

**TROPICAL FORESTRY AND BIODIVERSITY CONSERVATION
IN PARAGUAY:
A REPORT TO USAID/PARAGUAY**

Final Report of a Section 118/119 Assessment
carried out under the aegis of an EPIQ II Task Order

prepared by:
Thomas M. Catterson, Team Leader/Tropical Forestry Specialist
Frank V. Fragano, Local Environmental Specialist

presented to: USAID/Paraguay

presented by: Chemonics International Inc.

Asuncion, Paraguay
November 8, 2004

ACRONYMS

CITES	Convention on the International Trade of Endangered Species
CONAM	National Environmental Council
DPNVS	National Parks and Wildlife Directorate
ENPAB	National Strategy and Action Plan for Biodiversity Conservation
FAO	Food and Agriculture Organization of the United Nations
FMB	Moises Bertoni Foundation
GEF	Global Environment Facility
IADB	Inter-American Development Bank
IEE	Initial Environmental Examination
IUCN	World Conservation Union
JICA	Japanese International Cooperation Agency
MAG	Ministry of Agriculture and Livestock
NGO	Non-governmental Organization
PiP	Parks in Peril Project
ROAM	Network of Environmental Organizations
SEAM	Secretariat of the Environment
SFN	National Forest Service
SINASIP	National Protected Areas System
SISNAM	National Environment System
TFCA	Tropical Forests Conservation Act
TNC	The Nature Conservancy
UNDP	United Nations Development Program
UNESCO	United Nations Education, Science, and Culture Organization
UNFCCC	United Nations Framework Convention on Climate Change
UPAF	Upper Parana Atlantic Forest
USAID	United States Agency for International Development
WWF	World Wildlife Fund

A. INTRODUCTION TO THE ASSESSMENT

A.1- Rationale

Sections 118 and 119 are amendments passed by the US Congress in 1987 to the Foreign Assistance Act to complement existing U.S. Agency for International Development (USAID) environmental review procedures (22CFR216). The intention of the Congress was to ensure that the potential impact of Agency programs on the conservation of tropical forests and biodiversity were properly accounted for as part of strategic planning exercises, in the case of USAID Missions, each time a new strategic plan was being prepared. The following are a brief synopsis of the regulatory language contained in each section:

Section 118- Tropical Forests: Each country development strategy or other country plan prepared by USAID shall include an analysis of (1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and (2) the extent to which the actions proposed by support by the Agency meet the needs thus identified.

Section 119- Biodiversity: Each country development or other country plan prepared by USAID shall include an analysis of (1) the actions necessary in that country to conserve biological diversity, and (2) the extent to which the actions proposed by support by the Agency meet the needs thus identified.

A.2- Objectives

It is important to bear in mind that the tropical forestry and biodiversity assessment exercise is not specifically a programming or sector-wise design effort. Rather, it is an early environmental review of the Mission's new multi-year strategy for the country, conceived with the following objectives:

- Ensure that the planned activities and investments are not likely to adversely affect tropical forestry and biodiversity.
- Explore the opportunities for program synergy among the strategic objectives that could contribute to the conservation of tropical forests and biodiversity.
- Identify other issues and opportunities related to forestry and biodiversity conservation for USAID assistance that may match the Mission's overall strategy thrust.

Following the procedures that have become part of these Section 118/119 assessments, the overall findings and recommendations will be incorporated by the Mission in the ongoing development of its strategy. This full final report of this Tropical Forestry and Biodiversity Assessment will be in the master Mission CSP files and available on request. It should be noted that this assessment does not substitute for the Initial Environmental Examination (IEE) of activities identified in the new strategy. Each SO Team will be responsible for ensuring that

such IEEs or a Request for Categorical Exclusion is conducted at the SO level for all activities funded by USAID.

A.3- Methodology

This assessment was conducted during the period October to November 2004 by a team comprised of a Team Leader-Tropical Forestry and Biodiversity Specialist and a Local Environmental Specialist in accordance with the Terms of Reference provided by the Mission (see **Annex A**). Brief biographical sketches of the team members may be seen in **Annex B**. The methodology was quite straightforward and mainly dependent on secondary sources of information. **Annex C** includes a list of the key references and documentation used by the team. **Annex D** provides a list of persons consulted during this exercise.

B. PROGRAM CONTEXT

B.1- Background on the USAID/Paraguay Program

USAID recently celebrated its 50th year supporting development in Paraguay. The assistance it has provided covers a broad spectrum of activities from infrastructure to key government institutions and civil society. In the area of environmental protection and natural resources management, USAID has played a leading role that continues to this day.

The present report on tropical forests and biodiversity has been prepared almost 20 years after the first seminal document highlighting environmental issues was published by USAID in 1985, the *Environmental Profile of Paraguay*. The profile continues to be useful as a baseline for comparison and it focused investments by USAID and other US Government agencies that have helped maintain tropical forests and biodiversity to this day and for future generations.

The Outlook for the Year 2011

“Paraguayan development as it now stands, the natural resource potential, and prevailing socio-economic policy all suggest that significant environmental changes will occur. The increasing exploitation of nature by man will lead to imbalances in the ecosystem and the environment, imbalances which are not yet of alarming proportions, but which will have irreversible consequences if current trends continue.”

USAID Environmental Profile of Paraguay, 1985

USAID/Paraguay has taken a two-pronged approach over the past two decades with respect to environment that has been complementary to its focus on strengthening a participatory democracy. This approach has strengthened the network of national NGOs in the fields of conservation and sustainable development through programs that have focused on the conservation of natural resources and biodiversity. In 1985 only one national civil society NGO was cited in the *Environmental Profile*. A national list of NGOs shows some 20 environmental NGOs working in Paraguay. Several of these have been supported by USAID in some measure over the years or through its partner US-PVOs such as The Nature Conservancy, World Wildlife Fund, and Conservation International.

Important programs have included the support of the creation of one of the largest and best secured protected areas in the Alto Paraná Atlantic Forest Ecoregion, the Mbaracayú Natural Forest Reserve managed by the Fundación Moisés Bertoni. The first National Environmental Education initiative, the concepts of Private Reserves and decentralization of environmental management were pioneered by USAID/Paraguay programs throughout the 1990's leading to the main streaming of these issues in Public Sector programs and national environmental policy.

B.2- USAID/Paraguay Strategic Plan FY 2001-2005

The Strategic Objectives are:

- Key Democratic Governance Practices Instituted
- Management of Globally Important Ecoregions Improved
- Use of Voluntary Reproductive Health Services Increased
- Increased Incomes for the Poor in Selected Economic Regions

The program has focused over the present period on three ecoregional areas as defined in the SO; the Chaco dry forests, the Pantanal wetlands, the Upper Paraná Atlantic Forests (UPAF), considered one of the “hotspots” of global conservation priorities. Two of the ecoregions, the Chaco and Pantanal, continue to offer significant areas for conservation efforts in the form of national parks and other large-scale initiatives. On the other hand the most threatened and biodiverse ecoregion, the UPAF, is highly fragmented and harbors the greatest numbers of endangered species.

Upper Paraná Atlantic Forest

This program has supported efforts of World Wildlife Fund to establish a *Biological Vision* in this ecoregion that is shared by Brazil, Argentina, and Paraguay. The *Vision* has successfully established itself in both the conservation community through a participatory process developing the vision over the last decade. In the community at large, a mass media campaign has elevated the recognition of the forest and its importance to 50% from a baseline of 5% recognition nationwide. On-ground implementation of the *Vision* includes strengthening local NGOs, management committee support in the San Rafael Managed Resources Reserve, and efforts by public officials to prosecute illegal logging and environmental degradation.

Through a contract awarded to the local NGO, *Instituto de Derecho y Economía Ambiental* (IDEA), USAID/Paraguay is supporting implementation of the *Biological Vision* in the Northern Block (northeastern Paraguay) which has the remaining most important blocks of forest with the least percentage of public protected areas. The program is focused on local government strengthening for environmental management, strengthening of the Secretary of Environment's decentralization efforts in this sense as well as support for the few public protected areas in the region and consolidation of new ones.

Pantanal

The Nature Conservancy has partnered with USAID in the consolidation of a Chaco-Pantanal corridor. Efforts have focused on creation of conservation corridors between large blocks of National Parks in the northern Chaco. River communities including indigenous groups in the

ecoregion have been supported through this program to develop handicrafts and other community development projects linked in part to a large private reserve effort in the region.

Chaco

A Cooperative Agreement with *Fundación para el Desarrollo Sostenible del Chaco* (Desdel Chaco) has strengthened local governments, achieved listing of wetlands of international importance and established conservation groups with local communities in the ecoregion. Support for the Defensores del Chaco National Park through the Parks-in-Peril program has helped in conserving the largest park in Paraguay (780,000 hectares). Desdel Chaco has become in the few years of support by USAID and other donors such as AVINA Foundation, the most important conservation NGO in the Paraguayan portion of the ecoregion and an influential player in the three countries that share the Chaco (Bolivia, Argentina, and Paraguay).

B.3- USAID/Paraguay’s Proposed Overall Strategic Plan 2006 - 2011

The paper reflects the Mission’s conviction that both the reformist intentions as well as the legitimate achievements of the present government deserve continuing support. Accordingly, USAID/Paraguay’s plans for the next strategy period focus on consolidating the gains made in terms of overcoming the deep rooted issues of corruption, ineffective government and an undiversified economy during the present program (USAID 2004). It’s vision statement for the next period is:

“Reforming the System: Bottom-Up, Sustainable Development and Deepening of Democratic Culture”

It is also therefore not surprising that USAID envisages the Democracy program as “central to the Mission’s overall strategic plan” while at the same time providing “strategic orientation and pragmatic complementarities” to the other three proposed SO objective areas– economic growth, health and the environment (ibid). They intend to support the reformist trends by changing the political system from within creating incentives that reward transparency, accountability and good governance. Trade based diversification will be the hallmark of the efforts to foster economic growth while building alliances and constituencies in the areas of health and environment will further reinforce the results expected in decentralization and strengthened local governments. The new strategy features four Strategic Objectives, illustrated below with an indication of the illustrative activities each may undertake.

526-008: Corruption Reduced and Good Governance Improved in Key Sectors	526-009: Employment Generated through Diversification of Markets and Products	526-010: Health Coverage for the Underserved Population Improved	526-011: Management of Globally Important Eco-Regions Improved
— illustrative activities —			

➤ Anticorruption	➤ Trade	➤ Reproductive Health/Family Planning	➤ National Policy
➤ Governance	➤ Business Environment	➤ Child Survival & Maternal Health	➤ Local Regulation and Enforcement
➤ Rule of Law	➤ Inclusion	➤ HIV/AIDS	
➤ Party Reform			

B.4- Current Programming Efforts in the Environment Sector

A mid-term review of past investments by USAID in the environment sector in Paraguay concluded that its achievements were significant given the modest amount of resources invested (Bullen et al, 2004). Clearly, the most notable of these achievements are those related to strengthening local environment NGO capabilities. USAID is the only one of the donors active in the sector which has been able to work at this level and now has a close working relationship with the local NGO community that has been responsible, with USAID support, for the implementing effective programs supporting protected areas in the country. Despite these achievements, USAID and many others active in the environment sector recognize that Paraguay's unique forests and biodiversity assets are still under constant pressure from deforestation, mainly for land-use conversion and that the Government agencies mandated to manage the sector remain extremely weak.

USAID plans to continue its programmatic activities in the environment sector with a strategic focus on conservation. The Strategic Objective: Management of Globally Important Ecoregions Improved will be addressed through two intermediate results areas which are further described below. Program attention will be further focused in that USAID will limit its investments to only two of the principal ecoregions: the Dry Chaco and the Upper Atlantic Forests. Work in the Pantanal will be discontinued for a number of reasons: small portion of the Pantanal found in Paraguay, existing conservation efforts by private forces already cover a significant portion (70 thousand hectares) of the ecoregion and the fact that other donors and international organizations are active in the ecoregion.

IR 1- Effective national environmental policy implemented and regulatory framework to consolidate protected areas strengthened: Activities in this area will continue to support efforts to ensure the legal definition for designated protected areas and encourage innovative arrangements for conservation and management including both the NGO community and the private sector. Despite the very effective efforts of NGOs and the private sector (large landowners) in protecting wild areas designated as part of the national protected area system, the Government of Paraguay has as yet to officially sanction such arrangements. Similarly, USAID's investments will be targeted at practical steps to implementing national conservation imperatives including technical and legal assistance, increased public awareness of environmental issues, management plan formulation and training of conservation personnel. Importantly, USAID will support local efforts to acquire critical habitat areas for the establishment or expansion of additional protected areas and the corridors linking them. A possible debt-for-nature arrangement under the Tropical Forest Conservation Act (TFCA) will provide USAID and the Embassy with a forum and possible mechanism to convince the Government to create the national environment fund that could provide stable financial resources for biodiversity protection and conservation.

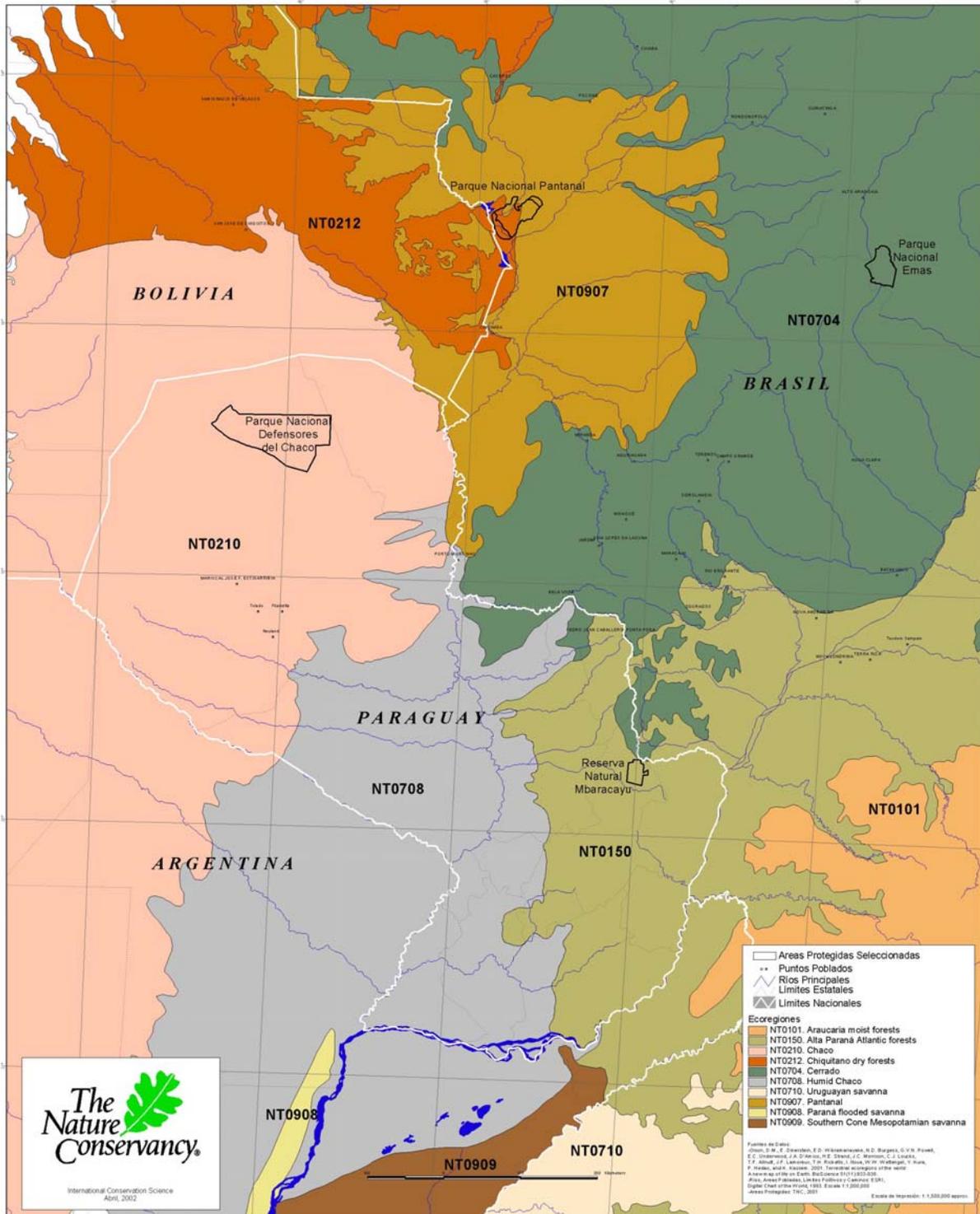
IR 2- Local environmental regulatory and enforcement models developed and implemented in priority areas: Building on its engagement through the Democracy and Governance SO, USAID will also focus these efforts to assist municipal and departmental governments to play a more proactive and localized role in conserving protected areas and promoting more sustainable natural resources management efforts within their territorial jurisdictions. In order to enable local governments to understand the implications of sustainable environmental development, USAID resources will be employed to encourage land-use surveys and zoning plans to protect their constituencies from ill-conceived, short-term profit taking which has been typical of the entrenched patronage system. Citizen participation at the municipal and departmental levels in the identification and solution of local environmental issues will also be supported providing practical and tangible results of a growing conservation constituency. Finally, USAID has signaled their intention to work with the National Environment Secretariat to encourage citizen participation at the national, local and community levels in the enforcement of existing environmental regulations.

B.5- Environmental Setting

The Republic of Paraguay is a relatively small country with a total area of approximately 406,752 km² (40.6 million hectares) and a population recently estimated at about 5.2 million people. Landlocked and surrounded by Brasil, Bolivia and Argentina, it still has access to the sea along the great Paraguay and Parana Rivers. On the whole, it is a relatively flat country with no real highlands (nothing over 800 masl).

The Paraguay River divides the country into two very different geographic regions. The Western Region, also known as the Chaco, has a total area of about 246,925 km² (61% of the national territory) and very low population density (0.52 inhabitants/km²) or only 3% of the total population. The Eastern Region on the other hand covers approximately 159,827 km² (39% of

Paraguay, Brasil y Bolivia: Ecorregiones



Fuentes de Datos:
 Jones, K. B., P. Brachmann, E. D. Williams-Landin, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. S. Soares, H. E. Storch, J. C. Morrison, C. J. Lovell, T. P. Albert, J. P. Lamberson, T. M. Anderson, J. D. D. Stewart, V. K. Van, P. M. de, and M. Kassem. 2001. Terrestrial ecoregions of the world: A new global map on Earth. *Biodiversity* 1(1): 33-46.
 Atlas de los Países Límites y Cuenca del Río.
 Digital Chart of the World, 1993. Scale: 1:500,000.
 Atlas Geográfico TNC, 2001. Escala de Imprimir: 1:1,000,000 approx.

the national territory) and is home to the remaining 97% of the population with an average population density of 31.6/km² (Gonzalez 2002).

These geographic distinctions are matched by significantly different ecological conditions. In the Western Region or Occidente, the Chaco is a relatively flat alluvial plane that gets less rainfall, ranging from semi-arid in the northwest (400 mm average rainfall) to sub-humid (1200mm average rainfall along the Paraguay River in the south central part of the country). In the Eastern Region (or Region Oriental), the topography is more broken with some hilly formations, many water courses and an average rainfall of 1200 to 1800 mm.

Five ecoregions are generally reported for Paraguay (Dinnerstein, 1995, Guyra, 2004) As illustrated by the following map, (see Map No. B-1), Paraguay is made up of five major ecoregions: the Chaco, the Humid Chaco, Pantanal, Cerrado, and the Atlantic Forests of the Alta Parana. In addition there is some evidence of the presence of Chiquitano Forests and Mesopotamia Savannah in different regions of the country as studies improve the state of ecosystem knowledge. The country is thus a ecological crossroads with a resulting interesting array of biodiversity. Published up-to-date data and information on land capability and actual land-use are not available but some recent studies provide an idea of situation.

The table (No. B.2) presented below provides some data from different studies of land capability and land-use in Paraguay.¹

While these figures in the table below contain some irreconcilable differences, they do underscore the importance of taking into account the basic premise of sound natural resources management, that of matching land use to land capability as an important part of the approach to sustainable development. Similarly, they do not capture recent land-use changes which have come about as part of the dramatic expansion of soybean cultivation in the country which has been achieved largely at the expense of clearing previously forested land.

A recent study proposing a moratorium on land clearing for the expansion of the agricultural frontier in Eastern Paraguay provides a synopsis of the evolution of land clearing there (Facetti et al 2003). In 1945, 55% or 8.79 million hectares of the total land area (15.982 million hectares) in the Eastern Region was still covered by forests. Twenty years later, 1.763 million hectares were cleared for agriculture, reducing forest cover to approximately 44%. During the seventies and as a result of major road projects which opened up more of the East, another 1.55 million hectares of forest were cleared for agriculture further reducing forest cover to 34%. The authors characterize the 1980s as the decade of the “green revolution” in Eastern Paraguay during which another 2.0 million hectares of forests were cleared for agriculture, leaving less than 25% forest cover.

¹ One of the recurrent difficulties for those interested in the natural resources sector in Paraguay is an erratic database with any number of contradictions that cannot be resolved by the reader dependent on secondary sources. Some of this data is being spread by other authors who use it, sometimes without citing the source, thus compounding the issue.

Table No. B.2- Land Capability and Land-Use Studies in Paraguay

Land Capability Map for Eastern Paraguay- Universidad Nacional de Asuncion, 1983.			FAO World Soils Map, Paraguay Portion, 1994.	FAO Agro-Ecological Zoning Project, 1999. (Eastern Paraguay)
Class	Hectare	%	<p><u>Eastern Paraguay:</u></p> <ul style="list-style-type: none"> - agricultural use - 47% - livestock use - 16% - forest production - 37% <p><u>Western Paraguay:</u></p> <ul style="list-style-type: none"> - agricultural use - 10% - livestock use - 71.2 % - forest production - 18.3 	<p>Actual Land Use:</p> <ul style="list-style-type: none"> - land with annual and permanent agriculture - 2247553 has. - land used for livestock purposes - 7419958 has. - land used in different forest management systems, including production, conservation and protection - 1676812 has.
I	1875	0.01		
II	4410250	27.5		
III	1884730	11.78		
IV	3735275	23.36		
V	4346625	27.18		
VI	961375	6.01		
VII	555000	3.47		
VIII	93045	0.69		
Total	15988275	100.		

Despite growing recognition of the phenomena of deforestation in the country and considerable efforts to reverse the process and contain the losses of forest and its attendant problem of soil erosion, Paraguay would enter the new century as the country with the highest rate of deforestation in Latin America. As the authors also point out, current studies offer a range of suppositions about the remaining total forest cover in Eastern Paraguay from 1.3 to 2.9 million hectares (8 – 18%). These same authors also acknowledge, as do many others, that the forest cover of Eastern Paraguay has now been highly degraded and fragmented, undermining the potential for sound management of the forest resources of the region and threatening its unique biodiversity assets (ibid).

C. LEGISLATIVE AND INSTITUTIONAL FRAMEWORK AFFECTING BIOLOGICAL RESOURCES

C.1- Sector Policy and Legislation

The Paraguayan Constitution of 1992 sets the stage for the development over the next 10 years of a more modern framework of environmental laws. The constitution refers to the environment specifically in three articles (6, 7 and 8). These articles establish an “ecologically balanced” and health environment as a basic right. It also establishes the need to protect resources from degradation and pollution. The principle of restoration and compensation for environmental crimes is also firmly grounded in article 8.

Paraguay has not traditionally derived its legislation in the environment sector from established national policy documents. Following the creation of the Undersecretary for Environment and Natural Resources in the Ministry of Agriculture of Paraguay in 1989, two documents in 1992 can be considered the first policy documents to have been presented by the Paraguayan

Government in this sector, one regarding natural resources conservation and the other regarding biodiversity. Their effects were limited but set the tone for the following years to make important advances in the promulgation of environmental laws, strategic plans, environmental protection programs and institutional strengthening in the sector.

Following the UN Conference on Environment and Development in Rio (1992), Paraguay embarked upon a broad, participatory, consensus building exercise in 1994, with support from the German Development Agency (GTZ). This exercise resulted in 1996 in Sector Guidelines for a National Policy in Environment and Natural Resources. It also generated a National Strategy for Protection of Natural Resources and Environment that included a proposal for the National Environmental Policy and a proposed law for a National Environmental System (SISNAM) composed of a National Environmental Council (CONAM, a consultative policy entity) and the Ministry of Environment (regulatory institution).

The policy was never formally adopted, possibly due to the overall government instability throughout the 1997-2003 period, however, the process set the basis for the creation of the SISNAM in 2000 including the Secretariat (rather than Ministry) of the Environment and a CONAM. Efforts over the last few years to establish policy in sectors such as forests and wetlands have produced mixed results or general documents that have not served as guidance for programmatic and legislative action and reform in the environment sector.

A major milestone was achieved in 2003 with the finalization and presentation of the National Biodiversity Strategy (ENPAB). This document provides the overall guidelines and priority areas for intervention in biodiversity. More recently, in the last week of October 2004, the CONAM approved the first National Environmental Policy document. The overall document was approved by the CONAM members but they now must go through it in detail for final approval of specific sections. This is a positive milestone to have reached after over 10 years of debate regarding a national policy document.

Two early laws however have had great impact on the pattern of natural resources destruction over the last 50 years. The Agrarian Statute of 1963 and the Forest Law of 1973 provided perverse incentives for the destruction of millions of hectares of forest in Paraguay. The first established that “unproductive land” (i.e. forests) were subject to expropriation for agrarian reform. This provided the incentive to owners of large forests to clear land and put them under “productive use” once democracy allowed small farmers to claim and invade them seeking expropriation. This law has been reformed over the last years and the incentives for deforestation removed.

The Forest Law also opened the door to forest destruction by leaving open the possibility to transfer the legal forest reserves (25% of any forested property) to other people which could then deforest them by 75%. At present, instead of 25% forest cover in the Eastern Region of Paraguay the levels are under 10% as a consequence of this loophole. Multiple proposals for reform of this law have been presented over the years and the Congress is presently studying several of them that primarily focus on reform of the Forestry Service.

Most of the more important laws in the sector including those that incorporate most of the international conventions have been promulgated in the 1990's. Table No. C.-1 provides details on the legislation and decrees that are relevant to the forest and biodiversity sector. In Paraguay, as is the case with many developing countries, the laws provide a broad basis for management and protection of natural resources, however enforcement and effective government programs are the major hindrance to achieving this. Some important gaps persist given that Paraguay does not have legislation regarding water resources (presently being studied by Congress) or land use planning which many consider to be key in achieving balance in the utilization of soil and water resources and protection of ecosystems including forests and wetlands in Paraguay.

Table No. C.-1– Major Sector Related Laws and Legislation

Law	Number	Year
Forestry Law	422	1973
Wildlife Law	96	1992
Environmental Impact Law	294	1993
Protected Areas Law	352	1994
UNFCCC and Kyoto	251	1994/1999
Defense of Natural Resources	515	1994
Environmental Crimes Law	716	1995
Forestation and Reforestation Law	536	1995
Biodiversity Law (CBD)		
Creation of SISNAM	1561	2000
Biosecurity		

C.2- Government of Paraguay Institutions

The current President, Dr. Nicanor Duarte Frutos, was inaugurated as President in August 2003. The program he presented has included protection of the environment as one of 14 programmatic themes for his term. Although the sector started out with much instability, (including three changes of the Secretary of Environment), the last six months have shown a marked improvement in the profile of the main institution. The new focus has been on decentralization of environmental management and a focus on deforestation, particularly in the Eastern Region of Paraguay. The new minister has achieved reinstatement of Medanos del Chaco National Park (over 400 thousand hectares of fragile Chaco dune ecosystem) and presented Congress with a deforestation moratorium law (now passed by both houses of Congress and with the President for approval or veto).

The budget of the Secretariat of Environment is smaller than that of several national NGOs, at around US\$ 1 million per year but most of the funding is dedicated to salaries for over 200 public employees most of which reside and work in the Capital. The Secretariat has authority with regard to environmental impact statements, protected areas, biodiversity and wildlife management among its many tasks.

The General Directorate of Biodiversity Conservation and Protection of SEAM makes due with a minimal staff and a budget of less than US\$200 thousand per year for management of the protected areas (over 2 million hectares) and wildlife management and research. Four offices manage the different aspects related to biodiversity: the Conservation Data Center manages

information and does ecosystem level analysis; the Directorate of Protected Areas manages the protected areas system; the Wildlife Directorate manages all wildlife trade and use issues as well as leads research for the management; the Museum of Natural History carries out taxonomic research regarding Paraguayan flora and fauna and houses the collections.

Parks of great importance for protection of biodiversity such as Defensores del Chaco National Park (720 thousand hectares) currently has only 3 park guards. Wildlife management is in a critical state given the lack of officers (less than 10 technical staff for the country), vehicles and equipment. Based on this dire situation the country notified CITES of a self-declared moratorium in 2003 on wildlife exports until the situation can be stabilized and managed properly. The present leadership of SEAM is not in favor of reopening the export trade in the near future.

The National Forestry Service was not included among the environmental institutions incorporated into the Secretariat of the Environment in 2000. This has created a complex situation for both the management and the conservation of forest resources. The Secretariat of Environment has affirmed its authority over Environmental Impact Statements and hence over land-use while the Forestry Service continues to play a role in authorizing “management plans” and control of the movement of wood throughout the country. There is little or no coordination between the institutions based on a common policy for the sector. Little more than an increase in bureaucracy has been achieved with these somewhat equal and opposing forces within the GOP.

The National Forestry Service (SFN) was set up as a result of the Forestry Law (No. 422/73) with the general mission of protection, conservation, expansion, rehabilitation and the rational use of the natural and artificial forests of the country. Three major programs were incorporated into its institutional mandate: research and extension, promotion of reforestation, and promotion and fiscal responsibility for the management of the natural forests. To carry out this mandate, the SFN is divided into four departments: the Forest Management Department, to carry out the survey of forest resources, the approval and monitoring of forest management plans and permitting related to the extraction and transport of forest products; the Reforestation Department is expected to review and approve reforestation plans and monitor their implementation; the Department of Education, Extension and Research is supposed to train the middle cadre of the organization, carry out research on forestry related subjects and provide extension services on forestry technology and know-how; and the Administrative Department which is responsible for the day to day management of the Service.

There are ten decentralized offices of the SFN, found in the following departments; Amambay, Canindeyu, San Pedro, Concepcion, Caaguazu, Alto Parana, Itapua, Caazapa, Central and Chaco (n.b., this is the only decentralized office of the SFN in the Chaco, currently located in Filadefia). Total staffing of the SFN is approximately 250 individuals. A 2002 study of the SFN identified a series of institutional shortcomings including a low level of autonomy in decision-making, the lack of systematic planning and monitoring, and insufficient financial and human resources. These weaknesses along with an abiding reputation as a corrupt institution perhaps account for the fact that during the last 30 years of its existence, deforestation and degradation of the forest resources base has reached unprecedented levels.

C.3- Non-Governmental Organizations

Paraguay now has a relatively strong and vibrant group of non-governmental organizations (NGOs) that have flourished over the years thanks to important support from USAID and other public and private donors around the world. Having recognized the need to conserve globally important biodiversity and participation by civil society, US-based international NGOs such as The Nature Conservancy, World Wildlife Fund and more recently Conservation International have partnered with Paraguayan conservation organizations over the years to protect the various ecoregions which characterize and contain the important biodiversity assets of Paraguay.

International NGOs

The Nature Conservancy (TNC) with support from the US Government was catalytic in launching the conservation NGO sector in Paraguay. Its first initiatives were with the Conservation Data Center in the Ministry of Agriculture in the late 1980's, resulting in 1993 with the Master Plan for Protected Areas (SINASIP) that continues to be the guiding document for protected areas to-date. TNC continues to support conservation in the Chaco, Pantanal, and Atlantic Forest Ecoregions as well as regional programs that have transboundary approaches and effects. It has supported both public and private reserves with support from USAID/Paraguay and through the Latin American programs of USAID.

World Wildlife Fund (WWF) has established itself more recently in Paraguay focusing entirely on the UPAF ecoregion. It has worked with USAID funding on several initiatives, primarily on developing a biological vision for the Eastern Region of Paraguay but also including environmental education and recently a "social pact" seeking to generate a consensus to stop deforestation with participation of the GOP, private sector and NGOs.

Conservation International (CI) has a few programs in the UPAF ecoregion, concentrating mostly on the Brazilian coastal sector of the Atlantic Forest. However, some important initiatives have been supported through CI including important biological surveys of the Pantanal and Cerrado habitat.

National NGOs

Based on that experience, the Moisés Bertoni Foundation (FMB) was founded in 1988 with seed money provided by USAID. This NGO helped establish and continues to manage the Mbaracayu Forest Nature Reserve—the best protected reserve in Paraguay's Upper Parana Atlantic Forest. Designated a Biosphere Reserve recognized by UNESCO in 2000, it is sustained financially by a trust fund that provides the needed resources for basic protection of the reserve.

The oldest organization among the conservation and sustainable development NGOs and presently one of the largest is Alter Vida. It has focused primarily on the Atlantic Forest Region in Central Paraguay mainly around the Ybytyruzu Managed Resources Reserve. It has traditionally been in the forefront of incorporating human development into conservation initiatives. It has also worked closely with municipalities in Paraguay.

Guyra Paraguay is a national partner of the worldwide BirdLife network (represented in the US by the Audubon Society). Although it is focused on conservation of avian diversity, it was founded to support consolidation of the San Rafael Managed Resource Reserve. This organization has successfully obtained support from national and international donors to purchase a portion of San Rafael Reserve for conservation.

Sobrevivencia is a national NGO that has had most success in the oversight of impacts of multilateral development projects—in particular those funded by the World Bank and the Interamerican Development Bank. They were awarded the prestigious Goldman Environmental Award for their work with the population affected by the Yacyreta Dam in southern Paraguay. They are active on several worldwide networks that represent civil society in meetings of international environmental conventions.

Many other small and local environmental organizations have been established and many are networked to the national and international level. Financial sustainability is an important issue for these local initiatives that ebb and flow primarily based on external resources given that little can be generated in poor communities in the interior of Paraguay.

There has been long-standing tension between the conservation NGOs and the government environmental managers ranging from open hostility to working independently of each others initiatives. In particular, regarding the issue of private reserves and co-management, there has not been much advancement in the last 10 years since the promulgation of the Protected Areas Law. NGO initiatives to establish easements have met with limited success and the government has formally approved (by decree) less than a half-dozen private reserves over the last decade.

A problem within the NGO sector recently has been the lack of consensus and capacity to articulate and fund national campaigns in regard to environmental issues such as deforestation, pollution and pesticides. In recent years, an important group of environmental NGOs splintered off the Environmental Organizations Network (ROAM) and created Alianza para el Desarrollo Sostenible (ALIDES). Under the umbrella of international groups like WWF, they have been having some success in bringing attention to the plight of the Atlantic Forest.

Civil society participation continues to play an important role and it is expected that greater interaction with the public sector will allow more widespread replication of its successful models. Overcoming the hindrances, both legal and political, to public-private partnerships is a key for advancing in the sector.

C.4- Role of the Private Sector

The private sector has been involved for many years in the tropical forests and biodiversity sector. The SINASIP incorporated the concept of private reserves in the 1992 law and included incentives for conservation. The implementation has been slow and interested landowners are sometimes overwhelmed by the governmental requirements and costs associated with non-governmental initiatives.

Paraguay is an important exporter of certified organic sugar. This success has stimulated interest from other sectors in exporting products from native biodiversity including medicinal herbs and teas. Tourism has also met with interest from the public and private sector over the last two years. Training and events in the Concepcion and Alto Paraguay (Cerrado and Pantanal ecoregions) supported by USAID and the GEF Wildlands Project have stimulated awareness by local governments and creation of some local tour circuits and guide services. FMB has associated with a large wholesale tour operator in Paraguay to offer nature tourism in the Mbaracayu Nature Reserve. These alliances with the private sector offer interesting potential and help overcome difficulties with NGOs operating for-profit businesses.

The link to biodiversity of private initiatives has been weak in general. The idea of incorporating the benefits to biodiversity of private sector commercial activities is still implicit rather than explicit in the marketing of these products. Most NGO funded programs have done little to document the benefits to biodiversity of the production and harvesting of the products related to forests and natural ecosystems. One exception is the production of Yerba Mate tea (*Ilex paraguariensis*) marketed in the US under the Guayaki brand name and associated with sustainable production of palm hearts in UPAF. The property associated with this product has been extensively studied for its biological value although the economic/commercial model used for production has not been well documented for potential replication and dissemination.

C.5- Bilateral, International Organizations and Multilateral Financial Institutions

Historically the donor community has played an important part in the management and protection of tropical forests and biodiversity. Some of the first initiatives in the national parks were supported by the Food and Agriculture Organization of the United Nations (FAO). While not specifically a donor agency, the U.S. Peace Corps helped established the Museum of Natural History of Paraguay with the support of many highly motivated and specialized volunteers in the 1980's.

The donor community continues to play an important part in the support of environmental protection. The major donors in the sector of tropical forests and biodiversity throughout the years have been GTZ (German Technical Cooperation), Japanese International Cooperation Agency (JICA), UNDP (primarily through the Global Environment Facility), FAO, European Union and USAID. The French GEF and World Bank GEF window has provided important resources for the Fundación Moisés Bertoni to work in the Mbaracayú Biosphere Reserve. The primary donors in forestry have been FAO, GTZ and JICA while the leaders in biodiversity have been primarily USAID and UNDP.

The natural resources and environment sector is the third priority for donors overall, receiving the most funding from bilateral donors after poverty reduction and democratic strengthening programs in Paraguay (STP 2003).

The international environmental conventions (generally through GEF funding mechanisms) also provide important support for issues such as the implementation of national action plans and strategies for compliance. Most recently, the National Biodiversity Strategy has provided an important guidance document for the sector.

The multilateral financial institutions are an important source of funding for environmental initiatives including biodiversity conservation. Presently the IADB is supporting an institutional strengthening program for the SEAM. The program has had many problems in execution given the instability in the institution since its creation however after a reengineering process and new leadership in SEAM it is hoped that the program will advance in the near future.

Investments in protected areas have primarily been made through mitigation programs linked to infrastructure development projects since the early 1990's. Several rural development projects and road projects have included land purchases for protected areas and park infrastructure as part of mitigation programs.

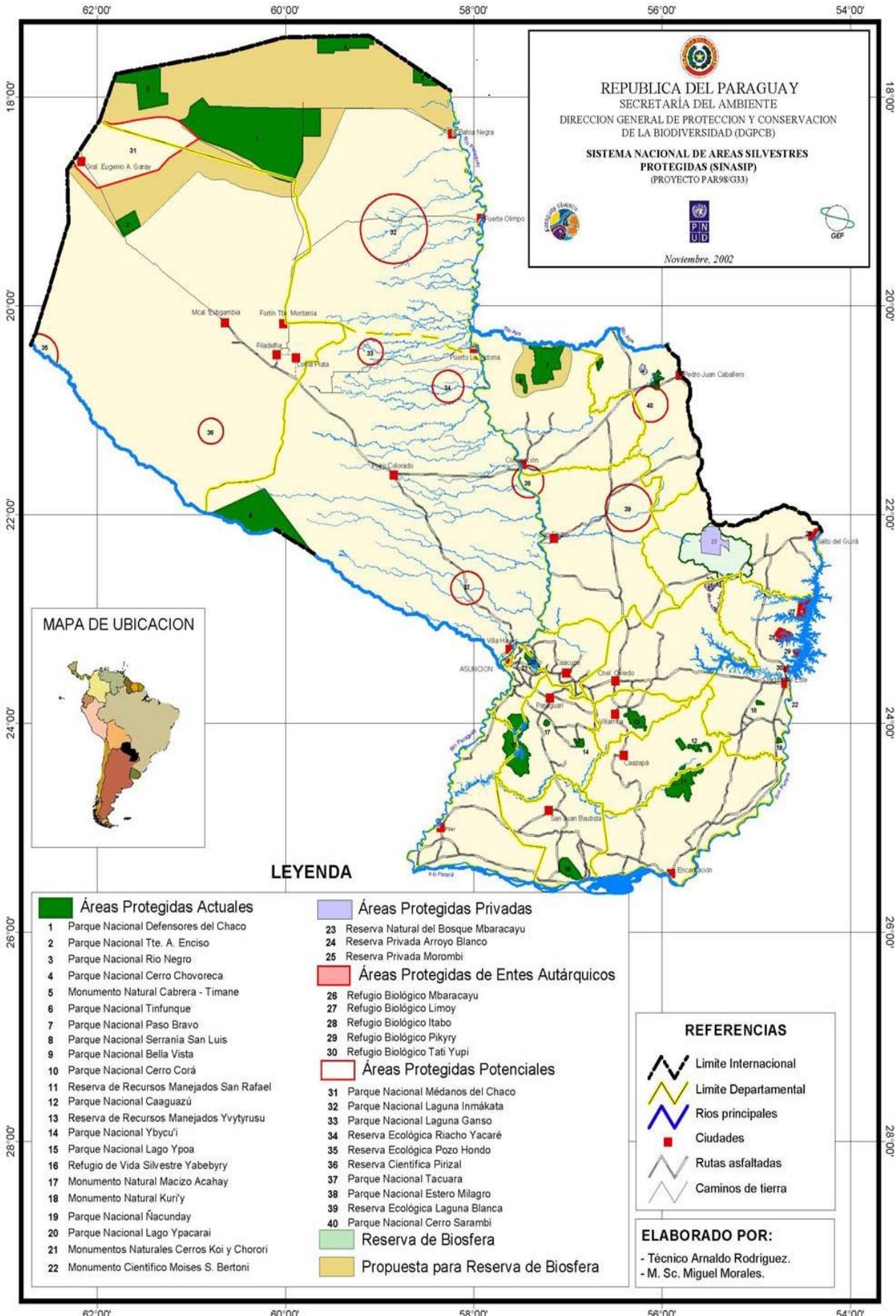
D. STATUS AND MANAGEMENT OF PROTECTED AREAS AND ENDANGERED SPECIES

D.1- An Overview of the Protected Area System

In 1948, Paraguay established its first reserve near the city of Asuncion. The first "national park", however, was created in 1966 in the humid Chaco in order to protect wildlife (Parque Nacional Tinfunque). In the following two decades, six more parks were created by law or decree, generally under the tutelage of the Ministry of Agriculture (through its Forest Service created in 1973) and the Ministry of Defense. In 1987, the creation of the National Parks and Wildlife Directorate (DPNVS) stimulated the creation of more protected areas which continues (with a hiatus between 1992 and 1998) through the year 2004 when the latest decree establishing Medanos del Chaco National Park was promulgated. Paraguay presently has 15 areas with the denomination of national park.

The national protected areas system (SINASIP) began its development in 1988 shortly after the creation of the DPNVS. The identification of 23 priority potential areas was achieved by the Conservation Data Center with the support of The Nature Conservancy and a Peace Corps technical volunteer. Following this process, the DPNVS and Moises Bertoni Foundation (FMB) with support from The Nature Conservancy and funding USAID prepared the seminal document laying the groundwork for a protected areas system in Paraguay—the Strategic Plan of the National Protected Areas System (SINASIP), presented in 1993. This plan considered priorities from several different perspectives including ecological value, potential environmental services, institutional and administrative capacity among others.

The final document proposes a system of 44 areas distributed in 3 subsystems (public, private and special areas) that required the creation of 16 new public protected areas. It also included components for technical/administrative reorganization of the DPNVS, fund raising for sustaining the system and NGO strengthening to support the system. Research, land acquisition, capacity building, research and increasing NGO participation in administration and buffer-zone management were included as well providing for a comprehensive and modern focus to protected areas management over a decade ago.



Unfortunately, following a few years of increasing budgets (see chart below), investment in the protection and management of the system began to decrease to its present state. Little more than US\$ 300 thousand is currently invested to maintain the protected areas and biodiversity (the 2001-2004 data includes wildlife management), an estimated 1.8 million hectares of protected areas. The investment is less than 17 cents per hectare of park system. Protected areas such as Mbaracayu that are well consolidated in the eastern region require at least 5 dollars per hectare.

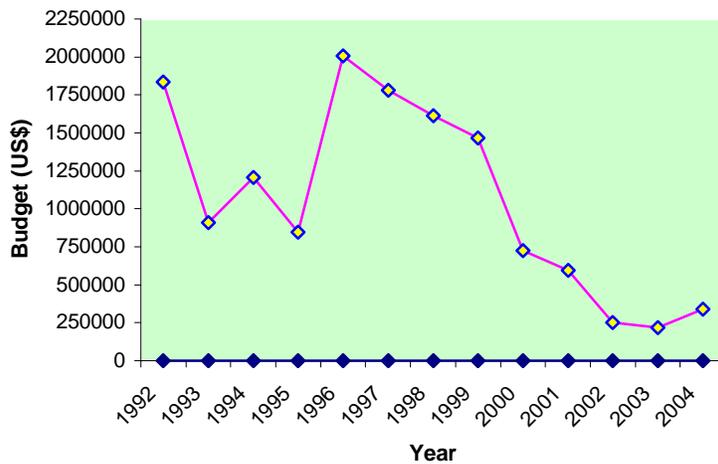


Figure 1 - Estimated Budgets for Protected Areas 1992-2004
(adapted from Ferreiro et al. 2004)

Mbaracayu Nature Reserve was created in 1991 by law and managed by FMB to protect over 60 thousand hectares of UPAF held previously by the International Finance Corporation. It is the best consolidated and protected area in the system having received several investments over the years from numerous donors including TNC, the GEF, French GEF and USAID among others for core area conservation and buffer-zone activities. Recently it was declared a Biosphere Reserve and

initiatives are underway to create corridors and improve enforcement of related environmental laws. The situation is made difficult by the continuous encroachment of ranching and soybean farming in the reserve watershed. The FMB counts on a trust fund to cover recurrent basic costs of protection.

D.2- Types of Protected Natural Areas

In addition to national parks, the country has many other types of protected areas allowed under the Protected Areas Law of 1993 which established the categories of areas considered to be part of the system. The system or SINASIP encompasses many categories of areas beyond the 6 categories established by the IUCN. It incorporates public, private, and special protected areas with the recent addition of Biosphere Reserves in Mbaracayu and the Chaco (proposed to UNESCO in 2004). The so-called special management areas are managed by the bi-national entities that operate the Itaipu and Yacyreta dams between Paraguay and the neighboring countries of Argentina and Brazil on the Parana River.

Conservation Easements were not originally contemplated within the SINASIP but have been promoted for several years with support from USAID. Few, however, have actually been established due to problems with taxes and difficulty in convincing land-owners to sign contracts required under Paraguayan Law.

The private areas system started and supported initially by FMB grew substantially between 1993 and 1998. Studies carried out in 1992 and 1995 by FMB with Cambridge University of the UK identified many private properties as key areas for conservation in eastern Paraguay. USAID investment in the FMB private reserves program permitted growth and outreach, working with some 30 properties totaling well over 100 thousand hectares of diverse ecosystems. However through the decade of the 1990's, the DPNVS provided little support to the initiative and none of the reserves were recognized by decree until 2002. The progress in the past two years has been better with three reserves decreed by the President adding 44 thousand hectares to the reserve system. With Mbaracayu Nature Reserve included, the private reserve sub-system the area totals over 108 thousand hectares under private protection.

The two dams on the Parana River, Itaipu and Yacyreta also add significantly to the SINASIP covering 46 thousand hectares. Most of the reserves are small (less than 20 thousand hectares), however, Itaipu's reserves are some of the few examples of the forest that was once found on the most productive soils of the area, now mostly lost to mechanized agriculture. The entities that manage the dams have important environmental departments, however, they have been poorly integrated with the national system over the past decade. There is significant potential to support conservation through payments by the dams for environmental services of watershed protection though it has not been officially proposed.

D.3- Management Models and Constraints

The management models of the SINASIP are varied. The public sub-system is the most traditional in its focus, centering almost entirely on trying to manage the core areas. In some cases weak tenure and poorly defined boundaries make even this aspect difficult. Buffer-zone management (or even their delimitation) has been minimal with most parks lacking management plans. Those that have them, do not use them as operational tools.

Co-management agreements have generally not been achieved although several NGOs have cooperative agreements with SEAM to support protected areas or training efforts. There has been interest by the Desdel Chaco Foundation to co-manage Defensores del Chaco National Park which was supported for several years under the Parks-in-Peril (PiP) program funded by USAID and TNC. The SEAM has resisted these initiatives over the years but there may be more potential given the recent change in policy with a view towards decentralization.

Municipal management of certain small areas has not advanced well either. Efforts have stalled when the issue of sharing benefits from fees and services arises. Some progress has been made with Ybycui National Park which is the most visited park in the system and has historic value as well as scenic and recreational value. This initiative may be the cornerstone for decentralization to municipalities of some areas should the problems be resolved regarding finances and management.

Participation has improved over the last few years with some support for this provided by the GEF Paraguayan Wildlands Initiative. This project is implemented through SEAM with UNDP support to consolidate four parks, San Rafael Managed Resources Reserve, Paso Bravo National Park, Medanos del Chaco National Park, and Rio Negro National Park in globally important

ecosystems. It has emphasized creation of management committees from its start as a basis for consolidation of the protected areas. The process has been difficult though with SEAM limiting the scope and role of the management committees to little more than consultative groups rather than having a real role in implementation. The process, however, has empowered local participants to a point where they can place significant pressure on the government body though SEAM has little capacity even if it were responsive to the requests. All four parks in the project now have management committees.

Many projects including the GEF project and Parks-in-Peril among others have funded park guards and other costs of management. The experience has not been positive with regard to the DPNVS picking up the costs after the projects are finalized (although the GEF project is ongoing). Trained park guards have been lost and those funded by projects are generally treated as separate from the public paid guards. This issue is critical for long-term sustainability of the system. The core areas will continue to need oversight and the present situation with only 33 public guards for the system and 19 hired by projects for the new areas will not sustain the system adequately. There is approximately one park guard per 20 thousand hectares in the public system.

D.4- Future Directions and Long-Term Expectations for PA System

Threats to the public reserves are encroachment of mechanized farming and livestock ranching. These activities are profitable and well funded throughout the country. Weak tenure, lack of human resources and poorly trained staff at all levels of SEAM exacerbates the effects of these threats.

The SINASIP after 10 years without significant implementation is outdated and does not incorporate many new aspects of protected areas management such as community involvement, indigenous reserves, and biological corridors among the most important concepts. Recently with support from the GEF, Nature Serve has developed a new priority setting for the Chaco that may be replicated for the Eastern Region to develop a new priority list of sites and mechanisms for conservation. The SINASIP should be updated in the near future to provide new directives, direction, vision that look at the viability of the areas in the system and update the priorities. It should also look closely at the need for financial sustainability through a diversity of mechanisms to permit the system to be viable. The country has many other experiences with models of management, participation, decentralization and financing that can feed lessons-learned into the process.

On the positive side, the creation of more local management committees and an improvement in the relations between SEAM, local governments and NGOs sets the stage for some advancement in the near future. Initiatives such as a debt-swap through the Tropical Forests Conservation Act seem viable in the near future under these conditions and there is some consensus to focusing the funding on the UPAF. Paraguay has requested eligibility under TFCA to the US Treasury and it expects a response in the course of November 2004 in this regard. A long-term financing vehicle--the National Environmental Fund--is also expected to be designed early 2005 with the support of an Inter-American Development Bank (IADB) loan for the strengthening of the SISNAM.

D.5- Status and Protection of Endangered Species

Paraguay has been of interest for taxonomists since the time of the Jesuit Missions starting with Sanchez Labrador, followed by de Azara, describing the rich diversity of Paraguay given by the confluence of many ecosystems in this relatively small country. Few naturalists followed though most likely due to Paraguay's isolation, wars, and political instability of the country. In the first half of the 20th century, some work was done by naturalists including Moises Bertoni (a Swiss citizen) and Podtiaguin (Russian). In the 1980's with the establishment of the National Museum of Natural History within the MAG, the situation improved with respect to biodiversity knowledge in Paraguay. The Peace Corps was an early supporter of the museum followed in later years by the Missouri Botanical Gardens, Geneva Botanical Gardens, and the Swedish Museum of Natural History.

The public sector efforts have been accompanied by much effort from the NGOs both nationally and internationally. Organizations like Guyra Paraguay have been leading the efforts in collecting information, generating databases and establishing international networks for knowledge sharing. They are presently working with the Interamerican Biodiversity Network (IABIN) initiative in cooperation with OAS and the National Biological Inventory of the US Geological Survey. Conservation International among the international NGOs has recently undertaken evaluations of the Pantanal ecoregion of Paraguay with a strong taxonomic focus.

Species Richness and Endangered Species

Plants have been the best studied and collected and are represented in Paraguay by an estimated 13 thousand to 20 thousand species. The largest taxon in numbers is considered to be the invertebrates at around 100 thousand species. It is important to note that among both plants and invertebrates, many endemic species (restricted to Paraguay) have been recorded.

Paraguay has 125 species currently included in the 2003 Redlist of Endangered Species catalogued by the IUCN. Of these, 100 are animals and 25 are plant species. The three species listed as critically endangered are birds. Thirteen species are considered endangered. The remainder are considered lower risk, near threatened or vulnerable. Some 17 species are listed as data deficient. Table D.1 lists the relative numbers of species and numbers considered threatened or of concern by CITES and IUCN.

Table No. D.1- Threatened and Endangered Species in Paraguay

	Number of Species	Nationally Threatened	CITES	IUCN Redlist
Plants	13000-20000	279	134	25
Invertebrates	100000	50		3
Fish	230-250	0		2
Amphibians	63-76	0		
Reptiles	132-150	8	18	4
Birds	645-688	86	123	58
Mammals	163-175	38	32	33
Totals	---	461	307	125

Adapted from SEAM 2003, IUCN 2003 and CITES 2004

Threats

The primary threats to flora and fauna in Paraguay are deforestation and logging, hunting/fishing, wildlife trade, infrastructure projects, and pollution (particularly in smaller streams and rivers). Non-native or invasive species also can displace or out compete native species. Potential effects of climate change with respect to wild relatives of domestic crops and other species are little studied but is expected to impact biodiversity in future scenarios as well.

Hunting and fishing are popular activities of Paraguayans and visitors to the country. The Wildlife Law of 1992 allows hunting as regulated by the competent authorities (presently SEAM). The capacity to regulate sport hunting is minimal and highly centralized by SEAM. Sport hunting has generated some interest and success in attracting foreign tourists. It has primarily focused on the various pigeon species that congregate near the colonies of the Central Chaco. It has been reported to bring in important income to the area every year during the winter to benefit of the local community including members of indigenous groups that assist in the hunt.

Another project with funding from a US-based organization called Conservation Force is studying Jaguars in the larger properties of the northern Chaco. The long-term plan is to generate a conservation incentive for land-owners through sustainable hunting of the species. The studies are carried out in coordination with SEAM but given the present difficult situation with CITES and the state of wildlife management in general, it is uncertain what the potential is for this effort.

Increasing international monitoring, in particular from European Union countries, resulted in the review by CITES of the wildlife trade, management procedures and records in Paraguay. The visit performed in 2003 resulted in a self-declared moratorium by Paraguay in regard to CITES species and has been extended to all wildlife exports at present.

The largest amount of wildlife captured is for the trade in animal skins, live wild animals for export as well as cacti, orchids, and palms for ornamental and horticultural purposes. The sale of permits for wildlife has generated approximately US\$80 thousand per year reported for the 2000-2002 period. Fishing licenses and commercial fishing fees have generated between US\$100 thousand to US\$190 thousand for the same period.

None of the species of fish in Paraguay are listed as endangered. Excessive sport and commercial fishing (including large legal and illegal trade with Brazil) is known to locally deplete resources, particularly near cities and popular fishing areas. The two dams have also had important impacts on fisheries of the Parana River given that many large commercially important species of the Parana Basin migrate during the spawning season. Smaller and commercially less important fish species may be disappearing given the pollution in streams but there is little monitoring and research to establish whether this is a fact.

Three species of endemic snails from the now flooded Yacyreta Island are extinct in the wild highlighting the impacts of infrastructure projects on biodiversity that are not easily mitigated.

They are bred in captivity in Misiones, Argentina while the search for other wild populations continues.

Non-native species have been recorded in Paraguay with 253 species cited. The impacts of most of these introductions have not been studied with exception of the Golden Mussel (*Limnoperna fortunei*). A native of Asia, it may have been introduced in ballast water of ships entering the river systems. It now has spread to the upper reaches of the Paraguay River into the Pantanal and has caused problems in the dams of the Parana River through biofouling.

E. STATUS AND MANAGEMENT OF TROPICAL FOREST RESOURCES

Nothing speaks more emphatically about the forestry sector in Paraguay than the often heard assertion that the country has one of the highest deforestation rates in Latin America². Perhaps just as disconcerting is the fact that given the current state of forestry statistics in the country, it is hard for those trying to make policy decisions related to the sector to know whether the above assertion is true, what it really means and what to do about it. In short, while the deforestation rate is clearly something to be concerned about, the abiding lack of clear policy and institutional capacity within the sector is of even greater concern.

E.1- An Assessment of Present Forest Cover

There are a number of studies and reports available which provide summary data on forest cover in Paraguay, most of which tend to emphasize the status of the forests in the Eastern side of the country. **Table E-1** below summarizes some of the data related to deforestation trends.

Table E-1: Forest Cover Change (Deforestation) in Paraguay

Deforestation Trends	Period	Authors	Institution
<i>Cambio Cobertura Forestal Paraguay Oriental</i> – Existing Forest- 1989: 3.1462 million has Non-Forest- 1989: 9.5211 million has Deforestation: 1.3555 million has	1989 to 2001	Aistatt et al	Univ. Maryland, NASA, CI & Guyra Paraguay

² According to the FAO Forestry Department publication, State of the World's Forests 2003, any number of other countries, both in South America and Latin America in general, easily surpass the estimated annual rate of deforestation reported for Paraguay– 123 thousand hectares per year between 1990 & 2000 or a rate of change of 0.5% loss per annum.

<i>Deforestation- Mapa de Uso de la Tierra 1991 y Avance de la Deforestacion de 1984 a 1991 (Region Oriental)</i> – Area of Forest in 1984: 5,362,186 has Area of Forest in 1991: 3,342,328 has Area Deforested: 2,019,858 has Average Annual Deforestation Rate: 288,000 has	1984 to 1991	Anon.	Univ. Nac. Asuncion, Carrera de Ingenieria Forestal
<i>Tasas de Deforestacion en los Ultimos 40 Anos en la Region Oriental de Paraguay</i> – 1968 - 1976: 210,000 has/year- Servicio Forestal Nacional 1984 - 1991: 288,000 has/year- Carrera de Ingenieria Forestal, UNA 1989 - 2001: 112,958 has/year- Global Land Cover Facility, UMD 1990 - 2000: 123,000 has/year- FAO	various	various	FAO- Situacion Forestal en America Latina y el Caribe, 2002

Over recent decades, as the above table shows, there has been much more concern and consideration of the forest cover in the Eastern Region of the country, reflecting the fact that these better watered areas produced the bulk of the nation’s forest products, both for domestic consumption and export. Of course, this area also directly coincides with where the bulk of the population resides– according to recent statistics, as mentioned above, a 97/3 percent split between the Oriente and the Occidente (Chaco). Accordingly, there is more data on deforestation trends available for the east than for the west. **Table E-2** which follows provides a summary of forest cover by department, with some extrapolations relating forest cover to the actual area of each of the departments.

Little information could be found about the deforestation statistics in the Chaco. Gonzalez (2002) cited above uses the figure of 201,707 hectares deforested in the Occidente over the period 1986 to 2002 although it is not clear from where or how these figures were derived. This same report summarizes forest cover in the West or Chaco Region as having declined from approximately 18.4 million hectares in 1987 to 15.5 million hectares in 2002, about 8 percent or 1.2 million hectares of which is currently protected within the boundaries of the protected area system. The Defensores del Chaco National Park alone covers an area of 780,000 hectares and there are three other areas (Tinfunque N.P., Tte. Enciso N.P. and Chororeca Natural Monument) that cover the rest (see the Section D above).

Over and above the inconsistencies that these data sets present, which are not untypical in many countries, they also underscore a number of themes worth mentioning about the tropical forestry situation in Paraguay. Although the actual area of deforestation is an important indicator for those considering the development needs and opportunities in the sector, it is by far much more important to have a quantified measure of the deforestation rate or current trends, ideally broken down to the degree that is possible. Furthermore, this trend must be expressed in terms of remaining natural forests (or perhaps total forest area if the area of plantations is of sufficient importance to a country, which so far it is not in Paraguay).

Another important measure of deforestation is a comparison of conversion rate and extent with the estimates of land capability. Although total area of natural forest deforested is a measure of grave concern to those interested in biodiversity conservation, deforestation against a backdrop

of fragile lands is also vitally important as an overall indicator of the environmental stability of the nation in question. If large areas of the country are being deforested that are not suitable for agriculture, the loss of biodiversity habitat is also accompanied by significant impacts on the other important environmental services these forests once provided– watershed protection, recharge of underground aquifers, soil stability and fertility, desertification and sedimentation rates in the watercourses.

Table E-2: Natural Forest Cover by Department in Paraguay (in hectares and by percentage) Source: Gonzalez 2002 + extrapolations

DEPARTMENT	A. Total Area of the Dept.	B. Total Forest Area	C. % B/A	D. Productive Forest Area	E. % D/A	F. % D/B	G. Forest in Protected Areas	H. % G/A	I. % G/B	J. Non- Productive Forest Area	K. % J/A	L. % J/B
CONCEPCION	1805100	621797	34.4	139859	7.7	22.5	113291	6.3	18.2	368646	20.4	59.3
SAN PEDRO	2000200	536348	26.8	115061	5.8	21.5	----	0	0	421286	21.1	78.5
CORDILLERA	494800	34549	7.0	6369	1.3	18.4	----	0	0	28180	6.0	81.6
GUAIRA	384600	73374	19.0	10335	2.7	14.1	24000	6.2	32.7	39040	10.1	53.2
CAAGUAZU	1147400	296208	25.8	35786	3.1	12.1	----	0	0	260422	22.7	87.9
ITAPUA	1652500	300562	18.2	63988	3.9	21.3	39000	2.4	13.0	197574	12.0	65.7
MISIONES	955600	13947	1.5	1002	0.1	7.2	----	0	0	12945	1.4	92.8
PARAGUARI	870500	67965	7.8	4593	0.5	6.8	7500	0.8	11.0	55871	6.4	82.2
ALTO PARANA	1489500	326231	21.9	27764	1.9	8.5	35954	2.4	11.0	262513	17.6	80.1
CENTRAL	246500	?	--	?	--	--	116000	47.0	--	?	--	--
NEEMBUCU	1214700	45356	3.7	1480	1.2	3.3	----	0	0	43877	3.6	96.7
AMAMBAY	1293300	398743	30.8	188801	14.6	47.3	13811	1.1	3.5	196131	15.2	49.2
CANINDEYU	1466700	542474	37.0	154161	10.5	28.4	63355	4.3	11.7	324958	22.2	59.9
EASTERN REGION	15021400	3257554	21.7	749199	4.9	22.8	412911	2.7	12.6	2211443	14.7	67.8
PTE. HAYES	7290700	3142606	43.1	1978417	27.1	62.9	280000	3.8	8.9	884190	12.1	28.1
BOQUERON	9166900	6593761	71.9	3116593	34.0	47.3	40000	0.4	0.6	3437168	37.5	52.1
ALTO PARAGUAY	8234900	5799780	70.4	4172891	50.7	71.9	880953	10.7	15.2	745936	9.1	12.9
WESTERN REGION	24692500	15536147	62.9	9267901	37.5	59.6	1200953	4.9	7.7	5067294	20.5	32.6

Table E.2 Notes- by Department and Region (explanation of the non-titled columns):

Column C- Percent remaining forest cover.

Column E- Percent total area still in productive forests. Column F- Percent total forest area still considered productive forest

Column H- Percent total area in protected areas. Column I- Percent total forest area in protected areas. Column K- Percent total area considered non-productive forests. Column L- Percent total forest area considered non-productive.

Another recent study, carried out by the Mesa Forestal Nacional with the support of FAO and said to be based on 2002 satellite imagery provides a different set of similar data for forest cover in Paraguay (MFN 2003). This study provided the following data:

Table E.3- Forest Cover Data prepared by the Mesa Forestal Nacional (2003)

Region	Total Area (ha)	Total Productive	Percent Coverage of
Oriente	15982700	765456	5.0%
Occidente	23838493	15536147	65.0%
National Total	39821193	16301603	40.0%

Although these figures are close enough to suggest some confidence in the data, there remain issues in terms of classification terminology and time frame which erode their importance as sector planning data. The data provided in Table E.2 does, however, provide some indications as to where in the country there are needs and opportunities for forestry sector attention and investment.

E. 2- Present Sector Policy and Institutional Framework

Concern for the forestry sector in Paraguay has been on the national agenda for some time. Indeed the present Forestry Law (Ley No. 422 de 1973) created the National Forestry Service, established fiscal incentives for reforestation, created the Forestry Fund and formulated the rules for forest exploitation (Vidal 2004). It also included a requirement that all rural properties greater than 20 hectares must maintain at least 25 percent of their land under natural forest cover. Rural properties over 20 hectares that did not have 25 percent forest cover were expected by law to reforest at least 5 percent of their lands. In 1986, there was another resolution (No. 18831) whose intention was to reinforce the existing requirements, however, this period also coincided with the period of very high deforestation related to the advancement of the agricultural frontier.

Although forest plantations are a relatively common sight in Eastern Paraguay, a number of efforts to further stimulate reforestation have had only modest results. A 1995 law for promoting reforestation (Ley No. 536 de 1995) was enacted creating economic incentives and subsidies for forestry plantations. Despite a promising start, Government has been unable to find the financial resources to maintain this program. The early budget allocations for this program have waxed and waned from a high of 20 million Guaranies in 1998 to 2 million in 2001. The current reforestation achievements have been estimated at approximately 40,000 hectares although it is not clear if this covers all reforestation or only that carried out under official programs.

The National Forest Service has not fared much better. Tarnished by a reputation as a corrupt institution and with little political and public support, its budgets have been at best minimal allowing only for paying salaries with little resources for operations or

investments. When the National Environment Secretariat was established in 2000, and many of the mandates for natural resources conservation and management transferred to it, the Forest Service remained behind as an Agency of the Ministry of Agriculture. In 2000, its budget was only 10 million Guaranies, orders of magnitude smaller than its sister agencies in the agriculture sector. There has also been a fairly constant turnover of leadership depriving the institution of the continuity of leadership that would be required to come to grips with the challenges and opportunities of the forestry sector.

Of even greater concern is the tacit policy that views forest lands as “undeveloped”. As a result, Government programs aimed at settling farmers without land, under the aegis of the Instituto de Bienestar Rural (IBR), now called Indesit, were often carried out at the expense of forest lands regardless of their inherent suitability for agriculture or potential for forest production. Forested areas are also typically chosen as targets by landless peasants invading private properties who justify their actions because the lands are not being “used” by their owners.

Of more recent vintage and of great promise is the establishment of the *Mesa Forestal Nacional*. Created in 1999, the MFN is a consultative body bringing together both public and private sector actors in a concerted effort to reform the forestry sector in Paraguay. With support from both FAO and GTZ, the *Mesa Forestal Nacional* has taken a proactive role, developing a national forestry agenda, a national forestry policy document, elaborating a Tropical Forestry Action Plan (PAFT), and most significantly a new draft forestry law which embodies proposals for the establishment of a National Forestry Institute and a Forestry Development Fund. Unfortunately, this draft law has as yet to be endorsed by the National Congress and the international support for the MFN has come to an end and the road ahead is unclear.

E.3- Forestry Sector Programs and Activities

Beyond the reforestation plans and programs mentioned above, there are also a series of so-called forest management mechanisms in Paraguay. From a forestry management perspective, the National Forestry Service authorizes three different types of plans: Forest Management Plan, Forest Exploitation Plan and the Land-Use Plan. The first (*Plan de Manejo Forestal*) is a genuine forest management planning process based supposedly on an inventory and projection of sustainable use and silvicultural treatment to maintain a productive forest area. The Forest Exploitation Plan (*Plan de Aprovechamiento Forestal*) is a simple cutting plan authorizing logging within a private forest area based on a minimum diameter limit and a 15 year rotation cycle. The Land-Use Plan (*Plan de Uso de la Tierra*) is essentially an official sanction of the right of property owners to clear forest within their property down to the 25 percent limit.

Despite several attempts to obtain up-to-date information on the area currently authorized under each of the above categories, no clear information emerged. Gonzalez (2002) cites figures from the National Forest Service that suggest that in 2001 there were a total of 105 approved management plans covering an area of

approximately 232 thousand hectares although it is not clear if these are both forest management plans and forest exploitation plans.

Those knowledgeable about the forestry sector told the Assessment Team that there were only three known examples of Forest Management Plans in the country, and that one of them recently folded after being sold. It is thought that there are many Forest Exploitation Plans, usually obtained by a land owner by contracting the services of a registered forestry consultant service. When such an authorization is obtained, the owner has the right to cut timber, based on the needs of the industry he is supplying and on a system of minimum diameters and idealized rotation (15 years between subsequent cuts). This cutting permit system conveys with it the right to transport wood (as do the forest management plans) but that by default because of lack of resources to man roadside checkpoints, the National Forestry Service is unable to properly control wood flows. By implication, these transport permits may be used several times or worse.

Wood Industries

It is therefore not surprising that the total area of productive forests in the Eastern side of the country is generally supposed to have been reduced to about 5 percent of the total area of what was once a massive forest estate. This lamentable state of affairs has also had its impact on the state of the wood and timber industries in the country. Recent forest industry statistics suggest that commercial wood production is now about half of what it was two decades ago and many industries are languishing for lack of raw material.

The following table (No. E-4) provides a snapshot of some of the data and information available about the breadth of the wood industries in Paraguay.

Table E-4: Wood Industry Data and Information

<p>Estimated total employment in the forestry sector- 2004: 40 thousand people, but including all those related to any activity within the forestry and timber sectors.</p> <p>Primary Wood Industry Sector: sawmills and veneer plants as well as commercial charcoal production both for domestic use and in steel making.</p> <p>Secondary Wood Industry Sector: wood flooring (parquet), plywood and furniture plants.</p>	<p>Timber and derivatives exported in the first 8 months of 2004: US\$ 48 million.</p> <p>Plantation based wood products exported in 2003: approximately US \$ 3 million.</p> <p>Value of imported wood products: approximately US\$ 3 million from January to June 2004, not including paper products.</p>
---	--

Source: Federacion Paraguaya de Madereros (FEPAMA)

Sector sources routinely cite a figure of 2.8 percent as the participation of the forest and timber industry in the Gross Domestic Product (PIB) although reliable figures are not currently available to substantiate this statement. Furthermore, timber exports are cited as being third in importance as an export commodity (after soybeans and cotton). Of recent vintage is some additional production capacity resulting from the impact of the Ley de Maquilas which allows wood industry to import raw materials (essentially

plantation produced wood--pine--from neighboring countries and process it as timber products--mouldings--for re-export). This situation may prove ephemeral because it is dependent on low salary scales for Paraguayan wood workers and disorganization among the wood industries in neighboring countries. There is some hope that the growing plantation forestry resource base could become a source of raw material for the transformation of the wood industries as the natural forests with prized species on which they were once dependent are no longer available, either because of forest degradation or the eventual imposition of national conservation imperatives.

Two products currently classified as forest products also offer some potential for continuing commercial development in the wood industry sector, although both of them are non-timber forest products-- yerba mate and palm hearts. Both are showing more options as late as some growers attempt to produce them “organically” in response to growing market demand for green products. Paraguay, it would appear, is well positioned to respond to both of these opportunities.

What is of greater concern is the growing realization that much of the timber industry in Paraguay has grown up dependent on relatively unrestrained supplies of inexpensive raw materials. This situation has led to the creation of a relatively non-competitive industrial base in the sub-sector because cheap raw material stimulates little incentive for technological innovation or efficiency in conversion. As a result, knowledgeable sources suggest that the majority of the private sector timber industries are not very competitive and would find difficulties in competing in an increasingly globalized or even regionalized timber marketplace. Typically, their products would be non-competitive because of high production costs and low quality control for manufactured products. Overcoming this situation will also be difficult because also typically, these industries have few specialized personnel, have not diversified their production chains and have generally underdeveloped managerial and entrepreneurial capabilities.

F. CONSERVATION OUTSIDE PROTECTED AREAS

F.1- Managed Natural Systems

Watersheds and Wetlands

Paraguay is well endowed with freshwater resources with an estimated 63,000 cubic meters per inhabitant per year, one of the highest in South America.. It has used this abundance to its economic benefit turning the country into a net exporter of electricity from hydro power to neighboring countries, Brazil and Argentina. The Parana River is the primary source of energy generation given that it has the greatest volume and changes in height that permit damming of the river.

The Paraguay River basin covers more of the surface area of the country but is smaller in volume and offers less opportunity for hydroelectric power production. The Paraguay River basin is quite flat providing ideal conditions for the formation of extensive wetlands systems. It is estimated that between 30 and 40 percent of Paraguay harbor wetlands of different types. The environmental services provided by these

wetlands including, the provision of freshwater, pollution control, buffering against floods, and maintaining fisheries have not been recognized historically.

Conservation policy has tended to focus on forested ecosystems. Major threats to Paraguay's wetlands include the expansion of rice cultivation and livestock management. Rice cultivation has increased channeling of water changing the flow and flood patterns as well as converting the ecosystems to monoculture. Livestock grazing results in burning, increased organic loads, and habitat change.

Sedimentation of wetlands due to deforestation in higher areas of the watersheds is also considered a major problem. Although the widespread adoption of no-till farming has lowered erosion (in the Parana basin especially), rural roads may be contributing important loads as well as smallholder traditional agriculture that still makes up large part of the landscape. Chemicals used in agriculture are also reported to be contributing to increased signs of eutrophication in the Ypacarai and Ypoa lakes, the latter a designated Ramsar site.

Some dramatic changes due to the impacts on wetlands have fostered greater attention in recent years. In the case of the Pilcomayo River in the Chaco, the sediment loads are so great that the river is retreating and wetland areas are disappearing or severely impacted including a Ramsar site, Tinfunque National Park, Paraguay's first national park. The situation is exacerbated by the diversion of large volumes of water by Argentina by means of a canal.

Some of the major paved roads of the country have important impacts on the wetland ecosystems of Paraguay. Roads in the department of Ñeembucu, Cordillera and the Transchaco highway create virtual dams to the passage and natural flow of water. Although designs have been improved over the last years, they still do not adequately take the dynamics of the wetlands into account. Oversight of design and construction continues to be weak and impacts should be more closely monitored in particular those supported by the major development banks.

Other major projects such as the Paraguay-Parana Waterway or Hidrovia also are considered threats to wetlands in a regional context. In particular the Pantanal ecoregion, considered a "hotspot" for biodiversity, which may have its flooding patterns altered by dredging and other work that could affect the wildlife.

Some progress has been made in regard to wetlands conservation although slowly. Projects like the Yacyreta Dam have been monitoring impacts to globally threatened species in wetland areas and are studying ways to mitigate impacts supported by the World Bank. In the Chaco, Fundacion Desdel Chaco with support from USAID, has successfully achieved designation of the Laguna Salada wetlands as a Ramsar site protecting important salt flats that harbor migratory species of global importance.

Efforts by local governments to stimulate tourism and cultural events linked to wetlands such as Pilar and Carapegua have also increased. Paraguay has expanded Rio Negro National Park and is presently consolidating the area of over 100 thousand hectares with support from the GEF Wildlands Project.

The watersheds of Paraguay not only are important from a surface water context but also from a regional groundwater context. Under Paraguayan soils are several freshwater aquifers that serve millions of people as a source of potable water. Other aquifers in the Chaco are shared with Bolivia and are being looked at for

The Guarani Aquifer covers a large part of Eastern Paraguay (coinciding largely with the area originally covered by the UPAF). It extends into Brazil, Argentina, and as far away as Uruguay. Presently the aquifer is the subject of research and policy-making by the governments of these countries with the help of the GEF. There may be potential to establish incentives for environmental services provided from the protection of recharge areas of this aquifer. Paraguay is thought to be an important area for recharge in the areas with sandstone geologic formations. Deforestation has been recognized as a potential threat to recharge as has contamination from expansion of chemical-intensive mechanized agriculture.

Grasslands

As occurs in many countries and with the wetlands, Paraguay's grasslands have been underestimated from a standpoint of productivity and biodiversity. The natural grasslands of southern Paraguay have only recently been recognized as belonging or sharing characteristics of the Mesopotamia Grasslands of Argentina. The grasslands of the northern part of Eastern Paraguay are also recognized now as important reservoirs of biodiversity of the Cerrado--some harboring unique endangered species such as the White-winged Nightjar (*Caprimulgus candicans*).

Burning is one of the threats to grasslands. Although for many of these grasslands fire may be part of the natural regime, the frequency and extent of burning is great. The impact of human activity and the effects of natural climactic patterns are poorly understood if at all to be able to propose any kind of management. As a human health issue the public recognizes the problem annually during the dry season or periods of drought but has no effective means to combat fires or stop intentional burning. Monitoring of fires in National Parks has improved thanks to a technology using MODIS satellite imagery and provided locally to conservation organizations and public institutions with the support of Conservation International, University of Maryland and Guyra Paraguay.

Natural grasslands are also targets for reforestation projects, generally for *Eucaliptus spp.* throughout Paraguay. The three critically endangered species of birds found in Paraguay are from grassland habitats. The expansion of plantation forestry will add to the list of threats faced by this habitat if not focused adequately. Efforts are underway by WWF to target abandoned agricultural areas for these plantations and expansion of other agricultural activities.

F.2- Ex-situ Conservation

Paraguay is a natural seed bank for many plants of importance to human needs. The country harbors wild relatives of papaya, cassava, pineapple, guava, peanut, custard apple, potatoes, rice, prunes, and chili peppers. It has been the focus of efforts by the USDA to document and collect species for seed banks in the US and Paraguay. The existence of these species has been taken into account in the process of priority setting for conservation in the Chaco. The deforestation and urbanization process may be taking its toll on these species.

It is an important first step that these plants have been highlighted in the National Strategy and Action Plan for Biodiversity Conservation (ENPAB). The programs of action include support for ex-situ conservation and for promoting research and agricultural technology related to these species.

F.3- Impacts of Infrastructure and Development Projects

Several projects of large scale throughout Paraguay and the region have been considered potential threats to conservation of biodiversity and maintenance of tropical forests. The projects if not adequately dealt with in terms of direct and indirect impacts. In particular many development projects are executed in a context devoid of adequate institutions for governance, capacity building and oversight among other needs.

Some of the projects that cause most concern and are in process of design or execution are highlighted below:

Paraguay-Parana Waterway

The waterway which is to permit navigation along 3400 km of waterway from the region of Brazil's Pantanal (Caceres) to Nueva Palmira in Uruguay. This would allow movement of goods such as soybeans and iron ore at a lower cost. The concerns range from effects that dredging would have on the dynamics of the river and wetlands of international importance along the Paraguay River to indirect effects of promoting expansion of soybean cultivation in the upper reaches of the Alto Paraguay Basin generating sedimentation and plowing under regions of important biodiversity.

The project has had a "stop and go" history. There are NGO networks dedicated to monitoring the processes in the various countries that are involved and interested in the waterway. Reports indicate that some work has been done to dredge the stretches in Argentina but the waterway has not proceeded in its original conception which was to straighten meanders and dredge a canal to 10 feet among other important physical alterations to the rivers.

Western Corridors

The Western Corridors project is a road improvement project carried out by the Ministry of Public Works of the Government of Paraguay and financed by the Inter-American Development Bank and the Andean Development Bank. The road would allow transit from east to west across the Paraguayan Chaco permitting access to Pacific ports.

Specific concerns are deforestation, soil erosion, displacement and impacts to indigenous communities and pressure on protected areas among others. The deforestation has been increasing over the last few years in the areas of influence of the project particularly for the establishment of ranches. Reports in the media over the last year indicate that members of the Ayoreo indigenous communities to have only recently come in contact are at risk from the road given their close proximity and insecure land tenure. Direct observations of the road show signs of direct impacts that are not adequately mitigated, including hunting around construction camps, increased deforestation and fires. It also seems that projects originally included to strengthen protected areas have not been included in the final project mitigation package.

Other projects

The list of other projects with potential impacts and that should be monitored over the next few years according to the ENPAB include the aqueduct project in the Chaco, petroleum exploration in that region (that caused the rescinding of a decree that created Medanos del Chaco National Park in 2003 reverted back to park in mid 2004), and the establishment of a new dam along the Parana River called Corpus. In addition, the Rural Roads Project funded by the IADB and ready to execute shortly also should contain mitigation packages considering biodiversity and tropical forests.

The tendency in the last few years has been to seek other sources of funding for infrastructure projects that may have much social and environmental conditionality added to them if done through the multilateral financial institutions such as World Bank and IADB. Such is the case of Ruta X in northeastern Paraguay finally build with Brazilian Development Bank funding which also may be funding a new bridge from Brazil into the Chaco shortly and the Corridors road co-funded by CAF.

H. BIBLIOGRAPHY

- CDC (Conservation Data Center). 1990. *Áreas Prioritarias para la Conservación en la Región Oriental del Paraguay*. Imprenta Graphis.
- CDC. 2003. *Proyecto Areas Prioritarias para la Conservación de Cinco Ecorregiones del America Latina. Ecorregion Chaco Boliviano Nature Serve-GEF*. Accessed at www.natureserve.org. september 2004.
- Clark, P. 2004. *Guide to Paraguay's National Parks and Other Protected Wild Areas*. Servilibro
- Congreso Nacional, Comisión Nacional de Defensa de los Recursos Naturales. nd. *Compilación de Legislación Ambiental, Tomos I y II*. AR Impresiones.
- Consulforest. 1995. *Documento Bases sobre Biodiversidad*. ENAPRENA. MAG-SSERNMA-GTZ. Icono
- DGEEC (Dirección General de Estadística, Encuestas y Censos). 1998. *Anuario Estadístico del Paraguay. Año 1997*. Secretaría Técnica de Planificación.
- Dinerstein, E. et al. 1995. *A Conservation Assessment of the Terrestrial Ecoregions of Latin America and the Caribbean*. WWF and The World Bank.
- DPNVS (Dirección de Parques Nacionales y Vida Silvestre), FMB. 1997. *Informe Nacional, Áreas Silvestres Protegidas del Paraguay – SINASIP. Primer congreso Latinoamericano de Parques Nacionales y Otras Áreas Protegidas*. MAG-DPNVS
- DPNVS, FMB. 1993. *Plan Estratégico del Sistema Nacional de Areas Silvestres Protegidas*. Imprenta Graphis.
- Facetti, J.F. 2002. *Estado Ambiental del Paraguay. Presente y Futuro*. ENAPRENA-SEAM-GTZ. Icono.
- Ferreiro, O, Fragano, F., Ugarte, E. 2004. *Sostenibilidad Financiera de las Areas Protegidas del Paraguay. Documento para Discusión y Análisis. Presentado en el Taller Financiamiento a Largo Plazo para los Sistemas Nacionales de Areas Protegidas*. UNDP-GEF.
- Fundacion Moises Bertoni. 2000. *Programa de Apoyo a Iniciativas Privadas de Conservación. Una Revisión de 10 Años de Experiencias*. FMB - USAID.
- Galindo-Leal C. and Gusmao Camara I. (eds.). 2003. *The Atlantic Forest of South America. Biodiversity Status, Threats, and Outlook*. Conservation International. Island Press
- Grisetti, M. And Stohr, G. (eds) 1996. *Lineamientos Sectoriales para una Política Nacional de los Recursos Naturales y Medio Ambiente – Versión Actualizada*. Proyecto ENAPRENA. SSRNMA-GTZ. Macrographic.
- Gonzalez, R. 2002. *Estudio de Tendencias y Perspectivas para el Sector Forestal en America Latina. Documento de Trabajo. Informe Nacional. Paraguay*. FAO. Accessed at www.fao.org/documents october 2004.
- IDEA (Instituto de Derecho Ambiental). nd. *Guia de Derecho Ambiental del Paraguay*. GG Servicios Graficos.
- IDEA. 2003. *Mejoramiento del Marco Legal Ambiental del Paraguay. Legislación Ambiental Concordada*. USAID.
- IIED, STP and USAID. 1985. *Environmental Profile of Paraguay*. St. Mary's Press.
- Lowen, J.C., Bartrina.L., Clay, R., Tobias, J. 1996. *Biological surveys and conservation priorities in eastern Paraguay*. CSB Conservation Publications.

- Raidan, G. 1992. *Legislación Ambiental del Paraguay*. Proyecto Uso Racional de la Tierra, Convenio Gobierno del Paraguay, Banco Mundial y PNUD. Imprenta Salesiana
- SEAM. 2003. *Estrategia Nacional y Plan de Acción para la Conservación de la Biodiversidad del Paraguay*. SEAM-PNUD-GEF.
- Salas D., Mereles F., and Yanosky A. (eds). 2004. *Humedales del Paraguay*. Comité Nacional de Humedales.
- Vidal, V. 2004. *Estudio sobre Mecanismos Financieros para el Manejo Forestal Sustentable en Sudamerica. Fase I. Cono Sur*. FAO. Accessed at http://www.rlc.fao.org/proyecto/rla133ec/pag/i_paises.htm september 2004.
- WWF and FVSA (Fundación Vida Silvestre Argentina). 2003. *Visión de Biodiversidad de la Ecoregion del Bosque Atlántico del Alto Paraná. Síntesis Informativa*. WWF.

Websites

- | | |
|-------------------|---|
| CITES | www.cites.org . |
| IUCN Redlist | www.redlist.org |
| FAO | www.fao.org and www.rlc.fao.org/proyecto |
| Ramsar Convention | www.ramsar.org |
| Nature Serve | www.natureserve.org |

APPENDIX 1

TERMS OF REFERENCE OF THE ASSESSMENT

APPENDIX 2

BRIEF BIOGRAPHICAL SKETCH OF ASSESSMENT TEAM MEMBERS

Thomas M. Catterson holds a M. Sc. in International Forestry from SUNY College of Environmental Science and Forestry. He has more than 30 years of experience in international forestry and natural resources management for developing countries. Beginning as a Peace Corps Volunteer in the late 60s (Chile 1967), he has worked for FAO (Community Forestry Officer at FAO HQ in Rome), USAID (Senior Forestry Advisor for the Africa Bureau) and a development consulting company. Since 1991, he has been working as an independent international consultant in community management of forests and natural resources, forestry sector policy and institutional development and environmental review issues. His work has taken him to more than 74 countries in Latin America, Africa, Asia, and the Middle East where his clients have included a wide range of the major bilateral and multilateral development agencies, the private consulting sector and the international NGO/PVO community. His mother tongue is English but he also speaks fluent Spanish and good French.

Francis V Fragano is a US citizen but long-time resident of Paraguay having spent much of elementary and high-school there. He holds a BS in Biology from Boston College and an MSc from Rutgers University in Environmental Science. With over 15 years of experience in the environment and natural resources sector, he initiated his career as a consultant in the US but has worked in Paraguay, El Salvador and Argentina as well. After serving several years with USAID/Paraguay he has consulted on short and long-term assignments for the World Bank, Interamerican Development Bank and UNDP. He is an avid birdwatcher and served several years as Founding Board Member and Executive Director of the Paraguayan partner of BirdLife International. He specializes in biodiversity conservation, protected areas and water resources programs. He is bilingual in English and Spanish but also manages some Guarani, Portuguese, Italian, and French.

APPENDIX 3

LIST OF PERSONS CONSULTED

Wayne Nilsesteuen	Director, USAID
Sergio Guzman	Deputy Director, USAID
Uwe Kurth	Mission Environmental Officer, USAID
Victor Vidal	Forestry Consultant, Tel. 603-360, e-mail: vcvidal@hotmail.com
Cesar Balbuena	Forestry Consultant, Tel. 258-151, e-mail: cesarbalbueno@cmm.com.py
Manuel Rodas	Executive Director, Paraguayan Wood Industry Association Tel. 441-182, e-mail: mrodas@rieder.net.py
Reinaldo Pender	Director Ejecutivo, Paraguay Vende, Tel. 209-110, e-mail: rpenner@paraguayvende.com.py
Tracy Shanks	Paraguay Vende
Juan Esteban Carron	Director Adjunto, Paraguay Vende, Tel. 209-110, e-mail: jcarron@paraguayvende.com.py
Cristina Sanchez	Gerente de Monitoreo de Resultados, Paraguay Vende, Tel. 209-110, e-mail: csanchez@paraguayvende.com.py
Wilfried Giesbrecht	Executive Director Fundación Desdel Chaco
David Sawatzky	Governor of Boqueron Department
Juan Pablo Cinto	Vice-Director, Instituto de Derecho Ambiental, Coordinador Ecoregional, Tel. 614-619, e-mail: juanpablo.cinto@idea.org.py
Aida Luz Aquino	Director, Bosque Atlantico del Alto Parana, WWF, Tel. 300-733, e-mail: alaquino@wwf.org.py
Alberto Villalba	Program Coordinator, The Nature Conservancy
Carlos A. Galarza	Director Ejecutivo, CEAMSO, Tel. 504-011, e-mail: ceamscoy@rieder.net.py
Nelson Torales	Park Guard Teniente Enciso-Medanos National Parks
Christine Hostettler	Executive Director, PROCOSARA

WORKSHOP PARTICIPANTS

Mercedes Juvinel, Consultora, Proyecto Finanzas Municipales, Tel. 225-193, e-mail: mjuvinel@finanzasmunicipales.com

Uwe Kurth, Mission Environmental Officer, USAID/Paraguay, Tel. 220-715, e-mail: ukurth@usaid.gov

Valdir Roberto Welte, FAO Representative, FAO of the UN, Tel. 574-342, e-mail: FAO-PY@fao.org

Stuart B. Pryor, Director, Sustainable Resources Foundation, Tel. 59521, e-mail: stuart@pla.net.py

Wilfried Giesbrecht, Gerente Ejecutivo, Fundacion para el Desarrollo Sustentable del Chaco, Tel. 52191, e-mail: wgiesbrecht@desdelchaco.org.py

Walter Ratzlaff, Turismo, Chortitzer Komitee Ltda., Tel. 52301, e-mail: walter@lp.chortitzer.com.py

Reinaldo Penner, Director Ejecutivo, Paraguay Vende, Tel. 209-110, e-mail: rpenner@paraguayvende.com.py

Rafael Carlstein, Mesa Forestal Nacional

Damiana Mann, Servicio Forestal Nacional, MAG

Angel Parra, Guyra Paraguay, Tel. 227777

Nelida Rivarola, Centro de Datos para la Conservación,, SEAM Tel. 615804

Mariana dos Santos, Consultor, JOBS, Tel. 220-984, e-mail: consultoria@jobs.com.py

Kelo Kriskovich, Gerente General, JOBS, Tel. 220-984, e-mail: kelo@jobs.com.py

APPENDIX 4

LIST OF PROTECTED AREAS

(adapted from Ferreiro, F., Fragano, F. and Ugarte, E. 2004)

Public Areas

Protected Area Name	Management Category	Sub-system	Area (há)
Defensores del Chaco ▣	Parque Nacional	Público	780.000
Tte. Enciso ▣	Parque Nacional	Público	40.000
Río Negro	Parque Nacional	Público	123.786
Cerro Cabrera -Timane	Parque Nacional	Público	125.823
Chovoreca	Parque Nacional	Público	100.953
Ñacunday	Parque Nacional	Público	2000
Paso Bravo ▣	Parque Nacional	Público	93.000
Serranía San Luis ▣	Parque Nacional	Público	10.282
Bella Vista	Parque Nacional	Público	7.311
Cerro Corá ▣	Parque Nacional	Público	12.038
Caaguazú ▣	Parque Nacional	Público	16.000
Ybycuí ▣	Parque Nacional	Público	5.000
Lago Ypoá*	Parque Nacional	Público	100.000
Lago Ypacaraí* ▣	Parque Nacional	Público	16.000
Yabebyry*	Refugio de Vida Silvestre	Público	30.000
San Rafael* ▣	Reserva Recursos Manejados	Público	72.489
Yvytyrusú* ▣	Reserva Recursos Manejados	Público	24.000
Macizo Acahay	Monumento Natural	Público	2.500
Kuri'y*	Monumento Natural	Público	2.000
Cerros Koi y Chorori ▣	Monumento Natural	Público	17
Moisés Bertoni ▣	Monumento Científico	Público	200
Tinfunqué*	Parque Nacional	Público	280.000
Cerro Lambaré	Zona Nacional de Reserva	Público	
Capií bary	Reserva Ecológica	Público	3082
Saltos del Guairá	Parque Nacional	Público	900
Total Area Public Subsystem			1.847.381

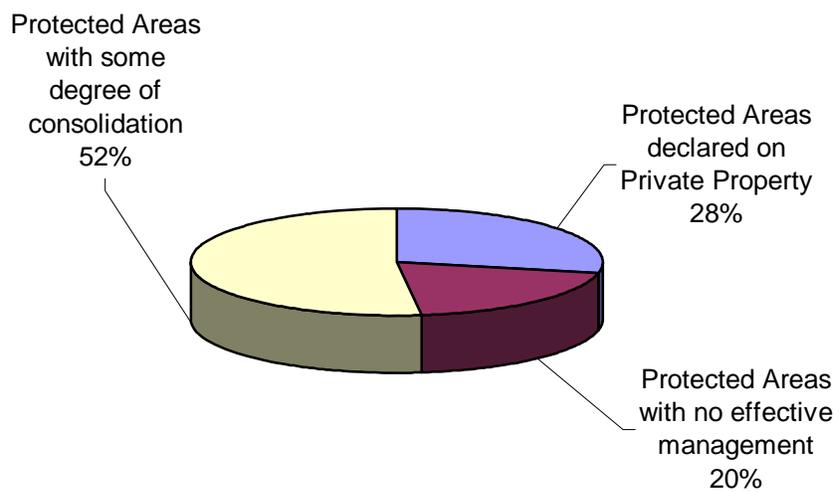
Private Protected Areas

NOMBRE DEL ÁREA	CATEGORÍA DE MANEJO	SUB-SISTEMA	SUPERFICIE (há)
Bosque Mbaracayú	Reserva Natural	Privado	64.405
Arroyo Blanco	Reserva Natural	Privado	5.714
Morombí	Reserva Natural	Privado	25.000
Ypetí	Reserva Natural	Privado	13.592
Total Private Subsystem			108.711

Special Areas

NOMBRE DEL ÁREA	CATEGORÍA DE MANEJO	DE	SUB-SISTEMA	SUPERFICIE (há)
Mbaracayú	Refugio Biológico		Itaipú	1.436
Limoy	Refugio Biológico		Itaipú	13.396
Itabó	Refugio Biológico		Itaipú	17.879
Pikyry	Refugio Biológico		Itaipú	1.109
Tatí Yupí	Refugio Biológico		Itaipú	1.915
Carapa	Refugio Biológico		Itaipú	2.575
Isla Yacyretá	Refugio Vida Silvestre		Yacyretá	8.345
Total Superficie Actual del SINASIP				46.655

Original Data: Proyecto de Actualización del Plan Estratégico del SINASIP, PAR98/G33 - SEAM. 2003



Situation of the Public Protected Areas System (% of total system)
Adapted from Ferreiro, F. Fragano, F. and Ugarte, E. 2004