

# Ñeembucú Wetlands



## ***Integrated Management Overview***

The Ñeembucú Wetlands comprise a major wetland complex within the Río de la Plata River Basin. Along with several other important wetland systems in the region, the Ñeembucú provides a critical habitat for at least 279 bird species, many of which are migratory. The region also supports a significant cattle ranching economy in addition to crop production.

**Location:** 26°55'06"S, 57°59'55"W – Ñeembucú, Paraguay

**Area** 8,000 km<sup>2</sup>

**Mean depth:** unknown

**Watershed area:** 35,700 km<sup>2</sup>

**Current condition:** Continued agricultural development and climate change trends (primarily drought) have raised concerns among farmers and local government officials regarding the long-term sustainability of the region.

**Management focus:** Efforts are now underway to begin the process for future implementation of an ecosystem management plan. These efforts are heavily focused on developing more sustainable agricultural land-use practices based on the concept of adaptive management.

 **Agricultural Wetland  
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## Network Discussion Themes

Based on the integrated management framework utilized for this project (Osborne, 2009), the following have been identified as key **discussion** themes. Network discussions should focus on the following **highlighted** items.

### Ñeembucú integrated management discussion themes

Governance	Commitment	Science	Capacity	Coordination
The Ñeembucú local government and area farmers have demonstrated concerns over the future of the region.	Financial, organizational and technical support to date has been limited.	Joint efforts between university contacts in Paraguay and Manitoba have shown promise	Aside from some university and local government support, current capacity is limited	n/a at this time
There is no existing management authority (or partnership of existing bodies) currently working on an ecosystem management plan.	There is a need for much greater government and other support for an ecosystem management plan.	There is a need for baseline scientific information and accurate land use, biodiversity and climate change impacts in the region.	n/a at this time	n/a at this time

## Integrated Management Assessment

This project is early in its stages of progress. At this time, **governance** and **commitment** issues should be the highest priority. Preliminary **science** activities must be built upon by local and federal officials towards building future commitment and capacity.

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Ñeembucú Integrated Management Framework adapted from Osborne, 2009

## ***Physical Geographic Considerations***

### **South American Context**

South America is, with a few exceptions a wet continent, dominated by large rivers connected to large interfluvial wetlands. The Amazon, Orinoco; Paraná, Paraguay and La Plata rivers occupy first, third and tenth positions (respectively) in terms of river discharge (Junk & Furch, 1993). In South America, the major watersheds are among the most important in the world. One of the biggest basins in this continent is the one formed by the Paraná and the Uruguay watersheds: the Río de la Plata Basin (Figure 1). This basin drains approximately one fifth of the South American continent. The La Plata River system is recognized as having the highest number of endemic fishes (in the Paraguay River sub-basin), the highest number of endemic birds (in the Paraná River sub-basin), 11 Ramsar sites (in the Paraguay River sub-basin) and the highest number of major dams (the Paraná River sub-basin) in the world (La Plata River Basin, 2005, The Annotated Ramsar List: Paraguay, 2005).

The Río de la Plata Basin has major wetlands in this system, including the Pantanal, Ñeembucú and Iberá (Figure1) (Agua un Bien Común, 2002).

### **Paraguayan Context**

Paraguay is a landlocked country and two thirds of its borders are aquatic, formed by the Paraná, Paraguay, Pilcomayo, Apa and Negro rivers, and the Estrella stream. Associated with these rivers are numerous and extensive wetlands draining much of Paraguay. These wetlands are a meeting point for globally significant numbers of Nearctic migrants (primarily shorebirds), austral migrants and resident species (Antas, 1983; Hayes, et al., 1990; Hayes & Fox, 1991).

To date, 117 species of water birds have been recorded in Paraguay, of which 25 are Nearctic migrants (mostly shorebirds). Examples include: Pectoral Sandpiper (*Calidris melanotos*), Lesser Yellowlegs (*Tringa flavipes*) and Solitary Sandpiper (*Tringa solitaria*) (Lesterhuis, Clay & Cabrera, 2005). One of the major wetlands in the Paraguayan territory is the Ñeembucú system, which occupies the southwestern corner of the east region in the Paraguayan territory.

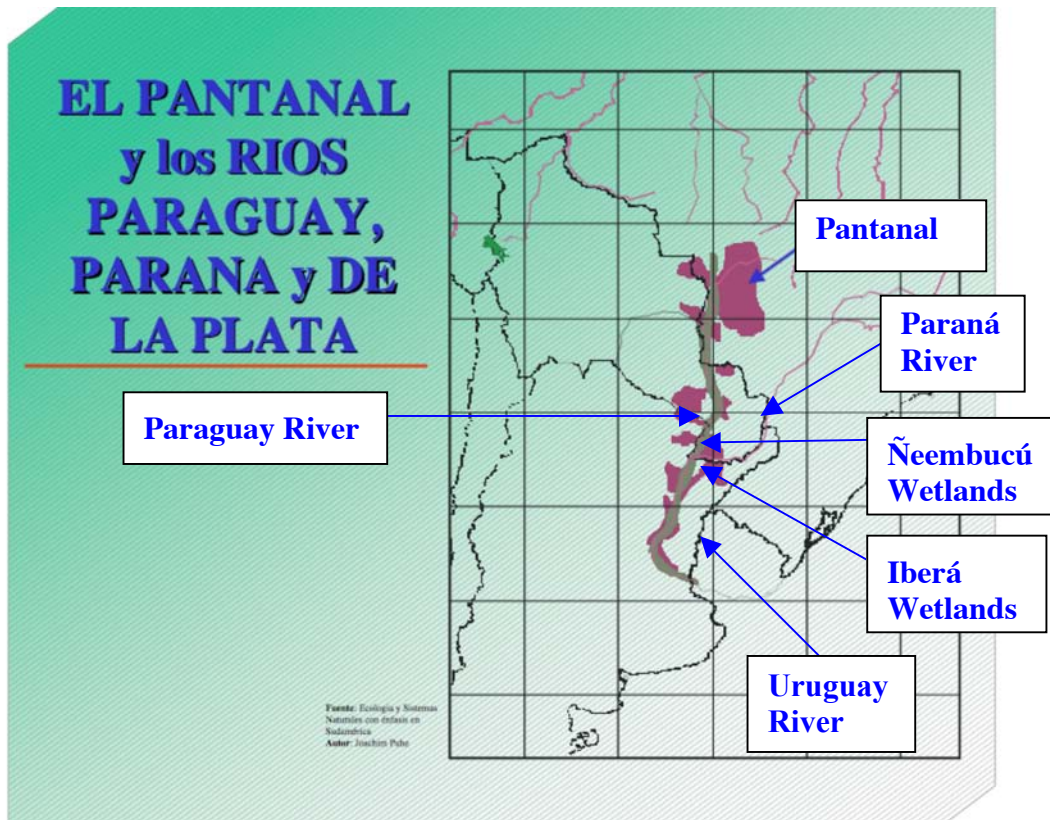


Figure 1: Río de la Plata Basin System with its major wetlands: Pantanal, Ñeembucú and Iberá. Major Rivers: Paraná, Paraguay and Uruguay. (source: Ecología y Sistemas Naturales con Énfasis en Sudamérica. Author: Joachim Puhe)

In an ecological classification system, Paraguay is subdivided into seven geographical regions (Figure 2), based primarily on vegetation and geographical features. One of these ecoregions is the Ñeembucú. Vast grasslands characterize this ecoregion, as well as extensive, periodically inundated wetlands. Palm savannas, typical of the Chaco to the North, occur in some areas, and the landscape is dotted with small patches of low, sub-humid Chaco-like forest (8–15 m high) on slightly higher terrain. The region's terrain is generally flat and low in elevation and near the confluence of the Paraguay and Paraná rivers; its elevation is slightly less than 50 m above sea level (Hayes, 1995, p. 224; Estudios de Impacto Ambiental ruta N° 4 José Eduvigis Díaz [Estudios], 1994).

## Natural Resources Use

As part of a worldwide tendency, the utilization of natural resources by humans is increasing in a geometric progression in Latin America, driven by the population increase and rapid economic growth (Bucher, Castro & Floris, 1997). In fact, the North America Free Trade Agreement (NAFTA) in North America and Mercado Común del Sur (MERCOSUR, the free trade agreement between Argentina, Brazil, Paraguay and Uruguay) in South America have exerted more pressure for even greater utilization of the natural resources in the region (Bucher, Castro & Floris, 1997).



Figure 2: Wetland drainage occurs with increased agricultural development of the Ñeembucú

During recent decades, the wetlands of South America have remained relatively pristine. Recent small-scale studies have shown, however, that those wetlands are disappearing at an alarming rate in some areas (Junk, 2002). Wetland drainage is an increasing concern where agricultural development is occurring, increasing the rate of water flow, erosion and sediment deposition downstream (see Figure 2). Increased road construction associated with development is a major concern in terms of wetland degradation (Figure 3). Long-term trends in wetland development vary from region to region according to the human demographic structure, economic development, and political system or leadership of each country.



Figure 3: Wetland degradation due to increased road construction

There are many human activities that affect wetlands, such as fisheries, agriculture and ranching; modification of the hydrological regime; modification of the native flora and fauna; deterioration of water quality; climate changes; recreation; and tourism (Junk, 2002). Water management challenges combine with land-use impacts, such as the removal of natural vegetative cover and overgrazing of pastures, to create pressing challenges within the watersheds of the Ñeembucú region (Figure 4).



Figure 4: Overgrazing is a major concern in the Ñeembucú region

In their migration, shorebirds use a succession of staging areas and a variety of habitats for resting and feeding; one of these habitats is wetland areas (Deinlein, 2005). Ñeembucú wetland areas provide the food and resources needed at different times of the year for breeding, migration and survival (Donaldson, et al., 2006). Today, many of these areas that have historically supported birds on their flights north and south of the Americas are reduced in size and the food supplies have degraded (Deinlein, 2003). Shorebirds are highly dependant on the resources found at the stopover areas; therefore, habitat loss in wintering grounds in Central and South America is affecting shorebird population size. In many cases, bird conservation means protecting the places where birds nest and raise their young, spend their winters, and rest and rejuvenate during migration. For highly migratory species such as shorebirds, attaining population sustainability in the Northern Hemisphere will be impossible if effective conservation is not occurring in other parts of their range (Donaldson, et al., 2006; O’Harra, 2002). The impacts of climate change are becoming apparent in changing temperatures and rainfall patterns around the world. Paraguay has had severe droughts in the past five years, affecting crop and cattle production, which are the cornerstones of the Paraguayan economy (Burgos, et al., 2006, p. 90). Wetlands play an important role in mitigating the effects of climate change; therefore, their conservation is crucial for the Paraguayan economy and the livelihood of the people living in these areas (Secretaría del Ambiente [SEAM], 2003, p. 110; Sudmeier-Rieux, et al., 2006). Additional biodiversity concerns relate to the replacement of native species with exotic plants.

## **Human Geographic Considerations**

Paraguay is divided politically into 17 departments, including Ñeembucú (Figure 5). This department has a low-density local population. Seventy per cent of the department’s surfaces are flooded areas. Due to this topographic characteristic, the principal human productive activities are traditional livestock management and subsistence agriculture. People use the high elevation lands for growing agricultural products that are used for subsistence (corn, beans and yucca) and for trading (cotton) (Proyecto de Desarrollo Rural y Mejoramiento Ambiental del Sur de Pilar [DERMASUR], 1992).

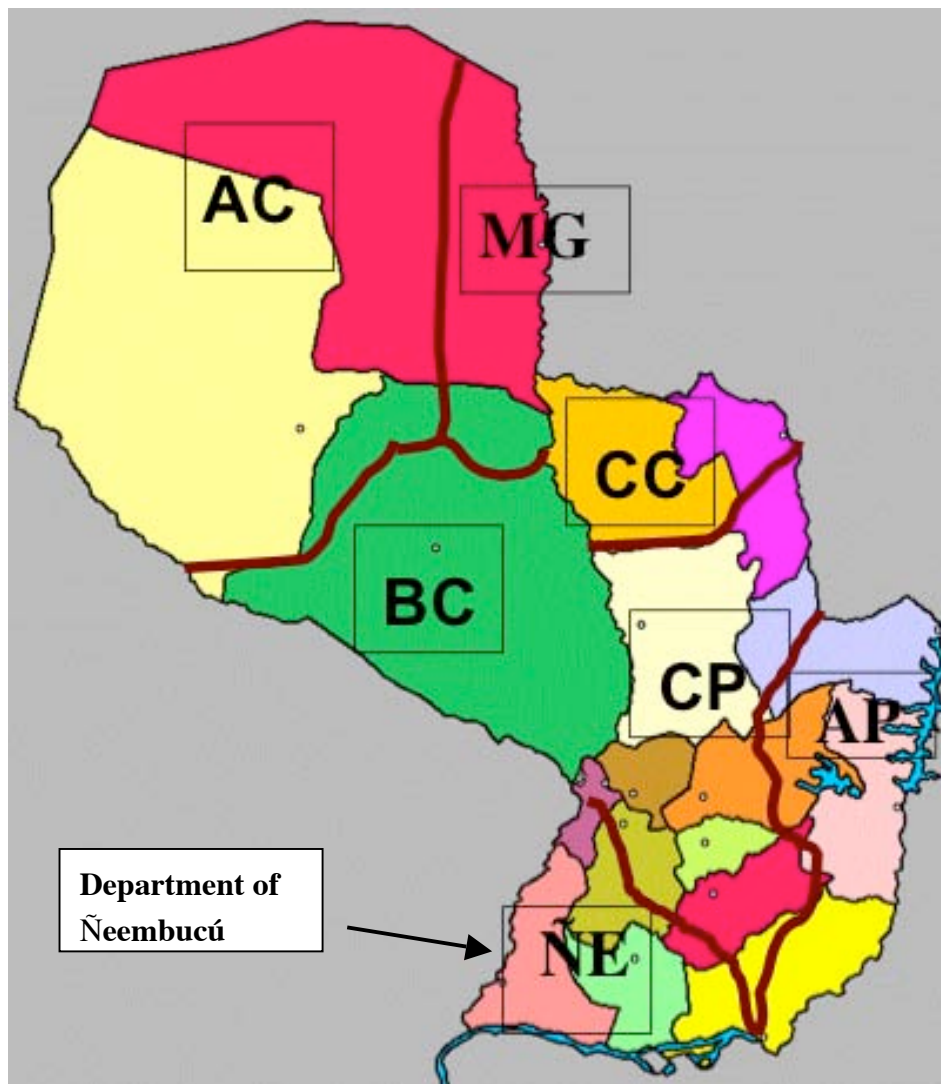


Figure 5: Paraguay geographical regions and departments: Alto Chaco (AC), Matogrosense (MG), Bajo Chaco (BC), Campos Cerrados (CC), Central Paraguay (CP), Ñeembucú (ÑE), Alto Paraná (AP). (source: map from <http://www.luventicus.org/mapas/paraguay.html>)

Since the majority of the working force in the Department of Ñeembucú is situated in the primary sector, it is very important to implement an ecosystem management plan in order to maintain the sustainability of this ecoregion. It is important because the inhabitants of this area depend on the environment for their livelihood (ENPAB, 2003; Lesterhuis, et al., 2005). Ranchers in Paraguay rely on the environment entirely because all the cattle are grass fed. A rancher's main goal is to preserve the ecological balance of the area in order to have the best performance in beef production (Burgos, Gonzales & Rodas, 2004).

The management of wetland ecosystems in the Neotropics is a challenging task due to the ecological, geographical and sociopolitical complexity of these areas. These difficulties are compounded by an incomplete knowledge of system dynamics and the potential impacts that economic activities may have on wetland ecosystem functioning (Loiselle, et al., 2004).

In the Department of Ñeembucú, most of the local population exploits the ecosystem for its livelihood. The hunting, fishing and gathering culture and the exploitation of the natural resources are common practice in the whole area, and these are cultural features derived from ancient civilizations that lived in this area (Fogel, 2000; Gómez, 2006). These ancient civilizations started with Paleo Indians (prehistoric migrants), followed by the aboriginal groups of Kaingans (Guaicurú Family), the Mbya and later the Payaguas.

### **Historical Population Changes**

The Paleo Indians were prehistoric settlers with hunting and gathering skills who arrived before the Christian era. Later, aboriginal groups of Kaingans (Guaicurú Family) arrived from the north (what is now known as Brazil). This group settled in the high areas (2000 BCE) and survived by hunting, fishing and gathering. Their knowledge of this ecoregion was transmitted from generation to generation (Fogel, 2000; Gómez, 2006).

The Mbya arrived in this region between the years 1 and 400 CE and assimilated the Kaingans; in doing so, they gained more knowledge. The Payaguas arrived, before the Spaniards, from the west of the Paraguayan territory. They incorporated the use of the *cachibeo*, which is a canoe built from the trunk of a single tree. The local residents, called *esteranos*, *ribereños* and *campesinos*, acquired all the knowledge gained from these civilizations (Fogel, 2000; Gómez, 2006).

After the arrival of the Spanish, the Jesuits established large communal farms (1609–1767). After Paraguayan independence (1811), Dr. Rodríguez de Francia (the Paraguayan dictator) nationalized these lands and created successful communal farms. At the end of the Triple Alliance War (1870), political cronies and wealthy foreigners became the new owners of most of the land. This sequence of events explains the current social structure in Ñeembucú (Fogel, 2000; Gómez, 2006).

According to Gomez (2006), the traditional social structure in the Department of Ñeembucú is as follows:

- Ranchers: those who own large amounts of land.
- Campesinos: those who own a small amount of land, few animals and practise subsistence agriculture with some cash crops such as cotton, corn or yucca.
- Esteranos (people living on wetlands): those relying on the resources provided by wetlands; gatherers and hunters.
- Ribereños (people living beside the river): those who are fishers and hunters.

## **Problem Statement**

The status of Paraguayan natural resources is threatened by diverse human activities in sectors such as: agriculture, industry, communications (roads), energy (hydroelectric dams) and also from the socio-demographic tendencies (Burgos, Gonzales & Rodas, 2004; ENPAB, 2003; DERMASUR, 1992; Salas-Dueñas, Mereles & Yanosky, 2004, p. 192).

This socio-demographic pressure on the environment results because three out of every four people in the working force are from the primary sector (agriculture/livestock). These types of work depend heavily on the environment (Censo Nacional de Población y Viviendas, 2002; Censo Agropecuario Nacional, 1991; ENPAB, 2003; Estudios, 1994).

Consequently, in a department such as Ñeembucú, working with sustainable restoration and preservation through partnerships, which pay attention to concepts of sustainable development, is critical. Thus, this study has investigated the feasibility of developing an adaptive ecosystem management plan. As part of the investigation, the following were considered: environmental education, public participation, adaptive resource management, departmental and municipal policies, and creation of protected areas. In addition, incorporating traditional and local knowledge, as well as scientific knowledge, was very important in order to implement participatory adaptive management. This approach was used to promote community awareness and action on conservation and management of wetlands and wetland resources (Bhandari, 2003).

## **General Goal and Specific Research Objectives**

The general goal for this project was to determine the feasibility of using an ecosystem management approach to enhance sustainability in the Ñeembucú ecoregion, Paraguay.

The specific objectives of this project are to:

1. Determine the socioeconomic situation in the Ñeembucú;
2. Assess changes in areas of water bodies and other land cover;
3. Identify general changes in wildlife composition in the Ñeembucú region, with particular emphasis on indicators of ecosystem health;
4. Establish how these changes are associated with cattle and crop production in the San Juan del Ñeembucú district;
5. Identify and establish further socioeconomic initiatives with ranchers and farmers that balance production and environmental priorities;
6. Recommend approaches to enhance sustainability of the ecoregion.

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