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## Information Sheet on Ramsar Wetlands

1. Date this sheet was completed/updated: January 2002

2. Country: Peru

3. Name of wetland: Abanico of Río Pastaza Wetlands

4. Geographical coordinates:

03° - 5° South latitude

74° - 76° 50' West longitude

5. Altitude: 100–200 metres above sea level

6. Area: The Abanico of Río Pastaza Wetlands covers 5,839,955 hectares in Peru (out of a total of slightly more than six million hectares) (CDC-WWF OPP 2001). The environment directly related to the wetland and proposed as a Ramsar site is the lower part of the Abanico of Río Pastaza system, which covers an area of 3,827,328.88 hectares.

7. Overview: This wetland is on a large depositional alluvial fan formed by volcanic sediments of varied relief with several types of marshes (formed by tectonic and fluvial phenomena) and other aquatic environments. There are many lakes in blocked valleys and islands that are remnants of the former broken relief (Tertiary), covering a triangular region of almost four million hectares in Peru (Räsänen, 1993; IIAP-WWF OPP, 1999; CDC-WWF OPP, 2001).

8. Wetland type: The Abanico of Río Pastaza Wetlands are located in the Amazon region and has many types of permanent wetlands: marsh systems, lakes and secondary rivers, seasonally or temporarily flooded woodlands and herbaceous marshes. The following types of wetland have been identified in the region, using the definitions of the Ramsar Convention (Ramsar Convention Bureau, 2000).

Code	Name	Prevalence
Tp	Permanent freshwater marshes/swamps/ponds; ponds (fewer than eight hectares), marshes and swamps on inorganic soils, with emergent vegetation in water for at least during most of the growth period	1
Xf	Wooded freshwater wetlands; including flooded freshwater woodlands, seasonally flooded forests, wooded marshes on inorganic soils	2
W	Marshes with shrub vegetation; including freshwater marshes and swamps dominated by shrub vegetation,	3

	scrub bogs (carr) on inorganic soils	
Ts	Seasonal/intermittent freshwater marshes/swamps/ponds on inorganic soils; including flooded depressions (storage lakes) seasonally flooded grasslands, marshes with Cyperaceae	4
M	Permanent rivers/streams; including waterfalls	5
P	Seasonal/intermittent freshwater lakes (more than eight hectares); including lakes in floodplains	6
O	Permanent freshwater lakes (more than eight hectares); including large meanders or abandoned river branches	7

There are seven types of continental wetlands of the 20 described in the Classification System of Types of Wetlands of the Ramsar Convention identified for the region of the Abanico of Río Pastaza. The types of wetlands present in the Pastaza become more important if only the wetlands that can occur in the Amazon are taken into account. This region has eight of the nine types of habitat found in the Amazon region.

In the following figure are given the units of the vegetation map of the proposed Ramsar site of Abanico of Río Pastaza with an indication of the types of wetlands found there (CDC-WWF OPP, 2001).

Unit	Area (ha)	Percent	Type of wetland (Ramsar)
Main rivers	73,070.04	1.91	M
<i>Cochas</i> , lakes, blocked valleys	44,567.48	1.16	O
Dense <i>aguajal</i>	294,511.25	7.69	Tp
Mixed <i>aguajal</i>	1,761,269.74	46.02	Tp, Ts
Riparian woodlands	971,992.52	25.40	Xf
High terrace forest	108,256.14	2.83	
Medium terrace forest	72,400.84	1.89	
Low terrace forest	370.74	0.01	
Wooded marsh	235,473.50	6.15	Tp, Ts
Herbaceous marsh	201,594.97	5.27	W, Ts, P
Highly broken high terraces	18,568.66	0.49	
Man-made landscape	45,253.00	1.18	
Total	3,827,328.88	100.00	

In addition to the seven types of wetlands described above, the habitat of seasonal/intermittent/irregular rivers/streams (N) is found in the area but because of the scale of the cartographic information used it cannot be mapped.

These environments have already been considered in the survey of wetlands in the Neotropical region (Scott and Carbonell, 1986; RHRAP, 1988), compiled by the International Waterfowl and Wetlands Research Bureau (IWRB) and other organizations in the mid-1980s.

9. Ramsar criteria: 1, 2, 3, 4, 5, 6, 7 and 8

The most significant criterion for this wetland is criterion 3 (Wetland considered internationally important because it supports populations of plant or animal species important for maintaining the biological diversity of the biogeographic region.)

Criteria that best characterize the site: The presence of almost the whole spectrum of types of Amazon wetlands.

10. Map of site included? Please tick yes -or- no

11. Name and address of the compiler of this form:

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12. Justification of the criteria selected under point 9, on previous page:

Criterion 1: (A wetland should be considered internationally important if it contains a representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.)

Initially, this region was located in the ecoregion of Napo (Dinerstein et al., 1995). Later and after more detailed studies (IIAP-WWF OPP, 2000), it was included in the ecoregion of woodlands subject to flooding (Amazon varzeas) in the Amazon region. The Abanico of Río Pastaza forms a system of unique permanent and temporary wetlands because of its size and complexity (habitats and ecosystems). Based on the analysis of different map sources and a field survey, the presence of at least seven types of wetland (classification according to current guidelines of the Ramsar Convention) have been identified: wooded freshwater wetlands (A), marshes with shrub vegetation (W), permanent and seasonal freshwater marshes (Ts), permanent rivers and streams (M), and permanent and seasonal freshwater lakes (O,P). In addition, because of its area, the Abanico of Río Pastaza Wetlands have the largest concentration of types of wetlands of the ecosystems subject to flooding in the Peruvian Amazon and the sub-division of that ecoregion in Peru.

The existence of rivers with different physical and chemical characteristics in the region, such as the Huallaga and Marañón (white water), the Urituyacu and Ullpayacu (black water), the Pastaza (intermediate water) and black-water lakes, such as the Chuinda, Rimachi and Trueno, give rise to a high diversity and

abundance of habitats, which in turn convert the basin of the Pastaza into a place with high specific ichthyological diversity and biological in general (Tello and Sánchez, 2001).

Criterion 2: (A wetland should be considered of international importance if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.)

In the Abanico of Río Pastaza, there is a large variety of ecosystems and species typical of floodplains (a large number of aquatic or semi-aquatic species), and it forms an immense depositional system (in the form of an alluvial fan) subject to frequent prolonged flooding over a large part of its area.

The most important endangered species in the region are *Pteronura brasiliensis* (CITES Appendix I; IUCN: EN A1acde), *Trichechus inunguis* (CITES Appendix I; IUCN: VU A1cd), *Inia geoffrensis* (CITES Appendix II; IUCN: VU A1cd), *Sotalia fluviatilis* (CITES Appendix I; IUCN: DD), *Ateles belzebuth* (CITES Appendix II; IUCN: VU A1c), *Priodontes maximus* (CITES Appendix I; IUCN: EN A1cd), *Melanosuchus niger* (CITES Appendix I; IUCN: LR/cd), *Podocnemis expansa* (CITES Appendix II; IUCN: LR/cd), *Podocnemis unifilis* (CITES Appendix II; IUCN: VU A1acd), *Geochelone denticulata* (CITES II, IUCN: VU A1cd+2cd), *Crax globulosa* (CITES: III CO, IUCN: VU A1bcd+2bcd, C1+2a), *Arapaima gigas* (CITES: II, IUCN: DD), *Swietenia macrophylla* (proposed for CITES Appendix II, IUCN: VU A1cd+2cd) and *Cedrela odorata* (IUCN: VU A1cd+2cd). Some of these species have up to now been protected only in the Reserva Nacional Pacaya-Samiria (CDC-WWF OPP, 2001).

In summary, the presence of nine species of wildlife listed in Appendix I and 70 species listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have been reported. According to the most recent lists of the International Union for the Conservation of Nature (IUCN), the presence of 17 species of fauna in some category of threat have been reported.

Criterion 3: (A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.)

The geographical location of Abanico of Río Pastaza gives it a basic characteristic because of the influence of hydrological regimes of rivers that begin in the northern hemisphere. The periods of flooding and drying-out occur inversely to that of the aquatic systems fed by rivers in the southern hemisphere. This characteristic, added to the high diversity of conditions of habitats, is vital for the migratory and reproductive processes of many species of fish in the region (Tello and Sánchez, 2001).

From the point of view of vegetation, the area is abundant in diversity of palm species. The geological and geomorphological characteristics of this area, such as the riparian forest located on temporarily flooded medium terraces along Río Urituyacu; on low terraces of volcanic sediments subject to flooding, the seasonal floodplain and the depressions of the Lower Pastaza create several habitats in which palms typical of forests subject to flooding prosper; palms such as *Bactris* sp.,

*Euterpe precatoria* and *Mauritia flexuosa*, but also species of temporarily flooded forests of *Bactris bifida*, *Elaeis oleifera*, *Geonoma macrostachys*, *Iriartea deltoidea* and *Oenocarpus bataua* and of forest not subject to flooding of *Hyospathe elegans* and *Pholidostachys synanthera* (Mejía and Vargas, 2001).

The Abanico of Río Pastaza Wetlands include examples of almost all types of wetlands that can be found in the Amazon biomass. In addition, it is part of the region of lowlands of the western Amazon identified by the World Conservation Monitoring Centre as an important area for conservation of biodiversity of freshwater ecosystems (WCMC, 1998).

Criterion 4: (A wetland should be considered internationally important if it supports plant or animal species at a critical stage in their life cycles or provides refuge during adverse conditions.)

Along Río Urituyacu, there are the palms *Aphandra natalia* and *Phytelephas tenuicaulis*. These species are not very abundant and have been recorded in very few places of the Peruvian Amazon. Likewise, on Río Pastaza there are large populations of *Elaeis oleifera*, whose distribution in Peru has been reported in small populations in only three places (Mejía and Vargas, 2001). The existence of dense and mixed mosaics of palm forests (*aguajales*) has great importance for wildlife, such as Psittacidae, ungulates and fish, which use these habitats as a food source and as a breeding area.

Criterion 5: (A wetland should be considered internationally important if it regularly supports 20,000 or more waterfowl.)

Criterion 6: (A wetland should be considered internationally important if it regularly supports 1 per cent of the individuals in a population of one species or subspecies of waterbird.)

As for criteria 5 and 6, there is currently insufficient information, but the presence of 11 species of wildlife of the lists of the Convention on Migratory Species (Bonn) has been recorded and 21 species of birds classified as migratory of the neartic (CDC-WWF OPP, 2001).

Criterion 7: (A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.)

Taking into account the studies made in the area during the recent five years, the number of species of fish recorded was 292 species, distributed in 33 families and 176 genera. This indicates a high diversity compared with the Reserva Nacional Pacaya-Samiria (RNPS). Nonetheless, in this protected area the samples were of greater density and covered a greater area, the number of species identified was 20 per cent less than that found on Río Pastaza (Tello and Sánchez, 2001).

Ichthyological diversity was determined for the region of the Abanico of Río Pastaza using the Margalef index of diversity. The indices of diversity found on Río Pastaza

were high, with a maximum value of 18.9 for the locality of Cocha Huangana (Río Pastaza) and was far above the values of diversity found in the Pacaya-Samiria Reserve whose maximum value was 9.0 (locality of Caño Alfaro, Río Pacaya), an isolated place of difficult access (IIAP-FPCN, 1994).

Criterion 8: (A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.)

During the flood season, the lakes, main channels, tributaries and the flooded areas are essential for the life cycle of fish. These habitats, because they are covered with water periodically (because of lateral overflow of rivers and lakes), provide excellent places for breeding larva and young fish. The indexes of individual growth in fish are high because the floodplain is rich in nutrients, detritus and food (fruit, seeds and invertebrates). For these reasons, conservation of these floodplains is of great importance for maintaining high productivity and diversity of species in the basin of Río Pastaza (Tello and Sánchez, 2001).

### 13. General location:

This wetland is located in the north central region of the Peruvian Amazon on the alluvial fan of the Río Pastaza valley, north of the Marañón River. Río Pastaza is a tributary on the left bank of Marañón River. Politically, it is located in the department of Loreto and includes part of the provinces of Alto Amazonas and Loreto. The city of Iquitos, capital of the department of Loreto is located approximately 300 kilometres towards the east (three days by boat).

### 14. Physical features:

#### Geology and geomorphology

Perhaps the characteristic that best defines and differentiates the Abanico of Río Pastaza from other natural formations and communities of the central Amazon region is its geomorphology. In the words of Matti Räsänen (1993), "this is a gigantic system depositional that forms an alluvial fan covered with wet tropical forest, the largest that has been studied in the world, with almost 6 million hectares (90 per cent of Peru and 10 per cent of Ecuador)".

Río Pastaza, the most important river that crosses the fan, is the source of the volcanic clastic material that makes up the fan. The narrow and poorly developed floodplain of Río Pastaza and the lakes in the blocked valleys in the lower basin of Río Pastaza (Mahuaca, Rimachi and Sevín) were created by fluvial deposition after a relatively abrupt change in its main channel. The accumulations of sediment of the Marañón River have also contributed to blocking drainage of the lower sections of the fan, resulting in the formation of abundant lakes in blocked valleys and large marshes.

The alluvial volcanic clastic and detritus material of the fan is blackish. Along the first 200 kilometres of the fan, Río Pastaza has a braided course, which transports large amounts of material of volcanic origin (Räsänen, 1993). The main reason for the

formation of the Abanico of Río Pastaza is the large area of watershed in the Andean region, with an annual precipitation that is more than 4,000 millimetres and the availability of abundant loose detritus and easily eroded volcanic material.

Origin: The alluvial fan begins in Ecuador in the Andean valleys of the upper basin of Río Pastaza, which erodes and drains the low areas of the Altar, Carihuairazo, Chimborazo, Cotopaxi, Sangay and Tungurahua (former name for the Río Pastaza) volcanoes. Several of these volcanoes are now active or were recently, in geological terms, during the Holocene (Räsänen, 1993).

Sediments on the fan have covered the relief previously dissected that is composed of sediments from the Tertiary and, as already indicated, the blocking of the valleys has created conditions that promote permanent and seasonal floodplains and large lakes and marshes. Remnant islands of the former relief dissected occur above all on the Lower Río Pastaza. Even the form of the lakes reflects the characteristics of this relief (Räsänen et al., 1993). The joining of geological formations of different ages and nature has created a mosaic of islands of ecosystems with unique combinations of plant and animal species from high ground and low lands (Conservation International, 1999).

Hydrology: The hydromorphic area formed by the Abanico of Río Pastaza is determined above all by the dynamics of Río Pastaza, the same that forms an important tributary of the Río Marañón. The Marañón, upon joining with Río Ucayali, which drains the Amazon basin and the central Peruvian Andes, forms the Amazon River. The Santiago, Morona, Pastaza and Tigre rivers are the main tributaries of Río Marañón on its left bank.

Río Pastaza, a white water river, is formed by the joining of the Baños and Palera rivers in the eastern part of the Ecuadorian Andes. It can be divided into two parts: the Upper Pastaza (from the origin to the mouth of Río Huasaga) and the Lower Pastaza (from the mouth of Río Huasaga to the junction with Río Marañón).

The main tributaries of Río Pastaza are the Huasaga and Huitoyacu rivers on the right bank and the Capahuari and Bobonaza rivers on the left bank. This junction defines the international border with Ecuador.

The area of the mouth of Río Bobonaza is very low and subject to flooding almost year round, except several elevations a few metres in altitude. In general, from the mouth of the Bobonaza and Huasaga rivers on Río Pastaza, there are abundant forested valleys, formed above all by abrupt changes in the main river, making drainage of the basin difficult and creating gigantic marshes and many lakes formed by meanders. On the higher parts, near the Peruvian-Ecuadorian border, the floodplain is narrowest and has a rocky bottom where the currents tend to be torrential, while in lower parts near the junction with the Pastaza on Río Marañón the floodplain expands and the river begins to form meanders of calmer water (Faura, 1964; Räsänen, 1993; Conservation International, 1999).

Climate: In general, the climate of the region of Abanico of Río Pastaza is permanently hot and humid. There is meteorological information from eight stations located on the edge of the region proposed as a Ramsar site, although most of them

are rainfall stations (see figure). According to available information, average temperatures range between 24.4° C during the winter (July, Station Borja) and 25.6° C during summer (February, Station Barranca). However, maximum temperatures of 30.0° C have been recorded at Station Barranca and an average minimum of 21.5° C also at Station Barranca, although temperatures of 16° C were recorded during the cold spell (friaje) of 1974 near the town of Jenaro Herrera on Río Ucayali.

#### Meteorological Stations in the Area of the Albanico of Río Pastaza

Station	Department	Province	Latitude	Longitude	Type	Altitude (m)
Tnte. Pinglo	Amazonas	Bagua	4° 25'	77° 37'	Rain	229
Chinganaza	Amazonas	Bagua	3° 56'	77° 46'	Rain	500
Bartra	Loreto	Loreto	2° 28'	75° 45'	Rain	180
Tnte. López	Loreto	Loreto	2° 31'	76° 14'	Rain	230
Barranca	Loreto	Alto Amazonas	4° 50'	76° 42'	CO	138
Borja	Loreto	Alto Amazonas	4° 28'	77° 33'	CO	174
Soplín	Loreto	Alto Amazonas	3° 24'	76° 21'	Rain	210
Sgto. Lores	Loreto	Loreto	3° 44'	74° 34'	Rain	120

As for precipitation, according to information from the stations mentioned averages range between extremes of 1900 millimetres (Station at Soplín) and 3400 millimetres (Station at Borja), although these values could be influenced by the orographic effect of the Cordillera de Campanquiz located west of the town of Borja. However, there are significant variations between the records of each station over the time series used. For the station of Bartra, records have been kept from 1964 to 1980 ranging between 2000 and 3400 millimetres of annual precipitation. For the station of Teniente López, records were used from 1964 to 1977, ranging from 1600 to almost 5800 millimetres of annual precipitation (T.H.E. Laboratories Inc., 1997). According to the Ecological Map of Peru (ONERN, 1976), the area studied corresponds to the life area of wet tropical forest, and although there is a transition towards wet pre-montane tropical forest, variations between the basic parameters of temperature and precipitation are insignificant.

#### 15. Hydrological values:

There is little hydrological information for the area, but it is known that the volume registered at flood stage is 2,769 cubic metres/second, while the volume of Río Marañón was measured at 16,374 cubic metres/second (October 1986) (IIAP–WWF OPP, 1999). The extent of flooding on Río Pastaza is six metres.

#### 16. Ecological features:

The Instituto de Investigaciones de la Amazonía Peruana has identified two landscape units with their corresponding plant communities from the mouth of Río Pastaza on the Marañón to Lago Chamara, characterizing them as follows (IIAP–WWF OPP, 1999).

A. First landscape unit: *Tahuampa* of white water in all of Río Pastaza itself.

#### 1. Bank complexes (including river islands):

Beaches or sandy areas: there are numerous areas, but they are quite small, although important as habitat for river turtles laying eggs (*Podocnemis expansa* and *P. unifilis*). In the older parts, there are associations of *Gynerium sagittatum* and *Tessaria integrifolia*.

Muddy areas: There are quite a few, small in area. Plant succession is composed of *Bacharis* sp., *Cecropia* sp., *Echinochloa* sp., *Ludwigia* sp., *Polygonum* sp. and *Tessaria integrifolia*;

Sandbars: Near the edge of Río Pastaza, there are narrow strips where rice, maize, yucca and bananas are grown. The characteristic wild species are *Calicophyllum spruceanum*, *Cecropia* sp., *Ficus insipida* and *Hura crepitans*.

2. Shrub and arboreal marshes: These are small flooded areas that are extensions of the sandbars with vegetation of *Bactris concinna*, *B. maraja*, *Pseudobombax munguuba* and *Triplaris* sp.

3. Low terraces: This corresponds to alluvial terraces, notable for their size. The plant communities are formed by a dominant association of palms. The dominant cover is *Sheelea* spp., with variable densities of *Astrocaryum* sp. and *Elaeis oleifera*. Among the dicotyledons, there are *Hura crepitans*, *Irianthera* sp., *Mansoa alliacea* and *Theobroma* sp.

4. Aguajal: These are found all along the river near the shore. There is a community of palms with a high and disperse canopy of *Mauritia flexuosa*, with thin trunks and an intermediate and continuous canopy of *Astrocaryum* sp., *Mauritia flexuosa* and *Sheelea* spp. and a low broken canopy of other palms such as *Euterpe precatoria*, *Mauritiella* sp. and *Socratea exorrhiza*.

5. Islands created by changes in the riverbed: The largest island found is located between Río Pastaza and Caño Rimachi. Vegetation is similar to that of the low terraces, reflecting its origin from changes in the course of Río Pastaza.

B. Second landscape unit: *Tahuampa* of dark water, seasonally with mixed water

Reference sectors: All the length of Caño de Lago Rimachi and the lower parts of the tributaries on the right bank of Cocha Huanayo, Cocha Pirumba, Lago Rimachi, Quebrada Chuinda, Quebrada Huitoyacu and Río Pastaza.

1. Riparian forest: This is formed by a thicket of shrubs, lianas and trees, which are important because of their high productivity and presence of species consumed by fish. The most common species are *Bactris* spp., *Ficus insipida*, *Hura crepitans*, *Inga* spp. (five species), *Inga tibatiana*, *Irianthera* sp., *Macrolobium* sp., *Schizolobium* sp. and *Uncaria guianensis* and Bignoniaceae with pink flowers. In the pools, there are *Echinochloa* sp., *Hymenachne* sp. and *Polygonum* sp.

2. Low terraces: Of alluvial origin, they are associations of palms (*Bactris* spp., *Elaeis oleifera*, *Hura crepitans*, *Inga* sp., *Maclura* sp., *Phytelephas tenuicaulis*, *Sapium* sp., *Sheelea* sp. and *Swartzia* sp.).

3. Aguajal: Extending over large areas, they are near stream banks, with abundance and dominance of *Mauritia flexuosa* in two emergent dispersed strata with thin trunks and hanging dry leaves and a medium and continuous canopy with a more robust trunks. Among the dicotyledons, there are *Buchenavia* sp., *Genipa americana* and *Macrolobium* sp.

4. Marshes: These border the lakes and areas of water in blocked valleys. In the open area, there are found aquatic floating and rooted macrophytes, such as *Ceratophyllum* sp., *Echinochloa* spp., *Hymenachne* sp, *Ludwigia helminorrhiza*, *Montrichardia arborescens* and *Pontederia* sp. and one aquatic fern, *Ceratopteris pterioides*. Among the shrubs and trees, there are *Bactris riparia*, *Bactris* sp., *Coussapoa* sp., *Ficus trinervia*, *Ficus* sp., *Genipa americana*, *Macrolobium acaciaefolium*, *Mauritiella* sp., *Pseudobombax munguuba* and *Symmeria paniculata* and very dispersed, *Mauritia flexuosa*.

The following habitats for birds have been identified (IIAP-WWF OPP, 1999)

- Primary forest not subject to flooding high ground (*tierra firme*) or very exceptionally flooded (high sandbars);
- Periodically flooded forest (*tahuampa* or *varzea*) also referred to as poorly drained forest not subject to flooding (*huicungal*, *sacha aguajal*, *shebonal*), with absence of *aguajes* and more closed canopy than that of the *aguajales*;
- Transitional forest on edges of rivers and large streams dominated by *Cecropia* sp., *Ficus* sp. and *Triplaris* sp.;
- *Aguajal* dominated by *Mauritia flexuosa* and of very open canopy;
- Secondary forest of various ages on the edge of primary forest;
- Farm and grassland including habitats degraded by man with herbaceous and shrub vegetation, especially near military camps and settlements. Also referred to as grasslands with scattered shrubs;
- Clearings in the forest, produced naturally by the falling of trees;
- *Zabolo*, a herbaceous strip with shrub typical of the edges of beaches, dominated by *Echinochloa* sp. and *Paspalum* sp. and shrubs of *Cassia* sp. and *Tessaria* sp.;
- Edges of streams and *caños de las cochas*;
- Edges of lakes (*cochas*) and pools;
- Edges of rivers;
- Rivers;
- Lake (*cocha*);
- Beaches.

The low region of the Abanico of Río Pastaza was identified as first priority for conservation during planning for a conservation strategy for the ecoregion of flooded forests in the Amazon (IIAP-WWF OPP, 1999).

#### 17. Noteworthy flora:

With regard to the flora, the most relevant aspect is the presence of large areas called *aguajales* (almost pure and mixed communities of *Mauritia flexuosa*) on both banks of Río Pastaza. These are especially important because of their good

conservation status and large area. In the rest of the areas of the Abanico of Río Pastaza, the dominant formations are mixed forests of palms, which because of their high productivity harbour an abundant and varied wildlife.

There are large populations of *Elaeis oleifera* (native oil palm), whose distribution is restricted to a few places in the Amazon. In addition, the presence of timber-producing species in relative abundance, such as *Calycophyllum spruceanum*, *Cedrela odorata*, *Ceiba* sp., *Guazuma crinita* and *Swietenia macrophylla*, are indicators of a lack of pressure on these resources.

Despite the relative abundance of rare species (endangered and vulnerable species), heavy extraction of *Ceiba* sp. and probably *Swietenia macrophylla*, by loggers from Iquitos is a latent threat for the decrease of these species. The other resources are exploited sustainably by local inhabitants (IIAP-WWF OPP, 1999).

During recent ecological surveys, 45 species of palms in 20 genera were identified, which gives the area special importance both for its diversity and the area of its plant communities. Among the species of palms found, several have not been recorded in the Sistema Nacional de Areas Naturales Protegidas (Mejía and Vargas 2001). In addition, surveys have recorded 804 species of arboreal and shrub plants.

#### 18. Outstanding fauna

As to the wildlife, the Abanico of Río Pastaza has a fauna ecosystem typical of the Amazon floodplain, outstanding because of its good conservation status and abundance of ungulates, aquatic birds and marine turtles, among others. There is a relative abundance in this area of several species categorized as threatened or in danger of extinction, such as *Ateles belzebuth*, *Geochelone denticulata*, *Inia geoffrensis*, *Lontra longicaudis*, *Melanosuchus niger*, *Panthera onca*, *Podocnemis expansa*, *P. unifilis*, *Sotalia fluviatilis* and *Trichechus inunguis*.

There is *Pithys castanea* (Thamnophilidae), a rare flycatcher, only is known until now by one type specimen collected at the locality of Andoas, Río Pastaza, in 1937 (Collar et al., 1992). In addition, several endangered or almost extinct species, such as *Crax globulosa* and *Pteronura brasiliensis*, have potentially extensive habitats that can harbour large populations in the region, in contrast to other areas of the varzea, except the Reserva Nacional Pacaya-Samiria (IIAP-WWF OPP, 1999).

There are important vertebrates, such as *Alouatta seniculus*, *Ara ararauna*, *A. chloroptera*, *A. macao*, *Caiman crocodylus*, *Chelus fimbriatus*, *Crax salvini*, *Hydrochaeris hydrochaeris*, *Jabiru mycteria*, *Lagothrix lagotricha*, *Myrmecophaga tridactyla*, *Penelope jacquacu*, *Priodontes maximus*, *Psophia crepitans*, *Puma concolor* and *Tapirus terrestris* (IIAP-WWF OPP, 1999).

The Abanico of Río Pastaza is included in the Endemic Bird Area (EBA) of Tierras Bajas del Alto Amazonas-Napo (Stattersfield et al., 1998), in evergreen lowland forests and forest subject to flooding. In this EBA, there are 10 species of endemic or limited birds, one of them threatened with extinction (Stattersfield et al., 1998).

During the recent ecological surveys, the presence in the area of 261 species of birds (53 families), 66 species of mammals (22 families), 57 species of amphibians (7 families), 38 species of reptiles (16 families) and 292 species of fish (33 families) was recorded (CDC-WWF OPP, 2001).

#### 19. Social and cultural values:

Occupation of the land is restricted to the main rivers: the Marañón, Pastaza, Tigre, Urituyacu and Nucuray rivers. Most of the population is composed of mestizo colonists (shore dwellers) and a native population of Candoshi and Quechua del Pastaza Indians. In the extreme southern part (right bank of Río Marañón), there are three important towns: San Lorenzo with about 10,000 inhabitants (administrative headquarters of the sub region of the same name), Barranca with 3,000 inhabitants and Centro Industrial with about 1,000 inhabitants located at the mouth of Río Pastaza. The population of these towns has recently increased considerably forming intermediate centres of consumption and trading in products from the area of the Abanico de Pastaza towards Iquitos, namely wood, game meat and fishing products.

District	Province	Population 1993	Urban population (%)	Population 1999	Annual growth rate	Population density (inhab./km <sup>2</sup> )
BARRANCA	ALTO AMAZONAS	8,558	0.54	11,534	5.1	1.9
CAHUAPANAS	ALTO AMAZONAS	7,598	0.10	10,124	4.9	7.6
JEBEROS	ALTO AMAZONAS	3,375	0.55	3,216	-0.8	0.7
LAGUNAS	ALTO AMAZONAS	12,164	0.58	13,618	1.9	2.4
MANSERICHE	ALTO AMAZONAS	7,098	0.07	9,621	5.2	2.8
MORONA	ALTO AMAZONAS	1,331	0.12	823	-7.7	0.1
PASTAZA	ALTO AMAZONAS	13,671	0.18	17,499	4.2	0.8
SANTA CRUZ	ALTO AMAZONAS	4,155	0.17	4,652	1.9	2.7
YURIMAGUAS	ALTO AMAZONAS	52,831	0.61	61,627	2.6	23
NAUTA	LORETO	26,703	0.33	34,575	4.4	5.5
PARINARI	LORETO	7,918	0.09	8,405	1.0	0.7
TIGRE	LORETO	5,858	0.23	5,449	-1.2	0.3
TROMPETEROS	LORETO	4,303	0.24	6,350	6.7	0.5
URARINAS	LORETO	9,548	0.08	11,203	2.7	0.7
Total		165,111		198,696		

In addition, the southern part of the fan is crossed by the Nor Peruano pipeline and the secondary pipeline in the middle and upper parts of the basin (on the border with Ecuador).

#### 20. Land tenure/ownership of:

In the area proposed as a Ramsar site, there are native communities of Candoshi, Quechua del Pastaza, Urarinas and Cocamas-Cocamillas Indians, in a total of 24 communities, in an area of 208,258.4 hectares. These communities are located on the banks of the Pastaza (Candoshi), Nucuray (Candoshi), Marañón (Quechua del Pastaza), Urituyacu (Cocama-Cocamilla) and Patayacu (Urarinas) rivers.

#### 21. Current land use:

Although there is a large population (about 200,000 inhabitants), the density of rural population is relatively low (estimated 123,000 inhabitants in 1999). Most of the population is settled along the main rivers. The area used for agriculture is limited, slightly fewer than 50,000 hectares (1 per cent of the total area). The most important crops are bananas, yuca and maize, which take advantage of the fertility of the volcanic soils and the soils of the shores.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects:

The most obvious threats in this area are (IIAP-WWF OPP, 1999):

The presence of the Nor Peruano pipeline and oil wells in the northern part of the basin, which increases the risks of pollution from accidental oil spills along the pipeline, at the production wells or drilling wastes.

Extraction of timber for the market in Iquitos and for supplying San Lorenzo and Barranca;

Hunting of wildlife for commercial purposes for the market of Iquitos.

23. Conservation measures taken:

Up until now, the only protection or management measures for the resources adopted by the Peruvian government related to the region of the Abanico of Río Pastaza has been establishment of the fishing reserve in Lago Rimachi, now under communal administration. Basic and applied research for regulation of local fisheries was carried out here under the Direction de Aguas Continentales of the Peruvian Instituto del Mar.

24. Conservation measures proposed but not yet implemented:

In the 1940s, the Pastaza-Morona-Marañón National Forest was established and is now under the Direction General Forestal of the Instituto Nacional de Recursos Naturales (INRENA) but there are no management plans or local administration.

25. Current scientific research and facilities:

During July and August 1999, an ecological survey, Aquarap, was carried out by Conservation International with the participation of scientists from North America and Peru. Later, in 1999, the Instituto de Investigaciones de la Amazonía Peruana (IIAP) in coordination with the World Wildlife Fund (WWF-OPP) carried out additional studies in the region of the Abanico of Río Pastaza in order to prepare a plan for conservation of the ecoregion of Amazon forests subject to flooding (varzeas). Finally, at the beginning of 2001, the Centre for Conservation Data of the Universidad Nacional Agraria La Molina in cooperation with IIAP and WWF-OPP carried out a complementary survey in the region.

26. Current conservation education:

Non-existent

27. Current recreation and tourism:

There is occasional tourism interested in ethnography and shamanism near Lago Rimachi (Río Pastaza).

28. Jurisdiction:

- Fisheries: Ministerio de Pesquería, Dirección Regional de Pesquería-Loreto;
- Soils/Forest/Fauna: Ministerio de Agricultura, Dirección Regional de Agricultura-Loreto, Instituto Nacional de Recursos Naturales (INRENA-Loreto);
- Tourism: Ministerio de Industria, Turismo, Comercio e Integración, Dirección Regional de Turismo-Loreto;
- Petroleum: Ministerio de Energía y Minas, Dirección Regional de Energía y Minas-Loreto;
- Indigenous communities: PROMUDEH (SETAI);
- Gobierno Regional de Loreto: Consejo Transitorio de Administración Regional-Loreto;
- Concejo Provincial de Loreto;
- Concejo Provincial de Alto Amazonas.

29. Management authority:

The agency responsible for application of the Ramsar Convention is the Instituto Nacional de Recursos Naturales (INRENA), which is also responsible for the Sistema Nacional de Areas Naturales Protegidas por el Estado.

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30. References: