# Biodiversity Vision for the

# Upper Paraná Atlantic Forest Ecoregion

THIS PUBLICATION IS A SYNTHESIS OF THE DOCUMENT:
DI BITETTI, M.S; PLACCI, G; Y DIETZ, L.A. 2003.
**A BIODIVERSITY VISION FOR THE UPPER PARANÁ ATLANTIC FOREST ECOREGION:**
DESIGNING A BIODIVERSITY CONSERVATION LANDSCAPE AND SETTING PRIORITIES FOR CONSERVATION ACTION. WASHINGTON, D.C., WORLD WILDLIFE FUND

4 What is an ecoregion?

5 Biodiversity Vision

6 Upper Paraná Atlantic Forest Ecoregion

9 Valuable natural heritage

10 Human occupation in Upper Paraná

12 Causes of degradation

14 Crafting the Vision

16 Biodiversity Conservation Landscape

22 Everyone's participation is essential

25 Good examples

26 Everyone wins with environmental conservation

# Introduction

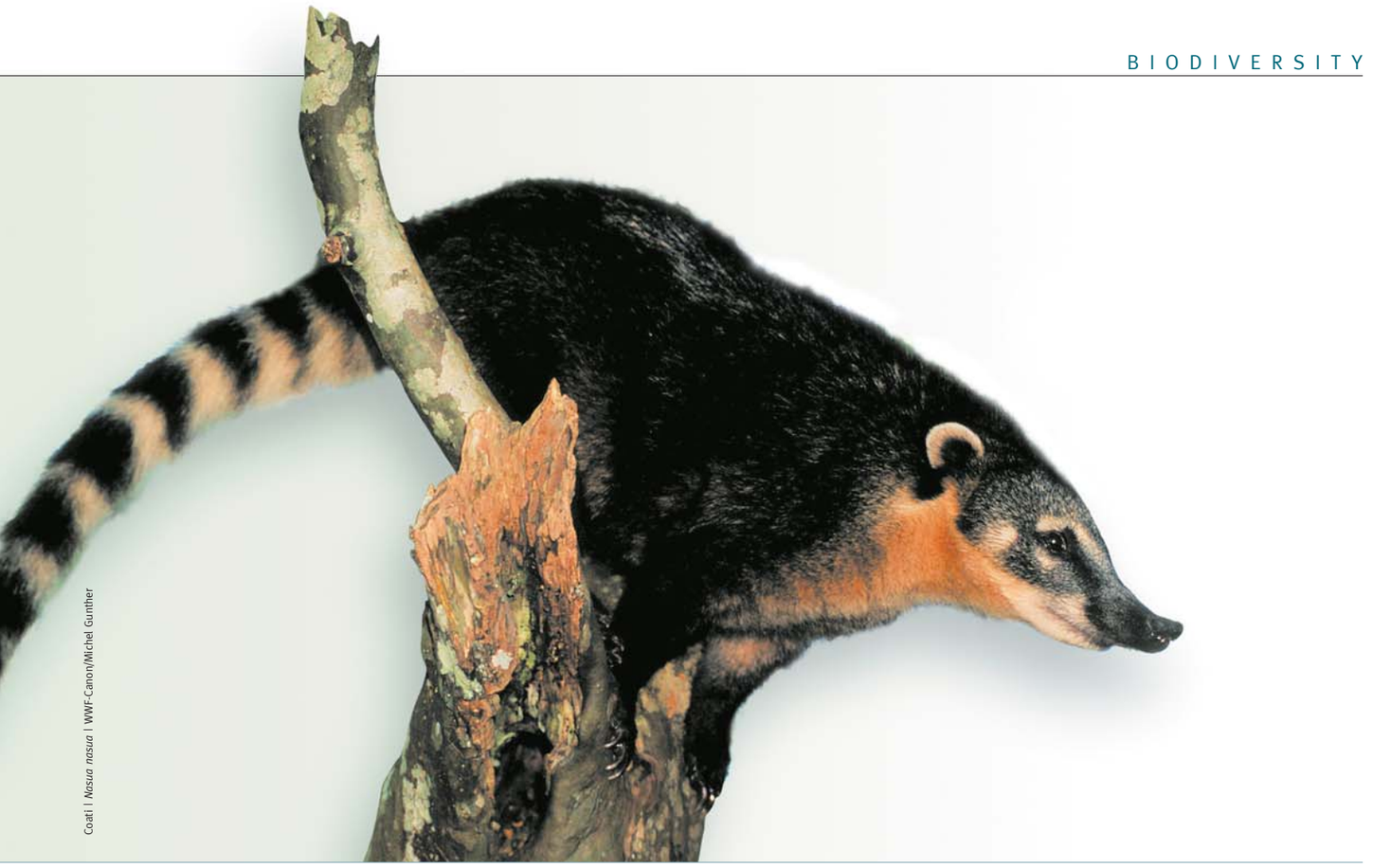
IN ADDITION TO BEING ECONOMIC AND CULTURAL PARTNERS, ARGENTINA, BRAZIL, AND PARAGUAY HAVE ANOTHER COMMON BOND: THE PARANÁ RIVER THAT FLOWS BETWEEN THE BORDERS OF THE THREE COUNTRIES AND IS RIGHT IN THE HEART OF THE UPPER PARANÁ ATLANTIC FOREST ECOREGION. THIS ECOREGION ONCE HAD THE LARGEST EXTENT OF FOREST COVER OF THE ATLANTIC FOREST, BUT TODAY IT IS HIGHLY DEFORESTED AND FRAGMENTED. HOWEVER, IT STILL HARBORS A MAGNIFICENT VARIETY OF FLORA AND FAUNA, MANY OF WHICH ARE ENDEMIC (OCCURRING NOWHERE ELSE IN THE WORLD).

In 1995, 1997, and 1999, meetings were held that brought governmental and non-governmental organizations together with higher education and research institutions, and resulted in the creation of a **Tri-national Initiative for the Conservation and Sustainable Development of the Upper Paraná Atlantic Forest**. An agreement was reached to create a transboundary Green Corridor that would ensure conservation of the biodiversity and environmental services in the ecoregion. To contribute to the planning of such corridor, WWF and its associate Fundación Vida Silvestre Argentina coordinated a multi-disciplinary study in the three countries entitled A Biodiversity Vision for the Upper Paraná Atlantic Forest Ecoregion. Developed jointly with over 30 governmental and non-governmental organizations that act in the region, the Vision presents a diagnosis of the current situation and proposes a set of actions to be implemented for the conservation of what remains of the forest, restoring the quality of the landscape and environmental services, and promoting the sustainable use of natural resources.

Lack of safe drinking water, climate changes, floods, droughts, blackouts, and infestation of insects and diseases in crops are some of the consequences of the destruction of the environment in the region. The Biodiversity Vision is a voyage into the future and an invitation to reconsider our relationship with nature. Although taking a long-term view, this inspiring Vision also proposes immediate actions. If you are not already involved, we invite you and your institution to incorporate them in your daily activities.

The proposed long-term ecoregional plan is an indispensable instrument in support of local economies towards a real sustainable development. Joint actions carried out by the three countries can also enrich cultural relations and magnify results that could not be achieved independently.

We hope that the Biodiversity Vision becomes a useful tool for planning, land use zoning, and implementation of appropriate actions in the ecoregion.



Coati | *Nasua nasua* | WWF-Canon/Michel Gunther

# Biodiversity Vision

THIS BIODIVERSITY VISION, RESULTING FROM THE CONSENSUS OF MANY GOVERNMENTAL AND NON-GOVERNMENTAL ORGANIZATIONS, IS A BLUEPRINT FOR HOW THE UPPER PARANÁ ATLANTIC FOREST SHOULD LOOK IN THE NEXT 50 OR 100 YEARS IN ORDER TO CONSERVE THE BIODIVERSITY, MAINTAIN ENVIRONMENTAL SERVICES, AND FURTHER ENHANCE THE SUSTAINABLE DEVELOPMENT OF ITS INHABITANTS. IT IS A DREAM THAT SHOULD INSPIRE AND GUIDE THE ACTIONS OF ORGANIZATIONS THAT WORK IN THE ECOREGION, AND IS BEGINNING TO BE REALIZED THROUGH THE DISSEMINATION OF THIS DOCUMENT AND THE VARIOUS ONGOING INITIATIVES CONTRIBUTING TO ITS IMPLEMENTATION.

The Vision consists of three basic components. The first is a diagnosis of the current situation. The second is a set of analyses that identify appropriate land uses that maintain environmental services and promote biodiversity conservation. And last but not least, the Vision has an Action Plan to reach this dream.

The centerpiece of the Vision is the Biodiversity Conservation Landscape that spans the three country borders and is illustrated in a map. This map represents the future landscape components necessary to achieve the Vision, and is intended to aid in prioritizing actions and establishing specific targets to achieve best results.

Lou Ann Dietz/WWF

Ecoregional scale analyses and planning are the basis for the establishment of conservation priorities. Although most actions will take place locally, it is necessary to act on a global or regional scale. Otherwise, we stand to lose the biological, social, or economic context essential for local actions to result in enduring conservation.

The Vision is a tool that can and should help us plan and monitor far-reaching conservation actions. **However, the Vision and Action Plan will only be useful if they are continually monitored, adapted, negotiated, updated and shared among all stakeholders in the ecoregion**.

# What is an ecoregion?

**ECOREGIONS** ARE RELATIVELY LARGE UNITS OF LAND OR WATER THAT CONTAIN A DISTINCT ASSEMBLAGE OF NATURAL COMMUNITIES SHARING A LARGE MAJORITY OF SPECIES, DYNAMICS, AND ENVIRONMENTAL CONDITIONS. THE MOST IMPORTANT EVOLUTIONARY AND ECOLOGICAL PROCESSES RESPONSIBLE FOR THE CREATION AND MAINTENANCE OF BIODIVERSITY TAKE PLACE IN THE ECOREGIONS. AS A LOGICAL COMPLEX OF INTER-RELATED BIOLOGICAL COMMUNITIES, ECOREGIONS PRESENT THE IDEAL SCALE TO CARRY OUT REPRESENTATION ANALYSES THAT TELL US WHETHER OR NOT ALL POSSIBLE COMBINATIONS OF COMMUNITIES ARE ADEQUATELY REPRESENTED IN OUR CONSERVATION STRATEGY. FOR THESE REASONS, WWF AND ITS PARTNERS HAVE CHOSEN ECOREGIONS AS THE BEST UNITS TO PLAN AND DEVELOP CONSERVATION ACTIONS.

UNITE TO CONSERVE LIFE
UNIR PARA CONSERVAR A VIDA
UNIR PARA CONSERVAR LA VIDA
I MBOJOAJU, ÑEÑANGAREKO HAGUÃ TEKOVEREHE

# The Upper Paraná Atlantic Forest Ecoregion

THE ATLANTIC FOREST BIOME IS COMPOSED OF 15 ECOREGIONS EXTENDING FROM THE STATES OF CEARÁ AND RIO GRANDE DO NORTE, ON THE NORTHEAST COAST OF BRAZIL, TO THE STATE OF RIO GRANDE DO SUL. FROM THE COAST OF BRAZIL, IT EXTENDS INTO EASTERN PARAGUAY AND INTO THE PROVINCE OF MISIONES IN THE NORTHEAST OF ARGENTINA. DESPITE COVERING SUCH LARGE EXTENSION, THE ATLANTIC FOREST IS AMONG THE MOST ENDANGERED RAINFORESTS IN THE WORLD, CURRENTLY WITH ONLY ABOUT 7.4 PERCENT OF ITS ORIGINAL COVER STILL REMAINING.

The Southwestern portion of the Atlantic Forest forms the Upper Paraná Atlantic Forest Ecoregion, the focus of this study. Of the 15 ecoregions comprising the complex, the Upper Paraná Atlantic Forest once covered the largest area (471,204 km2 originally), stretching from the western slopes of Serra do Mar, Brazil, to eastern Paraguay and northeastern Argentina. This area was covered with a continuous forest with high fauna and flora diversity, forming a variety of communities.

Source: SOS Mata Atlântica, Fundación Vida Silvestre Argentina and Fundación Moisés Bertoni /Dirección de Ordenamiento Ambiental (DOA) /Carrera de Ingeniería Forestal de Paraguay

Blue manakin | *Chiroxiphia caudata* | Jose & Adriana Calo

# Biodiversity

Despite all the threats it has faced, especially in the past two centuries, the Upper Paraná Atlantic Forest Ecoregion still contains some of the largest remaining blocks of Atlantic Forest, and harbors an important biodiversity that must be preserved.

Among the wildlife inhabiting these forests, of special note are top predators such as harpy eagles, crested eagles, jaguars, pumas, and ocelots. Other mammal species include tapir, brocket deer, coati, peccaries and monkeys.

Approximately 500 species of birds are found in the Upper Paraná Atlantic Forest, including five species of toucans. A large variety of reptiles and amphibians are also found here such as caimans, turtles, and boas, including endemic species of the genus *Bothrops*. There are lizards, amphibians such as the *Bufo crucifer* toad, and frogs including the *Osteocephalus langsdorffii*, *Hyla faber* and *Phyllomedusa tetraploidae*.

A number of animals in the region are endangered or threatened, including the giant river otter, the black lion tamarin, the black-fronted piping guan, the solitary tinamou, the Brazilian merganser, the vinaceous breasted parrot, the bare-throated bellbird, and the harpy eagle. Other species are distributed in very limited areas, thus leading to a local endemic population. The black lion tamarin (*Leontopithecus chrysopygus*), for example, is restricted to a small area in the western portion of the state of São Paulo, and the Urugua-í frog (*Crossodactylus schmidti*) is found only in a small area in Misiones, Argentina.

The National Parks of Iguazú (Argentina) and Iguaçu (Brazil) are among the best-studied areas in the ecoregion, with 460 species of birds and over 250 species of trees recorded. In the Iguazú National Park alone, 85 different orchids have been recorded, representing about one third of species known in all Argentina.

## Vegetation

The predominant vegetation in the Upper Paraná Atlantic Forest is semi-deciduous forest - a type of vegetation in which some trees shed their leaves during the dry season. There are over 300 species of trees in the ecoregion, many of which have a high timber value. Most of the remaining forests have been cleared or exploited for timber and some are secondary growth forests recovering from deforestation. Among the existing trees in the region we may highlight the peroba rosa (*Aspisdosperma polyneuron*), the cedro (*Cedrela fissilis*), the guatambú (*Balfourodendron riedelianum*), the cabriúva (*Myrocarpus frondosus*), the jacarandá (*Jacaranda micrantha*), the ipês (*Tabebuia ipe*), the marmelero (*Ruprechtia laxiflora*), the laurels of the genus *Ocotea* and *Nectandra*, the palmito (*Euterpe edulis*), the yerba mate (*Ilex paraguariensis*) and the timbó (*Enterolobium contortisiliquum*). Variations in the local environment and soil types allow for the occurrence of different plant communities - gallery forests, bamboo forests, and palm forests.

## Bodies of Water (rivers, lakes, ponds, headwaters...)

The forests of this ecoregion also play an important role in the conservation of rivers and their tributaries. Approximately 300 species of fish share these bodies of water with a variety of vertebrate and invertebrate aquatic animals, making this ecoregion one of the highest in freshwater species diversity.

Providing habitat for these species, this natural heritage is situated near one of the largest groundwater reservoirs in the world - the Guaraní Aquifer. This aquifer extends over 1.2 million km$^2$ including the central western region of Brazil, eastern Paraguay, northeastern Argentina, and the central west of Uruguay.

Despite the large surface water reserve, the drinking water supply in this heavily-populated region is increasingly dependent on the groundwater from the aquifer. Serious problems could result in the future if exploitation is not conducted sustainably, or if the waters become polluted.

Jose & Adriana Calo

*The Atlantic Forest diversity is a valuable source of food, medicine, fibers, and other resources.*

WWF-Canon/Michel Gunther

# Valuable natural heritage

THE ATLANTIC FOREST IS AMONG THE MOST BIOLOGICALLY DIVERSE ECOREGIONS IN THE WORLD. BESIDES BEING THE NATURAL HABITAT OF RARE SPECIES, THE REMAING ATLANTIC FOREST IS DIRECTLY RELATED TO THE QUALITY OF LIFE OF ITS INHABITANTS. THE FOREST IS VITAL FOR THE PROTECTION OF HEADWATERS, ENSURING THE SUPPLY OF FRESH WATER ESSENTIAL TO OUR SURVIVAL. THE FORESTS ALSO PREVENT SOIL EROSION AND THE SILTATION OF RIVERS, AND PROVIDE THE NECESSARY ENVIRONMENTAL CONDITIONS FOR BOTH URBAN AND RURAL LIVELIHOODS.

In Brazil alone, the Atlantic Forest is the water reservoir for nearly three quarters of its population. A large portion of the hydroelectric power consumed in Argentina, Brazil, and Paraguay is produced in Atlantic Forest rivers, especially in the Upper Paraná, where one finds three of the largest power plants in the world — Porto Primavera, Itaipú and Yacyretá. The Atlantic Forest diversity is an extraordinary source of foods, medicines, fibers, and other resources.

**Iguassu Falls -** The Upper Paraná Atlantic Forest Ecoregion is the setting for one of the most spectacular sights in nature: the Iguassu Falls on the border between Argentina and Brazil. Fifteen km before joining the Paraná River, the Iguassu River flows over uneven land, hurling down approximately 275 waterfalls that average 65 meters in height and are 2,700 meters wide. This natural phenomenon attracts about one million tourists every year. One of the most beautiful waterfalls is in the "Devil's Throat", at almost 80 meters in height.

Situated in the very heart of the ecoregion, both National Parks – the Iguazú in Argentina, and the Iguaçu in Brazil – have been declared UNESCO Natural World Heritage sites. Such a designation is a tribute that not only recognizes the natural value of the sites, but also the commitment of governments and communities to preserve them. UNESCO's recognition helps to promote ecotourism that can provide benefits to the local population.

# Human occupation in Upper Paraná

ACCORDING TO ARCHEOLOGICAL STUDIES THAT DATED STONE TOOLS, HUMAN PRESENCE IN THE UPPER PARANÁ ATLANTIC FOREST BEGAN SOME 11,000 YEARS AGO. WHEN THE SPANISH AND THE PORTUGUESE EXPLORERS ARRIVED ABOUT 1500 A.D., INDIGENOUS PEOPLES INHABITED THE REGION, MAINLY OF THE GUARANÍ ETHNIC GROUP, WHO LIVED IN COMMUNITIES WITH AN ECONOMY BASED ON SMALL FARMING, HUNTING, AND GATHERING OF NATURAL PRODUCTS DIRECTLY FROM THE ENVIRONMENT. THESE NATIVE AMERICANS LIVING IN LOW TO MEDIUM DENSITIES HAD AT MOST A MODERATE IMPACT ON THE ENVIRONMENT. HOWEVER, WITH THE ARRIVAL OF THE EUROPEANS IN THE 16TH CENTURY, THE PACE OF TRANSFORMATION OF THE ENVIRONMENT ACCELERATED GREATLY.

As the first part of Brazil to be colonized by the Portuguese, the Atlantic Forest has developed into the population center of the country. Currently, three quarters of the Brazilian population of 170 million live in the Atlantic Forest, and 80% of the GNP - the 8th largest economy of the world - exists in the region.

The deforestation process that initiated with the colonization of Argentina, Brazil, and Paraguay increased drastically in the last two centuries, especially due to the expansion of agriculture into the western region of Brazil - coffee in the 19$^{th}$ century, and wheat, soy, sugar cane and oranges in the 20$^{th}$ century. Industrial activities in the 20$^{th}$ century, mainly for steel production, promoted the growth of fuel wood consumption. In addition, pine and eucalyptus plantations, as well as other forest monocultures for the production of paper, charcoal and other wood products, replaced huge areas of native forest.

Aníbal Parera/FVSA

Those activities had a serious impact on the Upper Paraná Atlantic Forest, reducing it to just over 7% of their original area. In Brazil, as little as 2.7% of native forest remains, and outside of protected areas there is practically none left.

Human occupation in Argentina and Paraguay began later than in Brazil, and deforestation of large areas took place only in the past two decades. In Paraguay, this was mainly driven by the development of large-scale soy cultivation and the increase in the number of small farms. In the province of Misiones in Argentina, this process was mainly due to timber extraction and plantations of yerba mate, an endemic plant used to prepare tea. In Argentina, approximately 1,123,000 ha of remaining natural forests form a continuous corridor covering a large portion of the province of Misiones.

# Demographic characteristics of the ecoregion

**Brazil**
**Population:** approximately 25 million people, 18.6 million living in urban areas and 6.4 million in rural areas.
**States:** Goiás, Mato Grosso do Sul, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, and São Paulo.
**Municipalities:** 1,374

**Paraguay**
**Population:** 2.5 million equally distributed between urban and rural areas.
Departments: Alto Paraná, Amambay, Caaguazú, Caazapa, Concepcion, Canindeyu, Itapua, Guaira, Paraguary and San Pedro.
**Municipalities:** 123

**Argentina**
**Population:** 965,000, with 680,000 living in urban areas and 285,000 in rural areas
**Province:** Misiones, divided into 75 municipalities.

Paulo Backes

Aníbal Parera/FVSA

# Indigenous communities

**Argentina -** In the province of Misiones there are 76 indigenous communities of the Mbyá-Guaraní ethnic group. The majority of these communities face land tenure problems and very few maintain their traditions (growing their own crops and hunting wild animals). Many of them now live off the sale of handicrafts and orchids.

**Brazil** - Today, the indigenous population in the region is much reduced. Most live on small rural properties and few still speak their original language. The majority of the indigenous population in Brazil belong to the Guaraní ethnic group, although there are still populations of Guaraní Nhandeva, Kaingang, Xokleng, Pankararu, and Terena.

**Paraguay -** In Paraguay there are 184 indigenous communities of the Paî Tavyterâ, Mbyá, Avá Guaraní, all belonging to the Guaraní linguistic family, and Ache groups. Many of them were confined to small urban spaces after being expelled from their territories that were then converted to agriculture land. The indigenous communities still practice hunting and gathering in the remaining forests.

In all three countries, the traditional relationship between indigenous communities and the forest is being lost, and together with it the cultural identity and opportunities for sustainable development. Importantly, these communities could play a valuable role in the implementation of the Biodiversity Vision and their participation is a key element in achieving the proposed conservation goals.

WWF-Canon/Michel Gunther

# Causes of degradation

**AGRICULTURE AND RANCHING** - AGRICULTURAL EXPANSION AND CATTLE RANCHING HAVE CONVERTED LARGE EXTENSIONS OF NATIVE FOREST INTO CROPLAND AND PASTURE. THIS INCLUDES BOTH ANNUAL CROPS SUCH AS SOYBEAN, SUGAR CANE, CORN, WHEAT, COTTON, AND TOBACCO, AS WELL AS PERENNIAL CROPS SUCH AS COFFEE, YERBA MATE AND EUCALYPTUS. THE USE OF PESTICIDES POLLUTES THE SOIL AND WATER, AND POSES A SERIOUS THREAT TO PEOPLE AND TO THE LOCAL FAUNA AND FLORA. AGRARIAN REFORM SETTLEMENTS IN STANDING FORESTS IS A VERY COMPLEX AND SENSITIVE SOCIAL ISSUE THAT CAN BENEFIT FROM THE TOOLS OFFERED BY THIS VISION THROUGH THE MITIGATION OF THEIR IMPACTS AND INCENTIVES FOR SUSTAINABLE ACTIVITIES.

Aníbal Parera/FVSA

Aníbal Parera/FVSA

**Infrastructure -** Certain infrastructure projects also threaten the biodiversity, including the construction of the many dams in the ecoregion. Besides flooding large areas of native forest, dams change the dynamics of the rivers, increase forest fragmentation, and reduce fauna and flora dispersal between the opposite sides of the newly-formed reservoirs. They also prevent fish from migrating upstream to reproduce. Moreover, the changes brought by such construction could cause the proliferation of diseases such as dengue fever and schistosomiasis.

**Illegal hunting -** With the exception of a few species for which it is allowed and regulated, hunting is prohibited by law in all three countries. However, illegal hunting is a widespread practice in the region, resulting in the extinction of local species and the alteration of the forest dynamics. Other possible consequences include the extinction of species that perform an important role in seed dispersal, or the multiplication of herbivores previously preyed upon by hunted species, thus resulting in a shortage of their food supply. Hunting wildlife also reduces the chances of a more attractive ecotourism experience.

**Unsustainable exploitation -** Predatory and unsustainable exploitation of native forests is another cause of degradation of the Atlantic Forest. Remaining forests are being logged not only for construction and furniture making, but for firewood as well. In the states of Santa Catarina and Paraná, the majority of the rural population uses firewood or charcoal for heating, cooking, and drying food. Firewood derived from secondary forests is used for drying yerba mate in the province of Misiones and tobacco in Paraná and Santa Catarina. However, opportunities do exist to develop economic activities that are based on sustainable use of the forest, and these should be pursued in the context of this Vision.

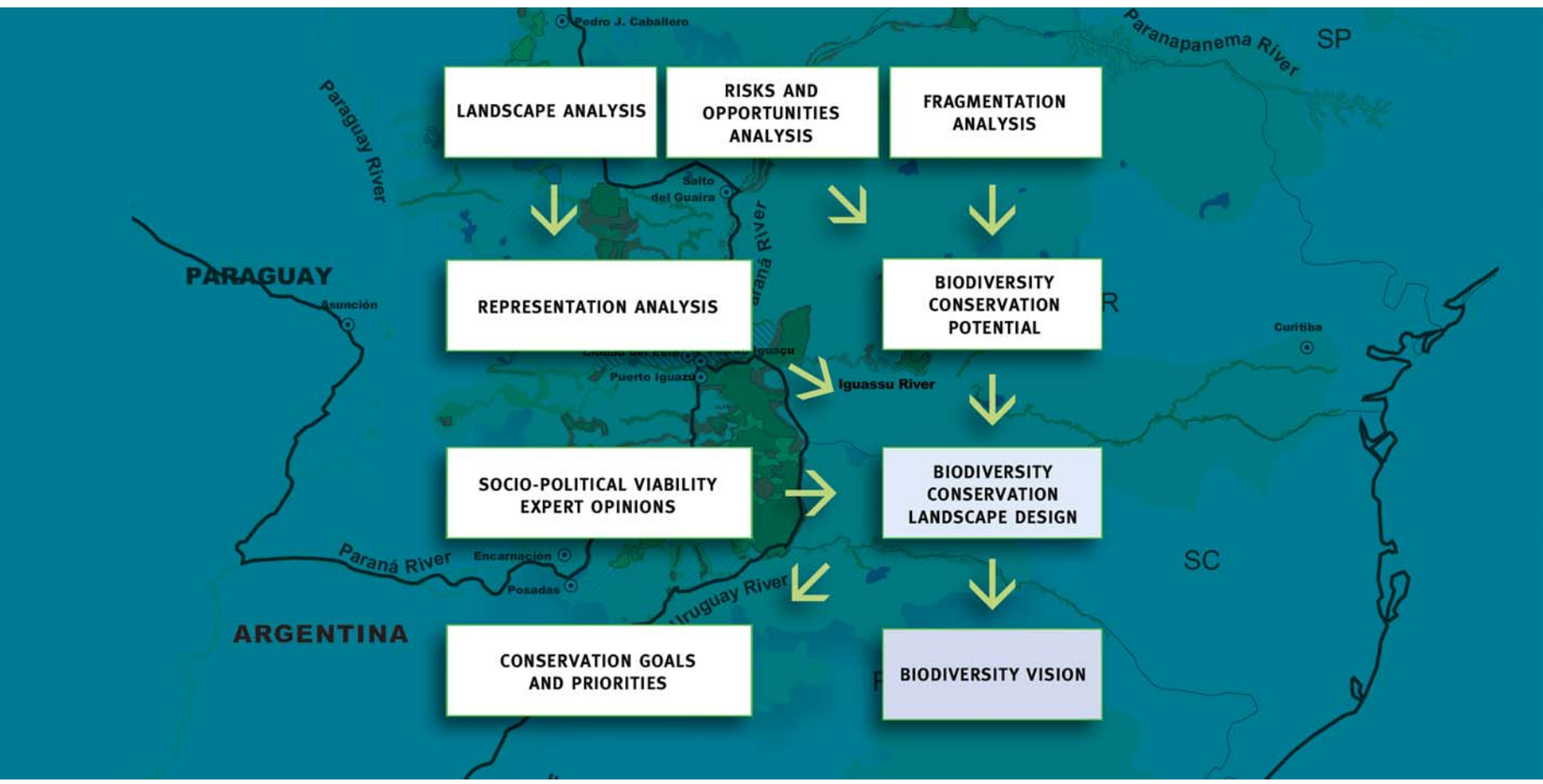
# Crafting the Vision

JOINT EFFORTS BY ALL THREE COUNTRIES WERE FUNDAMENTAL IN DESIGNING THE BIODIVERSITY VISION OF THE UPPER PARANÁ ATLANTIC FOREST ECOREGION. NEARLY 30 PARTNER INSTITUTIONS CONTRIBUTED IMMENSELY THROUGH THEIR PARTICIPATION IN DISCUSSIONS AND SHARING OF INFORMATION.

The Vision was developed with the aim to achieve over the next 50 years the following goals:

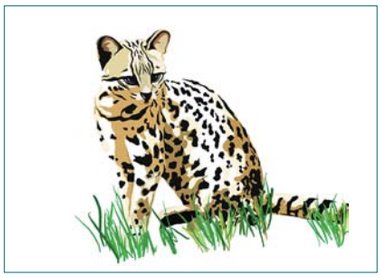
- Conserve blocks of natural forest extensive enough to be **resilient** to environmental changes.
- Maintain **viable populations** of all native species in their natural patterns of abundance and distribution and with the genetic diversity necessary to meet environmental challenges.
- Maintain **ecological processes** and selective factors characteristic of the ecoregion.
- Ensure the **representation** of all native biological communities across their natural range of variation within the Conservation Landscape.

## The process of developing the Vision



Three separate but interdependent analyses culminated in the design of the Biodiversity Conservation Landscape. As a first step, the landscape units were identified, followed by identification of the native forest fragments that have the greatest potential to achieve conservation goals, and finally an analysis of risks and opportunities was conducted.

Resulting from these analyses, large blocks of resilient forest were identified. It was then determined how many of these were represented in existing protected areas, and finally, it was established where the greatest opportunities and lowest risks existed. A proposal was designed for how each type of land use should be distributed in order to contribute to biodiversity conservation and maintaining environmental services.

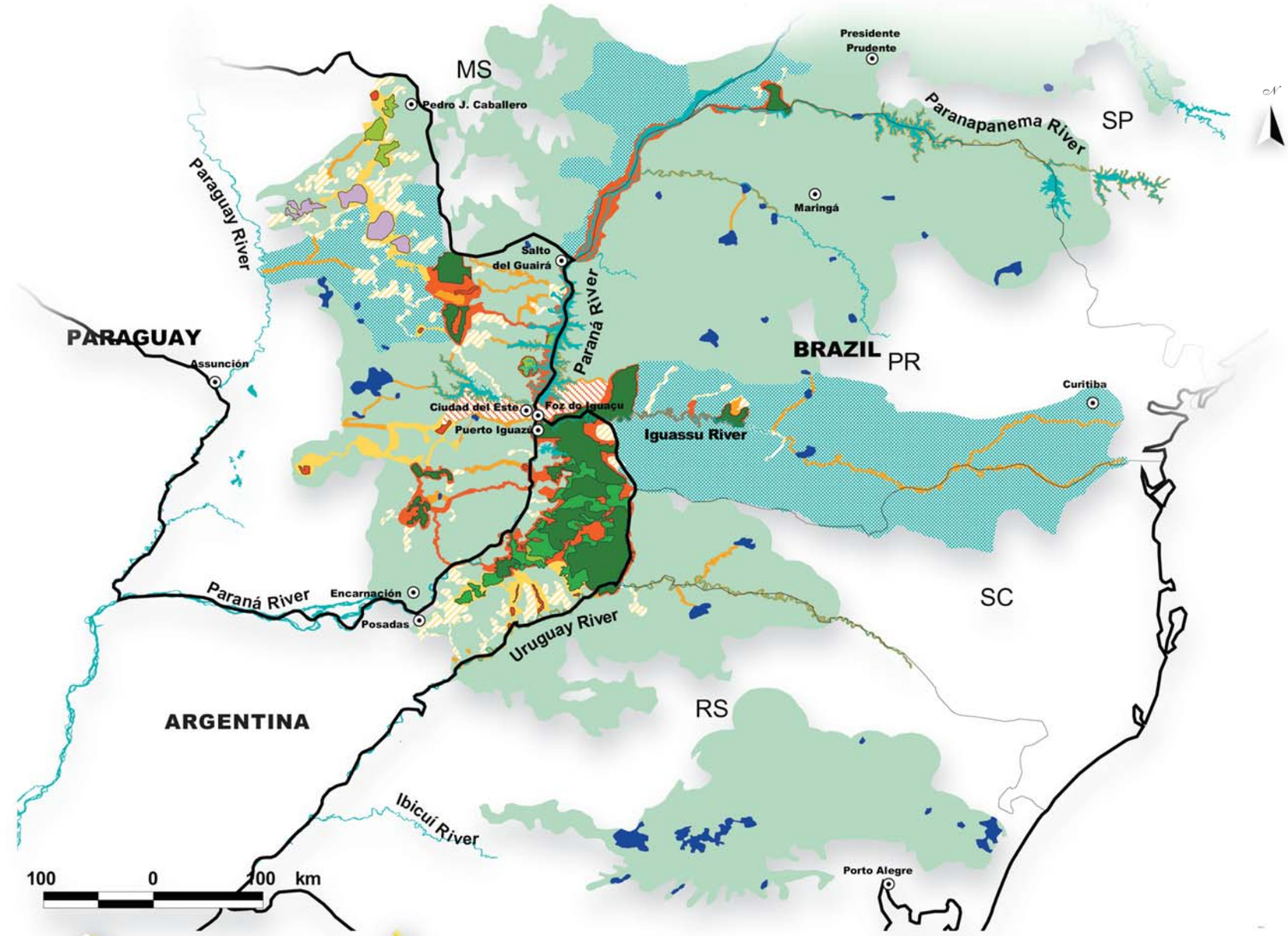


**Landscape Unit:** an area that contains a set of species, communities, or ecological processes that differ from other such units. Frequently, each landscape unit has its own characteristic climate, soil type, and group of species. Thus, to ensure a good representation of the full range of species and natural communities in the ecoregion, it is necessary to conserve representative portions of each landscape unit.

**Analysis of risks:** distance from cities, types of agricultural and cattle ranching practices, and density of rural population.

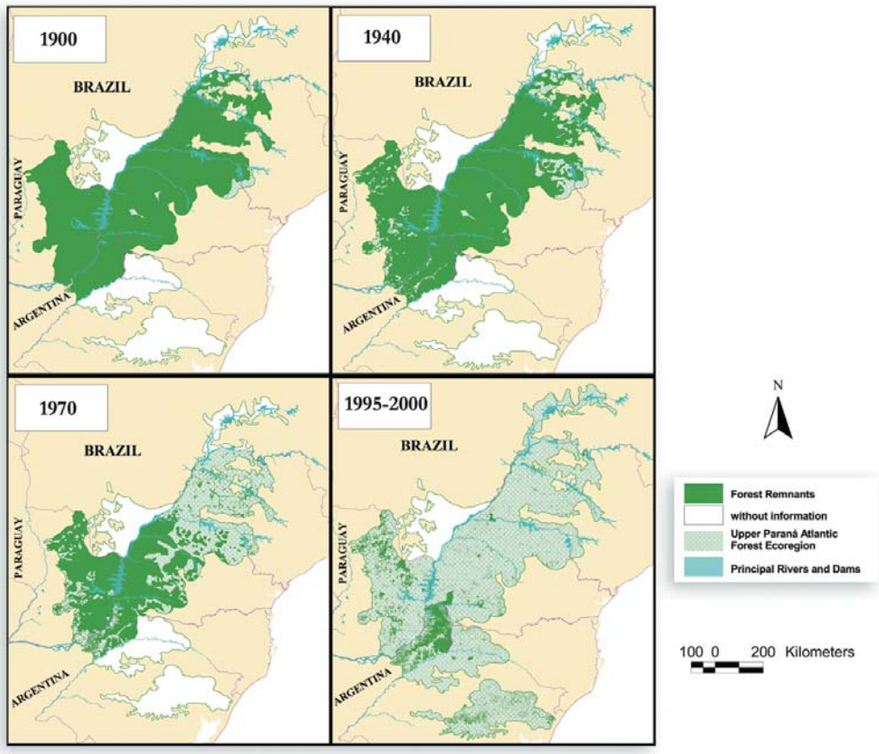
**Analysis of opportunities:** proximity to a protected area, proximity to a river (in this ecoregion, rivers form potential biological corridors), and where sustainable land use plans exist.

# Biodiversity Conservation Landscape



- CORE AREAS
- AREAS WITH HIGH CONSERVATION POTENTIAL
- POTENTIAL CORE AREAS
- FORESTED AREAS THAT NEED ASSESSMENT
- SATELLITE AREAS
- MAIN CORRIDORS
- SECONDARY CORRIDORS
- LATERAL EXPANSION CORRIDORS
- POTENTIAL CORRIDORS
- AREA NEEDING A CORRIDOR
- ISOLATED AREAS
- PRIORITY RIVER BASINS

*The jaguar, the harpy eagle, the giant river otter, and the white-lipped peccary are considered umbrella species. Without sufficient space to live, their populations are being reduced and they could disappear completely.*




THE MAP OF THE FOREST COVER OF THE UPPER PARANÁ ALTANTIC FOREST ECOREGION SHOWS THE DEGREE AND THE SPEED OF THE DESTRUCTION AND FRAGMENTATION PROCESSES THAT ARE TAKING PLACE. THE ANALYSES POINT OUT CERTAIN STEPS THAT CAN BE TAKEN TO REVERSE THIS SITUATION.

The Biodiversity Conservation Landscape is composed of a mosaic of core protected areas that are connected by biological corridors and then surrounded by buffer zones of sustainable use areas where economic and social activities are promoted that are compatible with conservation of natural resources. It is expected that the Biodiversity Conservation Landscape, a product of this Vision, would be capable of maintaining the majority of the existing biodiversity and would also generate new opportunities for sustainable economic development for the local communities, thus conserving and improving their quality of life.

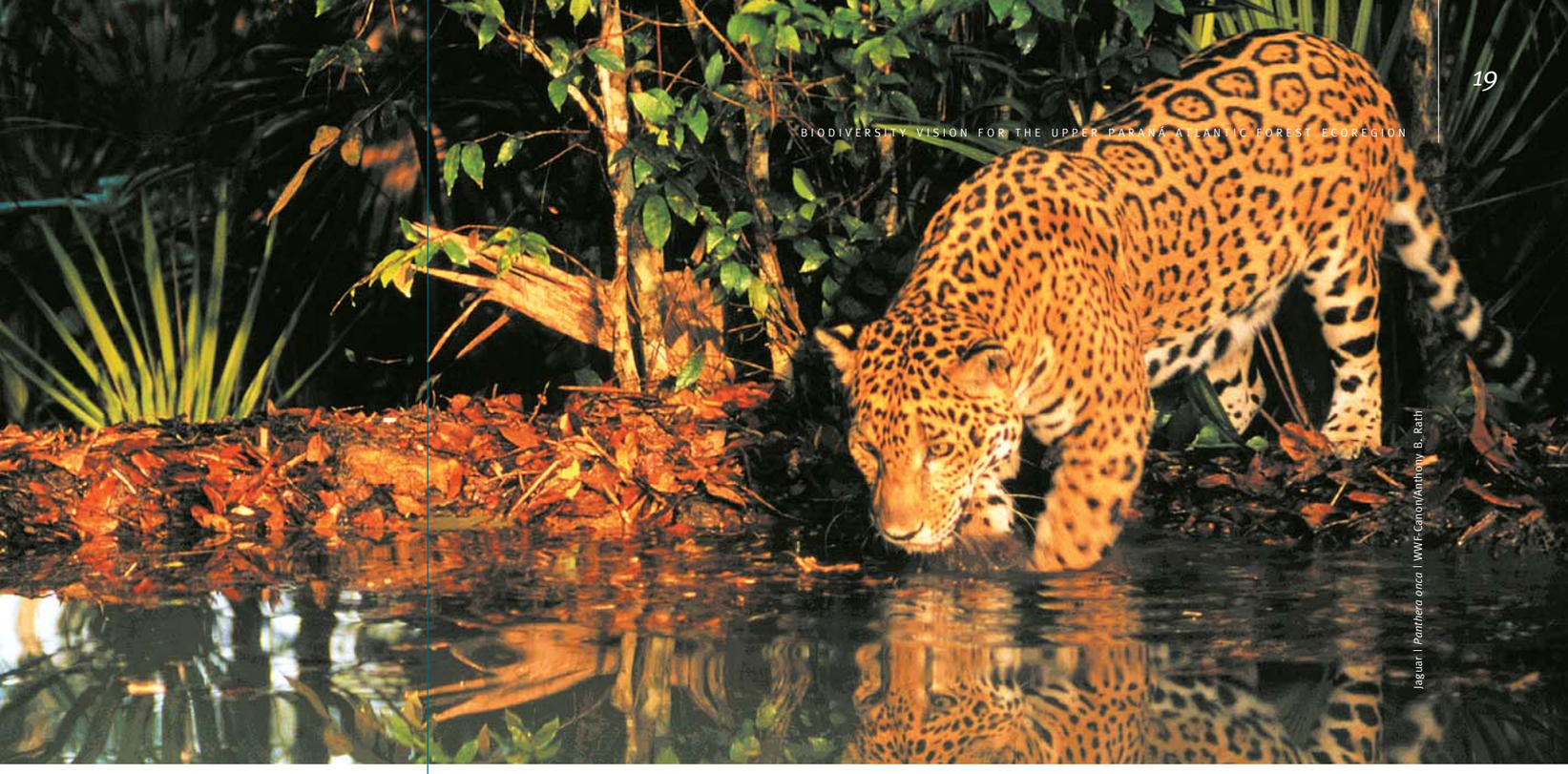
In order to conserve the biodiversity, it will be necessary to implement an efficient system of protected areas, especially in Argentina and Paraguay where large blocks of forest still remain intact. In addition, it is essential to reconnect these areas to facilitate the movement of wildlife and sufficient interchange of genes, pollen, and seeds. By connecting large blocks of forest with biological corridors, it is possible to ensure the survival of currently endangered species that require extensive areas for the maintenance of viable populations. Such is the case of the jaguar, the harpy eagle, the giant river otter, and the white lipped-peccary, all considered umbrella species (**see box next page**). Without adequate space, their population is being reduced and could disappear completely.

UMBRELLA SPECIES ARE THOSE THAT NEED AN EXTENSIVE AREA TO LIVE. THEREFORE, THEY CAN BE USED AS INDICATORS FOR CONSERVATION PLANNING AND FOR MONITORING, CONSIDERING THAT, IF WE ARE ABLE TO PRESERVE VIABLE POPULATIONS OF SUCH SPECIES, WE WILL ALSO CONSERVE SUFFICIENT HABITAT FOR OTHER SPECIES THAT NEED SMALLER AREAS.

To achieve this Biodiversity Conservation Landscape, it is estimated that, in addition to the effective implementation of all existing protected areas, it is essential to create and implement at least 1.28 million ha of strictly protected areas, 4 million ha of sustainable use, and restore 2.6 million ha of forests, incorporating these restored areas into a protected area system or in the formation of corridors.

## Size of area needed to maintain viable populations (approximately 150 individuals) of umbrella species

| | |
|---|---|
| Harpy eagle | 750,000 ha |
| Jaguar | 525,000 ha |
| Tapir | 38,136 ha |
| Deer | 9,574 ha |
| Black lion tamarin | 8,082 ha |
| Coati | 3,680 ha |
| Collared Peccary | 3,621 ha |
| White-lipped peccary | 2,672 ha |



Jaguar | *Panthera onca* | WWF-Canon/Anthony B. Rath

## The Biodiversity Conservation Landscape is composed of three main types of areas:

**A) Priority Areas for Biodiversity Conservation.** The **Core Areas** are the most biologically important and strategic areas for conservation and consist of well-preserved blocks of native forest sufficiently large to be resilient to threats that cause loss of biodiversity. Either public or private, each Core Area should be managed to maintain an area of continuous native forest large enough for the life cycle of umbrella species such as jaguars. Core Areas should be managed as strictly protected areas, and human activities causing negative impacts should be reduced to a minimum. To meet our biodiversity conservation goals, these areas should be connected to other Core Areas through of a network of biological corridors (relatively narrow areas of native forest). There are also **Areas with High Conservation Potential** that meet the requirements to be Core Areas, but there is a chance they will become either strict protection areas or sustainable use areas in the future. The **Potential Core Areas** are those which fulfill only one or two prerequisites to become Core Areas (they are larger than 10,000 ha, and over 60% of the area shows high conservation potential). However, they could become Core Areas in the future if restoration and best management practices are implemented. The **Forest Areas that Need Assessment** are Priority Areas situated within areas in Paraguay with the highest deforestation rate that have probably been reduced to less than 10,000 ha. Updated information on the current status will be required before defining the role of these areas in the Biodiversity Conservation Landscape. And finally, the **Satellite Areas** are areas with high conservation potential but have sizes ranging from 5,000 to 10,000 ha. If they are connected to Core Areas, however, they could play an important role in the conservation of biodiversity.

**B) Strategic Areas for Biodiversity Conservation.** These are composed of a series of smaller areas that, although not resilient enough in isolation, they could play a strategic role in biodiversity conservation by facilitating the implementation of biological corridors or increasing landscape representation. They were divided in two categories according to their location and the role they perform: **Stepping Stones** (located closer than 50 km from a Priority Area), and **Isolated Areas** (situated more than 50 km from the nearest Priority Area).

**C) Sustainable Use Areas.** These are large areas functioning as buffer zones and connections that surround Core Areas, other strictly protected areas, and biological corridors. They maintain the ecological processes, render environmental services, and harbor sustainable economic activities such as ecotourism, agro-silviculture, organic agriculture, and sustainable production of yerba mate, palm heart, timber, and non-timber forest products. Four categories of Sustainable Use Areas were identified: **Main Corridors** (connecting Core Areas), **Secondary Corridors** (linking other Priority Areas to the Main Corridors or to Core Areas), **Lateral Expansion Corridors** (connecting Stepping Stones that are not likely to become Core Areas), and the **Potential Corridors** (alternative corridors when other corridors are not viable, or to connect with other ecoregions).

Additionally, due to the crucial role of the forests in the conservation of water resources, **Priority River Basins** were also identified so that the development of sub-basin management and conservation programs would contribute to the implementation of the Vision. The selection of these river basins was based on various criteria: conservation status of the basin, existence of protected areas, ongoing conservation initiatives, and the potential to connect the Upper Paraná Atlantic Forest to neighboring ecoregions. According to the last criterion, the Iguassu and Jejuí river basins are especially important because they represent potential connections with the Araucaria Forest and the Chaco-Pantanal Ecoregions, respectively.

Jose & Adriana Calo

WWF-Canon/Michel Gunther

## Challenges and opportunities

While blocks of native forest and the work of innumerous governmental and non-governmental organizations represent opportunities for conservation and sustainable development, they also present a special challenge: how to work in concert across the borders of the three countries that have recently endured financial and social crises, that speak different languages, and that have a complex socio-economic and cultural diversity.

*Overcoming these challenges and turning them into real opportunities is a task for those who desire a better life for themselves and for future generations. The result will be the sum of efforts made by each and every community, government, and institution in the three countries.*

Over 28.2 million people inhabit this ecoregion, 20.3 million in urban areas and 7.9 million in rural areas. The decision-making process by governments is equally complex - where important policies for the Atlantic Forest are being developed and implemented by three federal governments, 18 state/province/department governments, and 1,572 municipal governments.

Moreover, to develop a good conservation plan requires not only knowledge of the causes of degradation but their roots that are directly linked to historical, cultural, economic, and social factors. Among such root causes are the social indicators that are critical components of environmental and socio-economic crises: accelerated population growth, illiteracy, lack of economic alternatives, and lack of knowledge of sustainable use practices.

Some existing public policies in the ecoregion represent excellent opportunities for biodiversity conservation and for sustainable development: the existence of over 50 strictly protected areas - 11 of them forming a large continuous block of approximately 340,800 ha; the expansion of the Atlantic Forest Biosphere Reserve in Brazil and the Mbaracayu Biosphere Reserve in Paraguay; the implementation of the Yabotí Biosphere Reserve, in the province of Misiones, Argentina; the creation in 2003 of 13,325 ha of strict protection areas in Paraguay; and the fact that the three countries have laws that protect the forest, water, and soil. Among others, these laws include the Forest Code and a Decree in Brazil that govern the exploitation of the Atlantic Forest, and the Green Corridor Law in Misiones that created a conservation and sustainable development area of over 1,000,000 ha.

UNITE TO CONSERVE LIFE
UNIR PARA CONSERVAR A VIDA
UNIR PARA CONSERVAR LA VIDA
I MBOJOAJU, ÑEÑANGAREKO HAGUÃ TEKOVEREHE

# Everyone's participation is essential

THE WORK CARRIED OUT BY WWF, FUNDACIÓN VIDA SILVESTRE ARGENTINA, AND ALL PARTNER INSTITUTIONS IS A FIRST STEP TOWARDS THE CREATION OF A TRANSBORDER PLAN FOR THE CONSERVATION OF THE UPPER PARANÁ ATLANTIC FOREST ECOREGION. IMPLEMENTATION WILL REQUIRE A SERIES OF ACTIONS AT DIFFERENT TIME FRAMES AND GEOGRAPHIC SCALES. ACTIONS MUST BE COORDINATED AMONG GOVERNMENTAL AND NON-GOVERNMENTAL ORGANIZATIONS AND FROM A VARIETY OF SECTORS IN BRAZIL, PARAGUAY, AND ARGENTINA.

**Land use -** A detailed land use plan is necessary for creating biological corridors and sustainable use areas. New environmentally friendly and economically viable alternatives must be developed. It is essential to develop and promote incentives for the conservation of forests on private lands, and to re-evaluate incentives that contribute to conversion of forests into pastures or agricultural land. Maintaining native forests within the Core Areas requires the implementation of existing protected areas and the creation of others, both private and public.

**Research -** The implementation of many of these activities will require basic and applied research in areas such as forest restoration, economic and biological sustainability of alternative land uses, zoning, and economic instruments that support conservation.

**Mobilizing Society -** The action plan calls for the continuous and active participation of partner institutions through information exchange and capacity building of all members to enrich and strengthen their activities. Large-scale educational campaigns are essential to raise awareness of the importance of the forests, and thus to obtain public support and involvement in conservation and sustainable development activities. Such mobilization will play a key role in compliance with existing environmental laws, the establishment of new ones when needed, the effectiveness of social monitoring, and the implementation of sustainable economic, environmental, and social alternatives.

**Respecting differences -** Due to the differences in each country or region, all conservation actions need to be designed and implemented according to the local social and political realities. Although most actions will take place at a national or regional level within each country, strategic planning, monitoring of threats and conservation results, and the adjustments made based on such results, must be conducted on an ecoregional scale.

# What can you do to help?

This Vision can only be implemented with everyone's active participation. This is how you can contribute:

**Governmental Agencies**

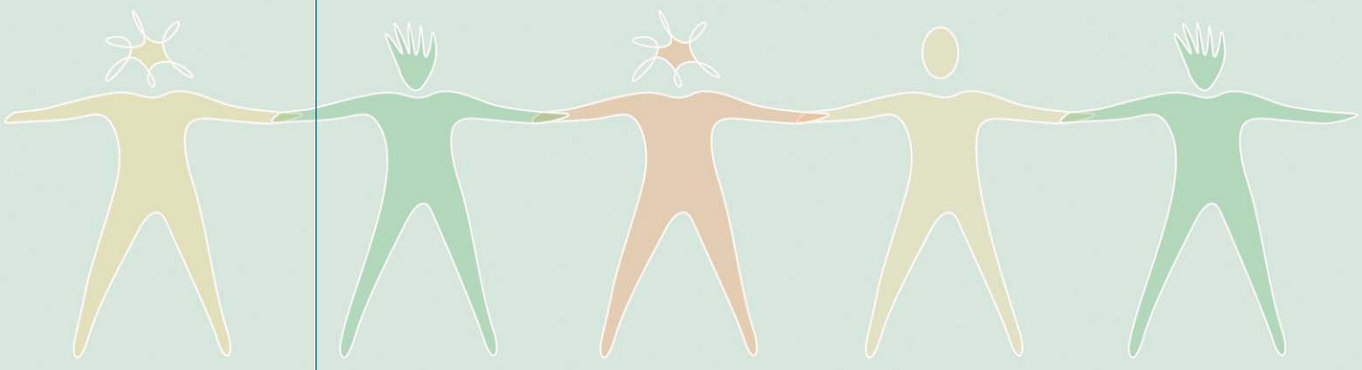
- Incorporate this Vision into public management, linking it to environmental, production, and tourism policies.
- Promote sustainable development incentives in strategic areas identified in this Vision.
- Adequately patrol and enforce laws, and contribute to the environmental education of farmers, fishermen, agriculturists, and those living in settlements.

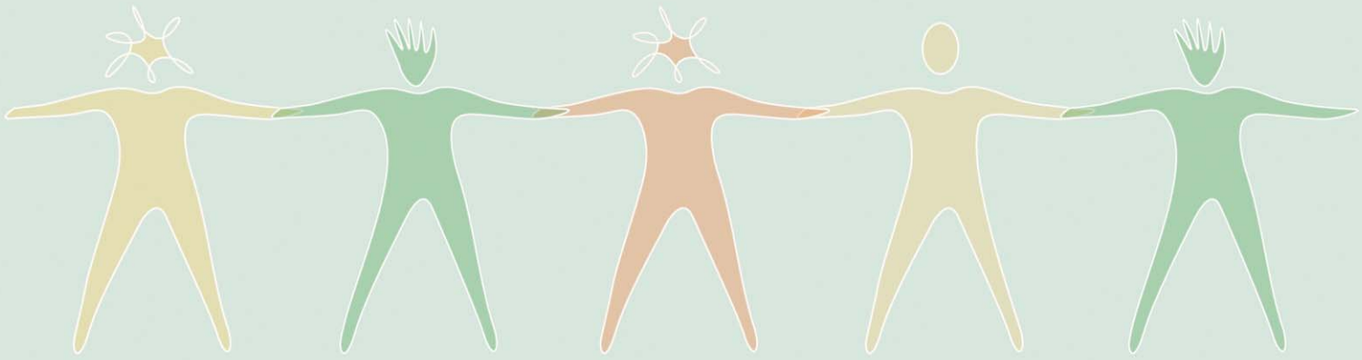
**Rural landowners**

- Comply with current forest and environmental legislation.
- Actively participate in the landscape planning proposed by this Vision, expressing your needs and opinions.
- Avoid the overuse of chemical products, manage soil properly, avoid slash and burn practices and hunting on your land, and adopt the use of ecologically sound agricultural practices.

**Business sector**

- Comply with current forest and environmental legislation.
- Take a lead in sustainable development and environmental and social stewardship, using tools such as a certification process.





**NGOs**

- Report environmental crimes and insist upon effective governmental actions.
- Mobilize communities on the importance of preserving the environment, and promote actions to implement this Vision. Promote environmental education campaigns.
- Conduct research and data collection that contributes to conservation planning and monitoring.

**Educational and research institutions**

- Promote scientific research that contributes to increased knowledge of the importance of forests in the conservation of natural services and human well being.
- Increase awareness in young people of their responsibility to conserve nature.
- Disseminate scientific knowledge, plans, and practices that could contribute to public policies and actions that promote sustainable development and responsible use of natural resources.

**Tourism operators**

- Promote responsible tourism that respects existing legislation; preserves natural areas, minimizes pollution and waste, and supports sustainable development.
- Respect local cultures and give preference to the employment of local inhabitants, encouraging socio-economic development through local tourism.
- Offer tourists information on environmental, cultural, and social issues as an essential aspect of the visit.
- Encourage the use of services, practices, and equipment that cause minimal impact and that are preferably certified.

# Good examples

THERE ARE MANY IMPORTANT ACTIONS THAT DIRECTLY CONTRIBUTE TO THE IMPLEMENTATION OF THIS VISION – AND SOME OF THEM ARE ALREADY UNDERWAY IN THE ECOREGION. THESE INCLUDE:

In the Itabó Reserve, located in the Paraguayan municipality of Francisco Caballero Álvarez, the Chololó SRL Company produces the Guayaki palm heart in a sustainably managed palm forest of 1,000 ha. Organic yerba mate is also produced in the Reserve, cultivated amongst 100-year-old trees. Also in Paraguay, private reserves were created, including Morombi, Arroyo Blanco (2001), Ipetî (2003), and Kai Rague (2004), totaling nearly 46,000 ha. An additional 13,325 ha were declared in 2003 as strict protection areas, and NGOs have incorporated this Vision into their conservation plans.

Lou Ann Dietz/WWF

The Bi-national Itaipú Power Plant provides environmental education to adults and children in both Paraguay and Brazil. It promotes conservation and reforestation actions throughout the area of the reservoir. It also maintains reserves and refuges for species reproduction, totaling 40 thousand ha. In 10 years of operation, the breeding facility has produced 520 offspring of 35 different species. (see www.itaipu.gov.br)

WWF-Canon/Michel Gunther

In Pontal do Paranapanema, in São Paulo, Brazil, NGOs such as the Ecological Research Institute (IPÊ) and the Association in Defense of the Paraná River, Tributaries and Gallery Forest (Apoena), have contributed to the preservation and restoration of remaining forests. These NGOs act in partnership with social movements, governments, universities, environmental agencies, and private entities. IPÊ is notable for its scientific research and professional training, environmental education, income generation programs, and sustainable businesses; Apoena's work includes forest restoration and environmental education in agrarian reform settlements, as well as supporting the implementation of the Transborder Corridor. (www.ipe.org.br and www.apoena.org.br)

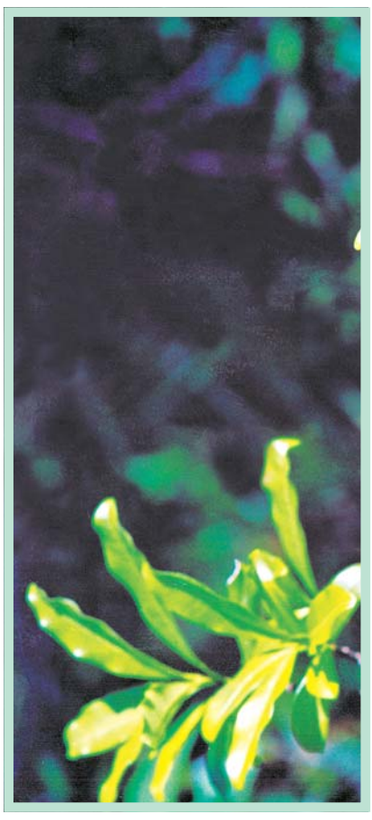
In September 2002, the government of the province of Misiones, Argentina, publicly declared as part of the Master Forest Plan the goal of achieving 100% of timber production under certified sustainable management by 2020. In addition, in December 1999, the Green Corridor Law was enacted, creating a conservation and sustainable use area encompassing over 1 million ha. This was recognized by the WWF Network in 2000 as a "Gift to the Earth". The Law envisions implementation through a financial mechanism and structures that guarantee effective participation by civil society. The private sector is developing a financial mechanism to support conservation activities and sustainable development, independent of the government.

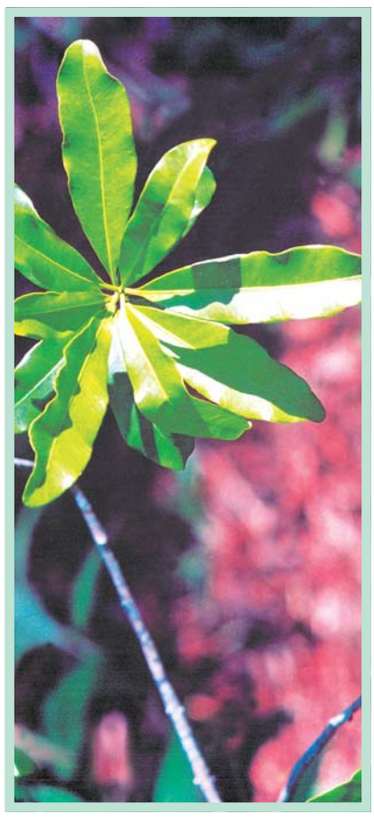
In Brazil, a partnership between the Ministry of Environment, UNESCO, WWF-Brazil, The Nature Conservancy, and Conservation International is pooling resources with support from the UN Foundation, to initiate the **Program for Biodiversity Conservation in the World Natural Heritage Sites in Brazil**. Various actions outlined in this Vision have been incorporated into this Program.

# Everyone wins with environmental conservation

THE IMPLEMENTATION OF THIS VISION CAN GENERATE MANY BENEFITS TO THE INHABITANTS OF THIS ECOREGION. AMONG THEM ARE GOOD WATER QUALITY, MAINTENANCE OF LOCAL CLIMATE, RECREATION AREAS, AND PRESERVATION OF THE BEAUTIFUL SCENERY THAT ONLY NATURE CAN PROVIDE. MOREOVER, AT THE LOCAL LEVEL THE FOREST CAN BE AN IMPORTANT SOURCE OF INCOME, GENERATING JOBS IN ECOTOURISM AND ENVIRONMENTAL EDUCATION ACTIVITIES, AND, WHERE IT IS STILL POSSIBLE, IN AREAS OF SUSTAINABLE MANAGEMENT OF RESOURCES AND CERTIFIED FOREST PRODUCTS. THE DEGRADED FORESTS CAN ALSO PROVIDE APPROPRIATE AREAS FOR FOREST RESTORATION BY UTILIZING NATIVE SPECIES OF FRUIT AND MEDICINAL PLANTS.

Beyond destabilizing the natural systems, the destruction of the forest has direct results in the loss of species and water resources, in contamination of the rivers, and in changes to local weather. By losing genetic and species diversity, we are losing important raw materials for food, for the cure of serious diseases, or for new natural coloring, flavoring, and fibers. Agriculturists can already detect an increase in the infestation of insects and diseases in their crops. In places where there is no "green" left, children have no idea what a forest looks like. All said, it is important that everyone get involved in conservation and responsible management of the Upper Paraná Atlantic Forest Ecoregion.





Paulo Backes

Monkey puzzle tree | *Araucaria angustifolia* | Jose & Adriana Calo

# Acknowledgements

This document is the result of a collaborative effort of the WWF Network with many other institutions and individuals in an ongoing process that began in 1998. We would like to thank the following individuals and institutions for their contributions:

**Financial Support:**
USAID Paraguay, through the Bureau for Economic Growth, Agriculture, and Trade, U.S. Agency for International Development (USAID), under the terms of Award No. LAG-A-00-99-00048-00. Additional support was provided by USAID Brasilia under the terms of Award No. 512-G-00-96-00041. The opinions expressed herein are those of the author(s) and do not necessarily reflect the views of the U.S. Agency for International Development;
The Summit Foundation, Washington, D.C., USA;
The Overbrook Foundation, New York, NY, USA;
The John D. and Catherine T. Mac Arthur Foundation, Chicago, IL, USA;
WWF-US, Washington, D.C., USA.

**Institutions:**
Many individuals from the following institutions have made valuable contributions throughout the development of this Vision.

**Argentina:**
Administración de Parques Nacionales (APN); Asociación de Productores, Industriales y Comerciantes Forestales de Misiones; Asociación de Propietarios de la Reserva Yabotí, Misiones; Asociación Madereros y Afines del Alto Paraná, Misiones; Asociación Misionera de Mediación; Aves Argentinas - Ornitológica del Plata; Alto Paraná S.A.; Forestal Montral S.A.; Federación de Cooperativas Agrícolas de Misiones (FEDECOOP); Colegio de Ingenieros Agrónomos de la provincia de Misiones; Cooperativa Agrícola Eldorado, Misiones; Escuelas Familia Agrícola (EFA); Facultad de Ciencias Forestales, Universidad Nacional de Misiones; Fundación para la Conservación y el Estudio del Medio Ambiente (Fucema); Fundación Cambio Democrático (FCD); Fundación Ecológica Universal; Fundación Vida Silvestre Argentina; Gendarmería Nacional; Grupo de Ecología del Paisaje y Medio Ambiente, Centro de Estudios Avanzados de la Universidad de Buenos Aires; Grupo Ecologista Misionero; Honorable Cámara de Representantes de la provincia de Misiones, Comisión de Medio Ambiente; Instituto de Desarrollo Social (INDES); Instituto de Botánica Darwinion; Instituto Nacional de Tecnología Agropecuaria (INTA); Laboratorio de Investigaciones Ecológicas de las Yungas (LIEY), Universidad Nacional de Tucumán; Ministerio de Ecología, Recursos Naturales Renovables y Turismo de la provincia de Misiones; Movimiento Agrario Misionero (MAM); Municipalidad de General Alvear; Municipalidad de Leandro N. Alem; Municipalidad de Oberá; Municipalidad de Puerto Iguazú; Papel Misionero SACyF; Pastoral Social Diócesis Iguazú; Premidia S.A.; Programa Social Agropecuario (PSA); Red de Agricultura Orgánica de Misiones (RAOM); Reserva Privada Puerto San Juan; Reserva Yaguaroundí; Robicué; Secretaría de Agricultura, Ganadería y Pesca de la Nación (SAGPyA); Secretaría de Seguridad y Protección a la Comunidad de la Nación.

**Brazil:**
Associação em Defesa do rio Paraná, Afluentes e Mata Ciliar (Apoena); Associação Mico-Leão-Dourado; Conselho Nacional da Reserva da Biosfera da Mata Atlântica; Conservation International do Brasil; Departamento de Botânica/Universidade Federal do Pernambuco; Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA); Fundação Biodiversitas; Fundação do Meio Ambiente-SC (FATMA); Fundação SOS Mata Atlântica; Fundação O Boticário de Proteção da Natureza; Instituto Ambiental do Paraná (IAP); Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA); Instituto de Biociências-Universidade de São Paulo; Instituto de Pesquisas Ecológicas (IPÊ); Instituto Estadual de Florestas de Minas Gerais; Ministério do Meio Ambiente; Parque Nacional do Iguaçu/IBAMA; Parque Nacional da Ilha Grande/IBAMA; Policia de Proteção Ambiental do Estado de Santa Catarina; Policia Militar do Paraná; PROBIO/Ministério do Meio Ambiente; Secretaria de Agricultura e Abastecimento de Río Grande do Sul; Secretaria Estadual do Meio Ambiente do Rio Grande do Sul; Secretaria do Meio Ambiente do Estado de São Paulo; Sociedade de Pesquisa em Vida Selvagem e Educação Ambiental (SPVS); Organização das Nações Unidas para a Educação, a Ciência e a Cultura (UNESCO); Terra Preservada; Universidade Estadual de São Paulo (UNESP); Universidade Federal do Paraná.

**Paraguay:**
Acción Cooperativa Orientada al Desarrollo Sostenible (ACORDES); Asociación ProCordillera San Rafael (ProCosara); Asociación para la Vida y la Naturaleza (AVINA); Centro de Estudios y Formación para el Ecodesarrollo (AlterVida); Carrera de Ingeniería Forestal - Facultad de Ciencias Agrarias, Universidad Nacional de Asunción; Centro de Datos para la Conservación (CDC), Dirección de Planificación Estratégica de la Secretaria del Ambiente; Centro de Educación, Capacitación y Tecnología Campesina (CECTEC);
Centro Internacional de Capacitación para Organizaciones Ambientalistas y de Desarrollo (CICOAM); Comisión de Ecología y Medio Ambiente, Honorable Cámara de Diputados; Comisión Nacional de Defensa de los Recursos Naturales, Honorable Cámara de Senadores; Dirección de Ordenamiento Ambiental del Territorio, Secretaria del Ambiente; Dirección General de Protección y Conservación de la Biodiversidad; Dirección de Investigación Biológica y Museo Nacional de Historia Natural del Paraguay, Dirección General de Protección y Conservación de la Biodiversidad; Facultad de Ciencias Químicas; Fiscalía del Medio Ambiente, Ministerio Público; Fundación Moisés Bertoni (FMB); Guyra-Paraguay; Instituto de Derecho y Economía Ambiental (IDEA); ITAIPU-Binacional Paraguay; Ministerio de Agricultura y Ganadería; Natural Land Trust; Peace Corps Environment Program - Paraguay; Servicios Ecoforestales para Agricultores (SEPA); Sobrevivencia - Amigos de la Tierra; The Summit Foundation- Paraguay; USAID - Misión en Paraguay; Yaguareté Forests.

**International:**
Itaipu Bi-National Power Plant, WWF Network, The Nature Conservancy, UICN Sur - Unión Mundial para la Naturaleza, University of Maryland.

*Although we have tried to acknowledge all of the many organizations and individuals who have contributed to this document, there may be some we have missed. We apologize in advance for any oversight of their hard and valuable work.*

**WWF Technical Team in the Ecoregion:**
Aida Luz Aquino (Coordinator - Paraguay)
Guillermo Placci (Coordinator - Argentina)
Mario S. Di Bitetti (Project Manager - Argentina)
Helena Maria Maltez (Coordinator - Brazil)
Lou Ann Dietz (International Coordinator)

**WWF Advisory Council for the Upper Paraná Atlantic Forest Ecoregion:**
Sandra Charity (WWF-UK)
Javier Corcuera (FVSA)
Leonardo Lacerda (WWF-Brazil)
Meg Symington (WWF-US)

**GIS Analyses:**
German Palé, Juan Carlos Riveros Salcedo, Tom Allnutt, and Guillermo Placci.

**Editing of this publication:** Helena Maria Maltez, Jorge Fecuri, Sofia Ferrari, Geralda Magela, and Nancy de Moraes.

**Maps:** Germán Palé, Guillermo Placci, Ekena Rangel Pinagé, and Carlos Alberto de Mattos Scaramuzza.

**Graphics and Layout:** Ribamar Fonseca | Supernova Design
**Illustration:** Tati Rivoire
**Printing:** Gráfica Ipiranga

Our special gratitude goes to Jose & Adriana Calo for the use of their beautiful images free of charge.

This publication is part of the
**"Program for Biodiversity Conservation in the World Natural Heritage in Brazil"**
(MMA/Brazil, UNESCO,WWF, TNC, CI, UNF)