

PARAGUAY

INTRODUCTION

by Nancy E. Lopez

Paraguay occupies an area of 406,752km² and, according to the 1982 census, has a population of some 3,563,000.

The Rio Paraguay divides the country into two regions; the "Oriental" and the "Occidental". The Oriental region, which includes the Rio Paraguay and Alta Parana regions, is a rolling plain interrupted by hills and low mountain ranges with elevations ranging from 80m to 850m. The majority of Paraguay's population lives in this region. The Occidental region, which includes the Alto Chaco and the Bajo Chaco, is a vast alluvial plain at about 130m sloping gradually down to the Rio Paraguay in the east.

The hydrological systems of Paraguay are part of the great basin of the Rio de La Plata. The Rio Parana and the Rio Paraguay are the most important rivers in this basin, both in terms of length and flow. Of the rivers flowing across the Paraguayan Chaco, one of the most important is the Pilcomayo, a shallow river with erratic course. In the basin of the Rio Paraguay, there are extensive wetland systems including the Pantanal Matogrosense, the Bajo Chaco, the seasonally flooded plains and swamps of the Yetyty, and the seasonally flooded plains and marshes of the eembucu. The Rio Pilcomayo feeds a zone of the Bajo Chaco known as the Estero de Patino, but this swamp can dry out during certain periods of the year because of the instability of the course of the Pilcomayo.

Lago Ypacarai, Lago Ypoa and Laguna Vera are the most important lakes in the country; all three are fed by tributaries of the Rio Paraguay.

In the Alto Chaco there are some temporary lagoons, but these have not been adequately surveyed.

According to Hueck (1978), Paraguay has the following principal vegetation types:

- a) Deciduous and mesophytic subtropical forest; occurring throughout the mountainous areas and characteristically with trees 25-30m in height, dense undergrowth, and abundant lianas and epiphytes.
- b) Dry forest of the central Chaco; open xerophytic woodland with few trees over 20m in height and most with small leaves. Common species include *Prosopis* sp, *Schinopsis* sp, *Aspidosperma* sp and *Bulnesia sarmentoi*. Gallery forest and scrub occur along river courses.
- c) Dry to sub-humid forest of the eastern Chaco; principally palm savanna dominated by extensive open stands of the palm *Copernicia australis* (*Copernicia alba*).
- d) Mesopotamian parkland; occurring along the edge of the Chaco where the water table is high and flooding is frequent. This is characterized by extensive marshes, wet savannas, gallery forest and scattered "islands" of forest and scrub. Agriculture has destroyed a large part of this type of vegetation.
- e) Cerrado; a vegetation type resembling savanna but with scattered trees, characterized by the presence of small trees, numerous shrubs and a ground cover of grasses and herbs.
- f) Campos limpios; open grassland alternating with belts and "islands" of forest.
- g) Pantanal vegetation; wet savannas inundated during the rainy season.
- h) Gallery forest; belts of forest of varying width along river courses, with species such as *Salix humboldtiana* and *Tessaria integrifolia*. The height of the trees ranges from 8-20m.

Institutional Base for Wetland Conservation and Research

Governmental

Ministerio de Agricultura y Ganaderia - Servicio Forestal Nacional: responsible for the management and administration of the national parks.

Ministerio de Defensa Nacional: cooperates with the Servicio Forestal Nacional in the administration of the Parque Nacional Cerra Cora and other historical sites in the country, and is involved in the wardening of the Parque Nacional Teniente A. Enciso.

Instituto de Bienestar Rural: subject to the agreement of other relevant institutions, this institute has the authority to designate national parks in areas of special geographical, historical or touristic interest and in areas of special importance for the preservation of fauna and flora. Once established as national parks, these areas are not transferable and can only be exploited for scientific, cultural and touristic purposes.

Direccion General de Turismo: responsible for the conservation and improvement of the country's scenic attractions.

Universidad Nacional de Asuncion - Instituto de Ciencias Basicas: responsible for conservation education at university level and for scientific research.

Non-governmental

Sociedad Paraguaya para Proteccion de la Naturaleza (PRONATURA): created in 1976 and dedicated to environmental education as a means to increase public awareness of the importance of natural resources and the need to conserve them.

Others

American Peace Corps: provides support through programmes of environmental education and research.

Progress in Wetland Conservation and Research

Nine protected areas have been established in Paraguay, and a further five are currently at the project stage. These are as follows:

Parques Nacionales

Defensores del Chaco (780,000 ha), established in 1975.

Tinfunque (280,000 ha), established in 1966.

Teniente A. Enciso (40,000 ha), established in 1980.

Cerro Cora (5,538 ha), established in 1976.

Ybycui (5,000 ha), established in 1973.

Yacyreta (17,000 ha), in the project stage.

Nueva Asuncion (96,000 ha), in the project stage.

Reservas Nacionales

Kuriy (2,000 ha), established in 1973.

Bosques Protectores

Jakuy (1,000 ha), established in 1975.

Nacunday (1,000 ha), established in 1975.

Caazapa (6,000 ha), established in 1976. (Currently named Parque Nacional Caaguazu).

Cerro Guazu (10,000 ha), in the project stage.

Cerro Cora (area unknown), in the project stage.

Reservas Forestales

Capiibary (9,000 ha), in the project stage.

The majority of these protected areas include important tributary rivers and streams of the Rio Parana and Rio Paraguay.

In the Plan Preliminar de Sistemas de Areas Nacionales Protegidas del Paraguay, prepared by SFN/MAG in 1983, the following proposals were made:

- a) to include the pantanal vegetation and humid forest as new units of conservation, under both private and state ownership;
- b) to protect the threatened ecosystem of the Pantanal Matogrosense;
- c) to include a sample of lakes in the system of protected areas;
- d) to conduct appropriate studies and establish protected areas as follows:
 - a nature reserve or wildlife reserve under state or private ownership in the Mesopotamian parkland and humid forest in the departments of Misiones and/or Neembucu;
 - a wildlife reserve under state or private ownership in the Lago Ypoa or Laguna Vera region;

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- a multiple use zone and forest reserve in the Capiibary region, in the Department of San Pedro;
- e) to reclassify the Bosque Protector Nacunday as an Area Nacional de Recreacion..

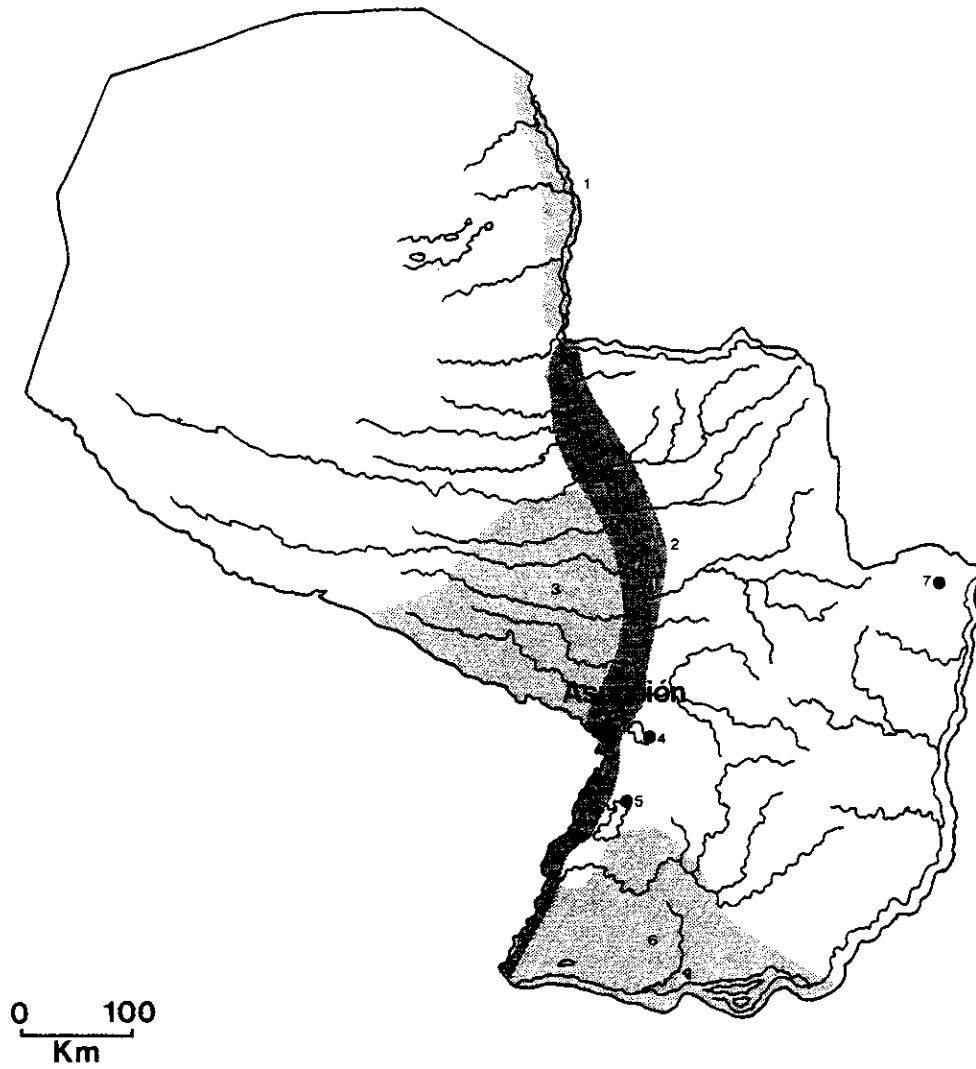
Since 1977, the Servicio Nacional Forestal and the American Peace Corps have been carrying out a programme which includes national park planning, a forestry project, environmental education and a biological inventory. It is hoped that this programme will promote the development of an efficient and viable institutional base for the management of natural resources. The Ministerio de Defensa Nacional, the Cooperacion Suiza para el Desarrollo (COSUDE) and other organizations have given assistance in the planning of national parks. The forestry project was initiated in 1981 with a view to promoting an efficient system of forestry for improved land management, and has been carried out with the collaboration of the Servicio de Extension Agricola y Ganaderia, the Corporacion Tecnica Suiza and US-AID. Activities in environmental education have been conducted in conjunction with the Ministerio de Educacion y Culto and with the Centros Regionales de Educacion. The biological inventory began in 1980 and is currently compiling basic information on the taxonomy, ecology, distribution and natural history of the fauna and flora of Paraguay. The inventory includes wetlands and waterfowl, and is attempting to centralize all the information obtained by creating a National Museum of Natural History (the Museo Nacional de Historia Natural).

In 1968, the Instituto de Ciencias Basicas at the Universidad Nacional de Asuncion began to conduct research on the ecology and pollution of the Lago Ypacarai basin, and this work continues.

Major Threats to Wetlands and Waterfowl

There are many threats to the principal wetlands and their avifauna in Paraguay. The most obvious are the uncontrolled destruction of forests and the drainage of natural wetlands for agriculture and livestock grazing. Another problem affecting wetlands is the high level of pollution from industrial waste. Uncontrolled sport hunting and the illegal trade in wildlife have affected the populations of some waterfowl, but no precise data are available on this.

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WETLANDS

Site descriptions based on data sheets prepared by Nancy E. Lopez of the Servicio Forestal Nacional. The information on reptiles and amphibians was provided by Aida L. Aquino, and that on mammals by Len West.

Pantanal Matogrosense (1)

Location: 19°40'-21°40'S, 58°00'W; along the Brazilian border, Alto Paraguay Department.

Area: 400,000 ha.

Altitude: 96m.

Province and type: 8.8.2; 09, 11, 12, 13, 16 & 18.

Site description: A continuation of the pantanal system of southwestern Brazil and southeastern Bolivia, extending south along the west bank of the Rio Paraguay to 70 km north of Puerto Casado. A vast area of humid palm savanna, with numerous small permanent freshwater lakes, streams and marshes; subject to inundation during the wet season (October to March) and with the flooding of the Rio Paraguay. Gallery forest and riverine thickets occur along the Rio Paraguay and permanent stream courses.

Principal vegetation: Characteristic marsh vegetation includes species of *Eichhornia*, *Azolla* and *Pistia*, and various Cyperaceae; the palm savannas are dominated by the palm *Copernicia australis*.

Land tenure: Privately owned.

Protection: None.

Land use: Palms were formerly harvested for electricity poles. The area is very remote and difficult of access, but illegal hunters enter the area by boat.

Waterfowl: Very poorly known, but certainly an important area for waterfowl characteristic of the pantanal. All three Ciconiidae and many Ardeidae and Threskiornithidae are common, and *Phoenicopterus chilensis* has been recorded as a non-breeding visitor.

Other fauna: Little information. The Tapir *Tapirus terrestris*, Jaguar *Leo onca*, the bat *Noctilio leporinus*, the iguana *Dracaena paraguayensis*, and the caimans *Caiman crocodilus* and *C. latirostris* are known to occur.

Threats: Illegal hunting may pose a threat to some species.

Research and conservation: The need for a thorough faunal and floral survey of this important area is evident.

Source: Nancy E. Lopez.

Criteria for inclusion: 123.

Rio Paraguay (2)

Location: 22°00'-27°15'S, 57°10'-58°30'W; between Puerto Caballo and Paso de Patria, central Paraguay.

Area: 1,265 km of river.

Altitude: 50-87m.

Province and type: 8.8.2/8.21.4; 10 & 11.

Site description: The relatively fast-flowing Rio Paraguay, with numerous sandy and muddy beaches and islands, and bordered with riverine forest; from the Brazilian border in the north to the Argentinian border in the south. The river level fluctuates widely, and at low water levels, extensive mud banks are exposed.

Principal vegetation: In the dry to subhumid eastern chaco woodland zone, with some semi-deciduous and mesophytic forest.

Land tenure: State owned.

Protection: None.

Land use: There are numerous towns and villages along the river, and there is a considerable amount of boat traffic. International conventions define the use of the Rio Paraguay for navigation.

Waterfowl: The sandy beaches and mud banks are important for a wide variety of passage and wintering waterfowl. Birds observed during a survey of part of the river in January 1984 included 40,000 *Phalacrocorax olivaceus*, 1,000 *Anhinga anhinga*, 4,000 *Ardea cocoi*, 300 *Egretta alba*, 200 *Syrigma sibilatrix*, 100 *Mycteria americana*, 20 *Jabiru mycteria*, 100 *Ajaia ajaja*, 300 *Amazonetta brasiliensis*, and 15 species of Nearctic shorebirds. Winter visitors from the south include *Coscoroba coscoroba*, *Cygnus melancoryphus* and *Netta peposaca*, and *Neochen jubata* and *Sarkidiornis melanotos* have been recorded.

Other fauna: *Caiman crocodilus yacare* and *C. latirostris* still occur along the river.

Threats: Pollution from industry and human settlements along the river banks must be a problem, but the levels of pollutants in the river are as yet unknown.

Research and conservation: There is a clear need for detailed studies of the riverine ecosystems, and the establishment of reserves in key areas.

Source: Nancy E. Lopez.

Criteria for inclusion: 123.

The Pantanal of the Eastern Chaco (3)

Location: 23°10'-25°10'S, 57°20'-60°00'W; west of the Rio Paraguay between Asuncion and Concepcion, Presidente Hayes Department.

Area: 4,500,000 ha.

Altitude: 100m.

Province and type: 8.21.4; 09, 11, 12, 13 & 16.

Site description: A vast area of seasonally flooded grassland and palm savanna, with numerous small permanent freshwater lakes, impoundments, and marshes; fed by tributaries of the Rio Paraguay. During the dry season, from April to August, most of the area dries out completely, but with the rains and flooding from the rivers, extensive areas are inundated to a depth of 1-2m.

Principal vegetation: The permanent marshes have an abundant growth of *Eichhornia*, *Azolla* and *Pistia*; the dominant palm of the savannas is *Copernicia australis*; and there are patches of riverine forest along the major stream courses. The region is within the dry to subhumid chaco woodland zone.

Land tenure: Most of the area is privately owned in large estancias.

Protection: The only protected area is the Tinfunque National Park (280,000 ha); although the park was established in 1966, no management plan has ever been produced for it. However, a number of the private landowners take an interest in conservation, and several prohibit hunting on their property.

Land use: Cattle ranching. Much of the *Copernicia australis* has been cleared to provide more grazing land, and burning is common. Steel factories in Villa Hayes utilize timber from the chaco for fuel.

Waterfowl: An extremely important area for waterfowl, particularly at the end of the dry season (July/August) when large concentrations of fish-eating birds congregate around the few remaining water bodies, and during the breeding season (September to March). About 70 species have been recorded, the most abundant including *Nycticorax nycticorax*, *Egretta thula*, *E. alba*, *Ardea cocoi*, *Mycteria americana*, *Euxenura maguari*, *Jabiru mycteria*, *Theristicus caudatus*, *Phimosus infuscatus*, *Dendrocygna autumnalis*, *Amazonetta brasiliensis*, *Cairina moschata*, *Jacana jacana* and *Vanellus chilensis*. Other species occurring in significant numbers include *Syrigma sibilatrix*, *Harpiprion caerulescens*, *Chauna torquata*, *Anas leucophrys*, *Sarkidiornis melanotos*, *Aramides ypecaha* and a variety of Nearctic shorebirds.

Other fauna: The area is very rich in birds of prey, with large populations of *Cathartes burrovianus*, *Rostrhamus sociabilis* and *Busarellus nigricollis*. Mammals include *Chrysocyon brachyurus*, *Pteronura brasiliensis*, *Hydrochoerus hydrochaeris*, *Myocastor coypus*, *Leo onca* and *Blastocerus dichotomus*. Reptiles include *Caiman crocodilus*, *C. latirostris*, *Hydromedusa tectifera* and *Hydrodynastes gigas*.

Threats: An expansion of ranching activities may reduce the extent of wetland habitat, and heavy hunting pressure may be threatening some species.

Research and conservation: Detailed surveys with a view to the establishment of additional protected areas, and development of suitable land use plans are urgently required.

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References: Bertoni (1930); Short (1975 & 1976); IUCN (1982); Peris *et al* (in press.)

Source: Nancy E. Lopez.

Criteria for inclusion: 123.

Lago Ypacarai (4)

Location: 25°17'S, 57°20'W; 25 km east of Asuncion, Central Department.

Area: 5,328 ha.

Altitude: 64m.

Province and type: 8.8.2; 12.

Site description: A permanent shallow freshwater lake, up to 1.8m deep, with associated marshes in rolling hill country.

Principal vegetation: Marshes with *Eichhornia* sp, *Pistia stratiotes*, *Cyperus giganteus* and *Acrocomia totai*. The native forests of the surrounding area have been largely destroyed.

Land tenure: Privately owned.

Protection: None at present.

Land use: Cattle ranching; wood-cutting; water sports and other recreation; and some industry nearby.

Waterfowl: Formerly an important area for waterfowl, but now the area is rather impoverished, presumably as a result of pollution and excessive disturbance.

Other fauna: The Marsh Deer *Blastocerus dichotomus* apparently still occurs in the area along with *Ozotoceros bezoarticus*. Reptiles include *Eunectes noteus*, *Hydrodynastes gigas*, *Phrynops geoffroanus* and *Hydromedusa tectifera*.

Threats: There is a serious pollution problem from effluents from several factories near the lake and domestic waste from housing along the shore. Native forests around the lake have been destroyed, and much of the shoreline is being developed for housing.

Research and conservation: A commission has recently been established to afford protection to the lake and to reduce the level of pollution. Ypacarai is of particular interest in that it is one of the very few wetlands of its kind in the country. Limnological studies have been conducted by Gonzalez Romero and Arzamendia.

References: Gonzalez Romero & Vera (1968); Gonzalez Romero & Arzamendia (1979 & 1983).

Source: Nancy E. Lopez.

Criteria for inclusion: 2a, 2b & 3a.

Lago Ypoa (5)

Location: 25°48'S, 57°28'W; 30 km west of Acahay, Central, Paraguari and Ñeembucu Departments.

Area: 18,200 ha.

Altitude: 100m.

Province and type: 8.8.2; 12.

Site description: A group of permanent freshwater lakes centered on Lago Ypoa, with extensive marshes, scattered palm groves and isolated patches of forest. The lakes are fed by a number of small streams, and the water levels fluctuate according to local rainfall. The lakes lie at the northern extremity of the great pantanal of southern Paraguay.

Principal vegetation: Marshes with *Cyperus giganteus* and *Eichhornia* sp; and the palm *Copernicia australis*.

Land tenure: Privately owned.

Protection: None.

Land use: Cattle ranching and some agriculture, mainly in the north and east; and some hunting. The southern part of the area is remote and little disturbed.

Waterfowl: Poorly known, but apparently not very important for waterfowl.

Other fauna: The area is an important centre for the rare Marsh Deer *Blastocerus dichotomus*, and the Maned Wolf *Chrysocyon brachyurus* is reported to occur. Reptiles include *Eunectes noteus*, *Phrynops nasuta*, *Hydromedusa tectifera* and at least one species of *Caiman*.

Threats: Drainage for agriculture poses the most serious threat; there was a proposal to drain some 40,000 ha of wetlands in the area, but this was abandoned. A considerable amount of illegal hunting also takes place.

Research and conservation: A proposal has been made to include Lago Ypoa and wetlands to the south in a Faunal Reserve, but no action has been taken to date. Further studies are required of this important lacustrine system.

Source: Nancy E. Lopez.

Criteria for inclusion: 2a & 3a.

Pantanal de Ñeembucu (6)

Location: 26°30'-27°20'S, 56°30'-58°30'W; southern Paraguay, in the Departments of Paraguari, Misiones and Ñeembucu.

Area: 800,000 ha.

Altitude: 65m.

Province and type: 8.21.4; 09, 11, 12, 13 & 16.

Site description: The pantanal of southern Paraguay, extending from the confluence of the Paraguay and Parana Rivers in the southwest to the region of Lago Ypoa in the north, and Ayolas on the Parana in the east. A vast complex of permanent and seasonal freshwater lakes and marshes, slow-flowing rivers and riverine marshes, and seasonally inundated grassland and palm savanna, with gallery forest along the permanent water courses. The water table is high, and extensive tracts of marsh along the Paraguay and Parana are permanent, but there are wide fluctuations in water level, and during the wet season, large areas of grassland and palm savanna are flooded to a depth of 0.5-1m.

Principal vegetation: Lakes and ponds with species of *Eichhornia*, *Azolla* and *Pistia*; marshes with Cyperaceae; and palm groves of *Copernicia australis*.

Land tenure: Privately owned in large estancias.

Protection: No legal protection at present. On several estancias, hunting is prohibited.

Land use: Cattle ranching; some agriculture; subsistence fishing; and sport and commercial hunting.

Waterfowl: A very important area for breeding, passage and wintering waterfowl, with all the characteristic pantanal species occurring. The area is however poorly known; no censuses have been undertaken, and the key sites have not as yet been identified. Some of the more interesting species occurring in the region include *Jabiru mycteria*, *Harpiprion caerulescens*, *Coscoroba coscoroba*, *Cygnus melancoryphus*, *Neochen jubata*, *Sarkidiornis melanotos*, *Heteronetta atricapilla* and a variety of Nearctic shorebirds.

Other fauna: Mammals include the Marsh Deer *Blastocerus dichotomus* and Maned Wolf *Chrysocyon brachyurus*; and reptiles include *Eunectes noteus*, *Hydrodynastes gigas*, *Phrynops geoffroanus* and *Hydromedusa tectifera*.

Threats: The area is at present relatively undisturbed, but potential threats include large scale drainage for ranching and agriculture, and increased human settlement with the construction of roads through the region. Excessive commercial hunting poses a threat to some species.

Research and conservation: A proposal has been made to include Laguna Vera in the north in a Faunal Reserve, along with the nearby Lago Ypoa. There is a great need for detailed studies of the area while it remains in a relatively pristine condition, so that key areas can be protected, and any future development carried out on a rational basis.

Source: Nancy E. Lopez.

Criteria for inclusion: 123.

Rio Carapa (7)

Location: 24°10'S, 54°37'W; 15 km west of Colonia Catuete, Canindeyu Department.

Area: 150 km of river.

Altitude: 350m.

Province and type: 8.8.2; 10 & 11.

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Site description: A small fast-flowing tributary of the Rio Parana with many rapids, flowing through humid subtropical forest and dense bamboo thickets. The upper drainage is in cerrado country, with riverine forest, bogs and wet grassland along the stream courses.

Principal vegetation: In an area of almost undisturbed humid subtropical forest.

Land tenure: No information.

Protection: None.

Land use: Some agriculture and exploitation of forests.

Waterfowl: The very rare Brazilian Merganser *Mergus octosetaceus* was observed on the Rio Carapa in February 1984 by Lopez; this constitutes the first record of the species in Paraguay for many years. The Rufous-faced Crake *Laterallus xenopterus* was recently discovered in an area of wet grassland only 50 km southwest of the upper Carapa drainage (Myers & Hansen, 1980), and presumably occurs in the Carapa drainage.

Other fauna: No information.

Threats: There is active colonization in the area.

Research and conservation: There are now very few undisturbed riverine systems in this part of the continent, and species such as *M. octosetaceus*, dependent on clear-water rivers and streams, are becoming increasingly rare. The establishment of protected watersheds in this region is obviously a high priority.

References: Myers & Hansen (1980).

Source: Nancy E. Lopez.

Criteria for inclusion: 2a, 2b & 3a.