	Evaluation of Watersheds with Hydropower Plants	5-9
6-1	Characteristics de Algunas Forrajeras-Nativas del Altiplano	6-3
6-2	Composition and Production of Three Grasses at Tiwanaku (15 year Enclosure)	6-8
7-1	Incidence of Eleven Transmissible Diseases, 1978	7-2
7-2	Levels of Sewer and Sanitation Services in 1976	7-2

List of Figures

<i>Figure</i>		<i>Page</i>
1-1	Geographic Profile of Bolivia	1-3
2-1	Organization of CDF	2-3
3-1	Diagram for the Classification of World Life Zones or Plant Formations	3-2
3-2	General Ecologic Map of Bolivia (Source: Unzueta, 1975)	3-3
3-3	National Forests, Parks, and Wildlife Reserves	3-12
3-4	Land Settlement Areas and Protected Areas	3-14
5-1	Susceptibility to Water Erosion	5-4
6-1	General Climatic Zones	6-2

**SUMMARY
&
RECOMMENDATIONS**

Summary and Recommendations

Summary

Methods and Purpose

During four weeks in September and October, 1979, a multidisciplinary team of seven experts in environmental and renewable natural resources undertook a general review in Bolivia of the following topics: wildlands and wildlife, natural forests, plantation forests, soil erosion and watershed management, high altitude range management and condition, and industrial and urban pollution and its health impacts. Individual reports were compiled and edited into the present report. The purpose of the review was to orient future efforts by AID, the Government of Bolivia and the international assistance community in environmental and natural resources work.

The Most Serious Problems Affecting Bolivia's Renewable Natural Resources

- **Soil erosion.** Eighty percent of Bolivia's farmlands and grazing areas are eroded in varying degrees. Except for a small program in Tarija, there is no work or program for combatting soil erosion and no institution charged with this task.
- **Range degradation.** In the 210,000 km² Altiplano all of the range is overgrazed and degraded, so that present productivity is as little as 10% of potential. Measurements of potential productivity vary from 6.6 mt of forage per hectare near Lake Titicaca to slightly less than 1.0 mt/ha at Patacamaya on severely eroded sites. Sheep are a major factor in range degradation; overgrazing is general.
- **Illegal settlement, hunting, and logging.** These activities are threatening the integrity of Bolivia's park and forest reserve system. Strong markets in Brazil for mahogany, and internationally for animal skins and live animals, as well as ease of circumventing laws and customs checkpoints, are major factors. Lack of coordination in MACA between the Instituto Nacional de Colonizacion and the Centro de Desarrollo Forestal, and no effective management of forest reserves and parks are also underlying problems.
- **Deforestation and destruction of woody vegetation.** Deforestation in the tropical lowlands, especially the Yungas, is destabilizing easily degraded soils and is occurring along newly constructed roads. Loss of tropical forests is relatively recent; 12,000 km² of forests are estimated to have been cut down. Approximately 560,000 km² of natural forest remains. In the Altiplano 24,700 km² of low forests have been destroyed over the centuries. Woody bushes are being cut and burned now for fuel. Reforestation efforts are in their infancy, except for relatively old plantations in Cochabamba. About 11,000 hectares of plantations, mostly eucalypts, were established by 1979.

The Most Serious Pollution and Related Health Problems

- **Water pollution.** Pollution by human wastes is associated with high incidences of gastroenteritis and typhoid fever (18,326 cases and 55 cases per 100,000 respectively). Twelve percent of the total number of deaths for all ages are related to water pollution and unsanitary conditions.
- **Pesticides pollution.** Pesticides intoxication is causing sickness and some deaths, particularly in cotton-growing areas in Santa Cruz. There is no control on the use of pesticides. Ignorance and carelessness characterize distribution and application. Measurements of pesticides in the environment or food chains have not been made.
- **Water pollution by industry.** ENAF and YPFB, the state mining and oil/gas industries, are principal polluters, according to persons interviewed. Industrial pollution has not been documented, however.

Constraints on Action

The principal constraints on solving Bolivia's principal environmental and pollution problems are:

- **Weakness of CDF.** The Centro de Desarrollo Forestal, which is charged with implementing the legislation concerning forests, wildlife and parks, is

presently a weak institution, with insufficient and inadequately trained staff, poorly executed programs, and little power relative to the importance of the resources it manages.

- **Lack of official perception of soil erosion and range degradation.** Absence of programs or even legislation aimed at these problems is testimony of a lack of awareness. There is no obvious explanation for this situation, especially since private individuals, including government employees, acknowledge the existence of soil erosion and range degradation.
- **Lack of regulations for the 1978 Health Code.** Regulations and related administrative or other measures are the next important step in controlling air, water, and land pollution. Without them authoritative programs cannot be developed.
- **Lack of a wider context for pollution control.** Emphasis on human health limits the scope of effective action and the definition of important environmental impacts which are not necessarily of immediate consequence to human health. A more

comprehensive policy for environmental protection is needed.

- **Current development strategies.** Emphasis at the national level on settling and developing the forested lowlands of the Oriente (which amount to about half the national territory), has diverted attention from the potentials of the Altiplano, which is generally considered to be overpopulated. In general, the productivity of the Oriente seems overrated and that of the Altiplano underrated, leading to the perpetuation of erosion and range degradation problems in the Altiplano and the ill-advised settlement of poor areas in the Oriente, resulting in fertility loss and invasion of weedy species. The vision that Bolivia's future is in the Oriente also weakens those who counsel conservation of forests and protection of wildlife.

Foreign Assistance

Foreign assistance concerned with Bolivia's environmental and natural resources management problems as exemplified in the table below, has been relatively modest.

Project title	Source	Total Amount (US\$)	Duration
Inventory and management of forest resources (BOL/74/031)	UNDP/FAO	\$ 699,215	1976-1979
Feasibility study of Hichukhota-Penas fisheries complex.	UNDP/FAO	9,700	1978
Programa de rehabilitacion de Tierras en el Valle de Tariá (8/BOL/C2/I)	FAO/TCP	90,000	1980
Plantacion de coniferas de crecimiento rapido (study only)	Corporacion Andino de Fomento	38,000	1977-1978
Mision Forestal Alemana	Fed. Rep. Germany	1,164,135	1973-1978
Escuela Forestal	idem	1,544,341	1978-
Saneamiento Ambiental	OMS/OPS	46,800	1975-1980
Saneamiento Ambiental	UNICEF/CIDA	1,058,000	1976-1980

Project title	Source	Total Amount	Duration
Regulation of Pirai River	Fed. Rep. Germany	708,229	1977-1980
Inundaciones (study, R. Mamore)	BID	20,000	1977-1978
Apoyo al Sistema Nacional de Desarrollo Cientifico y Tecnologico y Politicas Ambientales (BOL/79/008)	UNESCO/UNEP	168,000	1980
Manejo y conservacion de suelos en zonas aridas y semiaridas	UNDP/FAO	80,000	1979-1980*
Forest nurseries and erosion control in the La Paz Department	UNDP/FAO	150,000	1980-1982

*Pending government approval.

Additional assistance is being provided or has recently been provided as follows:

- **IDRC.** Trials in the Altiplano with forest species.
- **CIFCA.** 1979 seminar and short course on mining pollution.
- **U. of Goettingen.** \$3.0 million, 4-year project to support development of the Instituto de Ecología, affiliated with the Universidad Mayor de San Andrés.
- **OSTROM (France).** Scientific support for studies of Altiplano lakes, especially Lake Titicaca, to the Instituto de Geodinámica y Limnología (U. Mayor de San Andrés).
- **IUCN.** 1978 survey of Bolivia's parks and wildlife preserves.

Summary of Recommendations

The following recommendations are presented in greater detail in the corresponding chapters.

Renewable Natural Resources Management

Wildlands and wildlife

- Review illegal wildlife trade and find ways to enforce the Convention on International Trade in Endangered Species, to which Bolivia is a signatory.
- Train a cadre of Bolivians in the philosophy and methods of wildlands and wildlife management.
- Prepare a national plan and strategy for wildlands and wildlife management using the exercise as an in-service training opportunity. This would be a 2-year effort.
- Delineate and protect the homelands of Indian forest tribes.
- Relocate the squatters (about 70) from Isiboro-Secure National Park, north of Cochabamba.
- Initiate popular environmental education programs at the Santa Cruz Zoo (municipality of Santa Cruz) and Tarila Regional Park (La Paz Department, CORDEPAZ project).

- Study the possibility of two new parks: (1) MAB reserve linking Ulla Ulla National Park with Caquiahuaca Regional Park, and (2) Tariquia Podocarp Park.

Forest resources

- Undertake a field evaluation of GEOBOL's land capability classification for the Oriente (recently published).
- Provide 3-4 years of technical assistance to the Chore Forest Reserve facility set up by the Programa de Plantaciones Forestales and expand the facility to carry out training and research on natural forest regeneration and management as well as plantation forestry. (Combines recommendations concerning natural forest and plantation forests.)
- Technical and financial assistance to CDF for its forest plantation program. Three to four years of assistance is recommended; co-direction of the proposed PL 480/WFP reforestation project would be a major portion of the work.
- Undertake national educational campaign to promote forest plantings. Formal as well as informal means are needed for communicating information on the need for and values of trees.

Soils and watersheds

- Carry out a national survey of erosion and sedimentation. About 30 person-months of technical assistance would be required in addition to field, office, and laboratory support.
- Undertake a national education effort on soil erosion and conservation. (The outline of a curriculum was provided to the Dirección de Ciencia y Tecnología, Min. de Planificación y Coordinación Económica).
- Train technical personnel in MACA in erosion control and watershed management.
- Establish soil conservation/land rehabilitation demonstration centers in a number of communities in the Altiplano and Valleys area.
- Develop work plans for the management of two important watersheds, one in the Altiplano, and one in the Valleys (or Yungas) region.

Range resources

- Undertake practical trials in a number of ayllus in range regeneration and management.
- Carry out research and development with native forage species, with the aim of improving their productivity.
- Map the range potential of the Altiplano.
- Carry out research and development on range management and regeneration techniques.

Pollution and Health

- Reduce pesticides hazards, through the enforcement of regulations, educational programs, and improved medical services.
- Institute a program of industrial pollution control.
- Develop small-scale technological alternatives to sewage treatment and safe water in communities.
- Draft regulations for the 1978 Codigo de Salud.
- Strengthen the Instituto de Salud Ocupacional.

Other Recommendations

Comprehensive planning for environmental conservation

All the team members commented upon the need for a focused effort to develop a comprehensive plan for conserving environmental quality and natural resources. The Direccion de Ciencia y Tecnologia was about to initiate such an effort in late 1979, with assistance from UNESCO and UNEP. However, Dr. Carlos Aguirre, the director of the Direccion (who has since left this post), emphasized the desirability of undertaking well-defined, specific studies that would establish the scientific and technical bases for conservation and pollution control. The Direccion de Ciencia y Tecnologia could coordinate such studies by governmental agencies, while the Academia Boliviana de Ciencias could provide a link between government and the universities, which has not been well utilized in the past.

In essence, the informational base for comprehensive planning of environmental quality and natural

resources conservation is very weak, and must be built up by means of a number of specific actions and studies. Ultimately, also, some form of public dialogue must be undertaken in order to establish a democratic base and public acceptance for achieving goals of environmental quality and conservation of soils, forests, waters, and wildlife.

Non-governmental groups in conservation and pollution control

Non-governmental groups such as the Sociedad Boliviana de Ecologia (SOBE) in La Paz could undertake important work in surveys, research, and education, given the needed resources. SOBE's planned seminar on environmental problems in Bolivia is an example of an event that constitutes a public dialogue on these problems.

The Aymara language radio, Radio San Gabriel, located in La Paz, is another example. That radio is interested in broadcasting programs on ecology and resource conservation to its listeners throughout the Altiplano, as part of its formal and informal education program. Another radio, ACLO (Accion Loyola), broadcasts in Quechua and reaches Altiplano as well as Oriente residents.

Appropriate technology and natural resources conservation

AID support of projects which introduce appropriate technologies and of projects for natural resources conservation should be integrated to the extent possible. In the Altiplano, the reduction of grazing and cutting pressures on scant vegetation as well as the improvement of soils, could be greatly assisted by the development of alternatives to organic fuel (solar, wind). Also land use patterns that hedge against climatic vicissitudes, but also prevent innovations for resource regeneration, could be more easily modified by such introductions as home or village level greenhouses for food or cash crop production, or other changes that assure food availability.

Demonstrations at the village level of soil erosion control, range regeneration and management, and watershed management could well be fortified or integrated with appropriate technologies which ease the pressure on renewable resources.

Integration of natural resources conservation and community development

Especially in the Altiplano, community development must be the matrix for introducing measures to

renew soils and range and to conserve their productivity. A number of circumstances supports this recommendation: (1) communal ownership or cooperation in the use of farmland and rangeland; (2) the fact that resource degradation is a symptom of underdevelopment; (3) the fragmented nature of properties, largely as a hedge against climatic variability; and (4) the imperative for treatment of soils and range over continuous surfaces, dictated by physical conditions.

Recommendations to AID

The following recommendations are consistent with congressional authorizations under the Foreign Assistance Act, namely Sections 102, 103, 103b, 118 and 119, relating to assistance in institutional strengthening as well as direct assistance in environmental and natural resources, including forestry, agroforestry, soil conservation, and watershed management.

An attempt to prioritize the recommendations has not been made. The initiation of projects or actions with long term payoffs, such as planning a strategy for national wildlands conservation, or drafting regulations for the Health Code should not be delayed. Neither should efforts be delayed to resolve the very immediate problem of pesticides intoxication. Since Bolivian endorsement is, in any case, essential for the implementation of the recommendations, it is suggested that the project possibilities be ranked after a review by the Bolivian government.

1. Support the national reforestation program proposed for PL 480 funding, as outlined in a memo from the team's forest plantation consultant (October 14, 1979, David A. Harcharik to Ken Johnson, Title III Officer, AID/Bolivia).

2. Provide technical assistance in forestry as follows:

- Three to four person-years to assist CDF in executing a national forestation program, and related silvicultural work.
- Two years of technical assistance to the Programa de Plantaciones Forestales (PPF) center in the Chore Forest Reserve, to assist in the design and execution of research and education programs in forest management and agroforestry. This technical assistance could be routed through CDF who is a partner with PPF in the Chore Forest Reserve Center.

3. Provide financial and technical support through AID/Bolivia or AID/LAC/ Washington for a

wildlands and wildlife planning effort. Work would be undertaken under arrangements with World Wildlife Fund, IUCN, the University of Michigan, or the Department of Interior, who would coordinate technical expertise and provide project management. A 2-year effort would be needed, and should be designed with CDF's Departamento de Vida Silvestre and with the Departmental Development Corporations. This effort should also integrate training in wildlands management and the delineation of Indian homelands in the Oriente. A commitment at the level of the Minister in MACA is needed to obtain maximum results from this work.

4. Design a 3 or 4 year program (1) to support research and development under the auspices of IBTA on range improvement with native forage species for different kinds of range, and (2) to develop a range potential map.

5. Design and support a number of community level resources conservation and management projects, which would seek ways to regenerate and manage range land and to rehabilitate and conserve soils so as to increase their productivity. These projects could integrate AID support of appropriate technologies aimed at rural communities. Approximately 10 soil and range conservation/improvement projects are recommended for different environments in the Altiplano and the Valleys.

6. Design and support a long term (3 to 5 years) land rehabilitation and rural development project in the San Jacinto sub-watershed of the Tarija Valley, in cooperation with PERTT. Per hectare costs could be as much as \$1000, exclusive of technical assistance. Approximately 5,000 hectares need treatment. Because soils are relatively productive, reclaimed areas could be settled by small farmers. Probable construction of the San Jacinto dam and power project makes this a priority project for PERTT.

7. Support advisory services for the design of research and development in integrated pest management for cotton production, as well as horticultural crop growing.

8. Provide technical and financial assistance for educational projects or programs concerned with natural resources conservation and pollution, for different levels in both formal and informal settings, and through governmental as well as non-governmental channels. Technical assistance in project or program design is needed. A small grant project in support of non-governmental organizations working in conservation education is suggested.

An educational effort to reduce pesticides pollution and intoxication is urgently needed and should be considered

9. Provide technical assistance for the development of air and water quality standards and the preparation of regulations for the Código de Salud, of 1978.

10. Through meetings with other members of the development assistance community in Bolivia, seek to coordinate projects concerned with renewable natural resources, or which impinge indirectly upon these. Greater coordination between AID and the World Food Program in rural conservation works would be very desirable.