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Information Sheet on Ramsar Wetlands

1. Date this sheet was completed/updated: June 2002
 2. Country: Ecuador
 3. Name of wetland: Cajas National Park
 4. Geographical coordinates:
 - 2° 50' 22" North latitude
 - 79° 14' 09" West longitude
 5. Altitude: 3160–4445 metres above sea level
 6. Area: 29,477 hectares, including 1,202 hectares (4.15 per cent) of lakes. The rest is the watershed.
 7. Overview: In Lagunas del Cajas there is a unique type of lake paramo. It is a mountain system with exceptional characteristics in which there are more than three hundred bodies of water. This group of lakes is located in the part of the Andes closest to the Pacific Coast. El Nudo of El Cajas is the point of origin of a hydrographical system that flows west to east through the Valle de Tomebamba, where the city of Cuenca is located (the third largest city in Ecuador and a World Heritage Site). Five centuries ago, it was the Incan city of Real de Pumapungo and before that Paucarbamba, the centre of the Cañari civilization at the source of water and the historical connection with the coast. In addition, it is an important ecosystem representative of the biodiversity of the Andean paramo.
 8. Wetland type: M, N, O, P, Tp and Ts
 - M -- Permanent rivers/streams/creeks
 - N -- Seasonal/intermittent/irregular rivers/streams/creeks
 - O -- Permanent freshwater lakes (over 8 hectares)
 - P -- Seasonal/intermittent freshwater lakes (over 8 hectares)
 - Tp -- Permanent freshwater marshes/swamps/pools; ponds (below 8 hectares)
 - Ts -- Seasonal/intermittent freshwater marshes/pools
- Types of wetlands by decreasing order of importance: O, M, P, N, Tp, and Ts
9. Ramsar criteria: 1, 2, 3 and 4
- Criteria that best characterize the site: 1
10. Map of site included? Please tick yes -or- no

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

Paula Cordero
Jefe del Parque Nacional Cajas
Benigno Malo 7-78 y Sucre
Casilla 2-97
Cuenca, Ecuador
Tel.: (593 7) 890 418
E-mail: etapauma@etapaonline.net.ec/paulac70@hotmail.com

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

Criterion 1: The exceptional universal importance of Lagunas del Cajas lies in a group of Andean paramo lakes with very high aesthetic value inherent in their formation from moraines, habitat for indigenous species and archaeological and historical traces of life in the Andes from 3000 B.C. until present. Cajas National Park is located in the narrowest part of the Andes and because of this the distance from the continental divide to the sea is the shortest of the entire cordillera. In addition, the concentration of lakes is exceptional. Cajas has a complete range of geological and geomorphologic processes that have created more than 300 lakes in an exceptional physiographic formation within the mountainous Andean system and the world. Its importance as a hydrological reserve is strategic. In 1879, the German Teodoro Wolf stated, "the Paute fluvial system is the most beautiful in all of Ecuador" proving that "importance should be given to the Matadero (Río Tomebamba) because it is the longest river that begins in the lakes of El Cajas". He also stated that "no other river in northern South America, among those that empty into the Atlantic Ocean, begins as close to the Pacific Ocean as Río Paute because its headwaters are no more than 8 to 10 leagues in a straight line from the Gulf of Guayaquil" (León, 1992).

Criterion 2: Cajas should be listed as a wetland of international importance because it provides habitat for vulnerable species such as the Andean condor (*Vultur gryphus*), the white-tailed deer (*Odocoileus virginianus*), the Andean bear (*oso de anteojos*) (*Tremarctos ornatus*), the Andean wolf (*lobo de paramo*) (*Pseudalopex culpaeus*) and many birds including the *tucán de la sierra* (*Andigena hipoglauca*). There are endangered plant species found here, such as the *Podocarpus sprucey* and *Polylepis* sp.

Criterion 3: Cajas National Park should be considered of international importance because it sustains populations of plant and animal species indispensable for maintenance of the biological diversity of a specific biogeographical region, namely the Andean paramo. Cajas is within the northern Andean centre of endemism (Cracraft, 1985), and the endemic biota, including plants and animals, are highly vulnerable to disturbances or extinction because of the small dimensions of their habitats in the mountain forests (Mark et al., 1996). Cajas is a centre of diversification and endemism of *Polylepis* (Kessler, 1996) and has four of the seven species in this genus recorded in Ecuador. It is the only site in the world where *Polylepis lanuginosa*, *P. reticulata* and *P. weberbaueri* coexist in a single small area along with *P. incana* in small nearby areas (DIFORPA, in preparation). Cajas National Park is one of the protected areas in Ecuador with greatest plant endemism

according to the “Red Book of Ecuador’s Endemic Plants” (Valencia et al., 2000). It is an irreplaceable area from the point of view of ornithology, and conservation efforts there seem to function well because they are supported by conservation initiatives from the local communities (Krabbe et al., 1998). Wege and Long (1995) identify it as a key area for the conservation of birds in Ecuador. In general terms, at least ten species endemic to the northern Andes centre of endemism (Cracraft, 1985) are found in the park; eight of which are in one of the IUCN categories of vulnerability (Granizo, 1997). There are two migratory species and six species whose area of distribution is restricted to the Ecuadorian Andes (Krabbe et al., 1998). This area is one of the few that has forest in the western part of the province of Azuay (Mazán forest), which serves as a biological corridor for small-scale migrations (Rodas, personal communication). This helps maintain the genetic diversity of the isolated populations because of the discontinuity of habitat, therefore, improving their chances of survival.

Criterion 4. As for migratory species, it is an essential habitat for the *playero de Baird* (*Calidris bairdii*), a boreal migratory species that uses this area for feeding during its migration towards more southern areas (Ridgely and Greenfield, 2001). They arrive in the area of Cajas in small flocks between September and November and feed on invertebrates on the muddy or rocky shores of the small streams and lakes (Rodas, 1998).

13. General location:

Cajas National Park is located in the parishes of Chaucha, Molleturo, San Joaquín and Sayausí, in the canton of Cuenca, northwest of the city of Cuenca, province of Azuay. Its centre of gravity is approximately 26 kilometres on a straight line from the centre of Cuenca to the centre of Cajas National Park. The population of the city of Cuenca is estimated to be 275,000 inhabitants according to the most recent census carried out in 2002 (annex 1).

14. Physical features:

One of the main geological characteristics of Ecuador is the Andes cordillera. In Cajas, the glacial processes have produced high rates of denudation because of intense glacial erosion. Relic, typical glacial, morphology characterizes the area, from steep slopes and large differences in elevation to the most curious of moraines.

Rocks in Cajas belong to the Tarqui geological formation, which is represented by the volcanic flow covering large areas in the mountains of southern Ecuador in discordance over older layers. In the sequence, there are deposits of pyroclastic materials and agglomerates of compositions from riolite to andesite, toba, volcanic ash and ignimbrite. Two radiocarbon datings of fossilized wood indicate young ages of 34,300 and 24,900 years (from the Upper Pleistocene) (UNDP, 1969; Huss, 1973, in Bristow, 1974). During the Pliocene, approximately 5 million years ago, there was volcanic activity, mainly in the western part of the basin, forming heavy lava flows that covered the cordillera. Approximately 12,000 years ago, there was an intense glacial period that destroyed the Cajas mountain range above 3000 metres in elevation, forming this region’s characteristic glacial morphology. The soils in Cajas are formed from volcanic ash. According to the FAO classification of content of

organic material, the soils in Cajas have a high carbon content and are very shallow. They are classified as histosols, and several have a low carbon content. Deeper soils are classified as andosols. The average carbon content in the soil in the park is 30 kilos/square kilometre (300 milligrams/hectare), comparable to the carbon content of a mature forest (Abcouwer, 2001).

As for the climate, the outstanding characteristics are low temperature and considerable diurnal variation. The minimum temperature recorded is -1° C at night, and the maximum is 22° C at mid-day, with an average of 10.9° C. The coldest and windy months are July and August. The climate has no seasonal variation because of constant radiation throughout the year near the equator.

Wind and humidity are typical characteristics of the paramos. Maximum, minimum and average humidity of 95 per cent, 40 per cent and 80 per cent, respectively, have been recorded. Average wind velocity is 4.5 metres/second. There are two periods of precipitation: one from February until May and the second from October until December. Precipitation is caused by the effect of the intertropical convergence zone (ITCZ) on Ecuador. The main dry season is from June to August, the southern winter, and the second dry period is from the end of December to January (*veranillo del Niño*).

15. Hydrological values:

Cajas contains a complete range of geological and geomorphologic processes that led to the exceptional formation of more than 300 lakes of an average of five hectares each, making up a physiographic formation exceptional within the Andes and the world. There is a density of 1.4 lakes per square kilometre. The aquatic ecosystems of Cajas are subdivided into oligotrophic, mesotrophic and eutrophic lakes and swamps.

Soils: The relationship between dry density and water content is high under various climatic conditions, from rains in May until the dry season in September, confirming that there is no climatic influence between the relationship of density to water content (Abcouwer, 2001). The extreme low dry density and the high water content are properties of volcanic soils, which act as sponges that retain water.

Cajas forms part of the upper hydrographical basin of Río Paute. It has a hydrographical system of more than 300 lakes and 13 hydrological micro basins most of which are oligotrophic; in other words with clear water (a photic zone approximately 10 metres in depth), well oxygenated and with low levels of nutrients. The water is used for consumption by the inhabitants of the city of Cuenca (760 litres/second) and the surrounding rural areas. According to the water quality index (WQI), there is a water quality index of between 91 to 98 per cent throughout the micro basins, which signifies that there is excellent water quality in the park (annex 3) (unpublished study, ETAPA 2001).

16. Ecological features:

The combination of its range in altitude, between 3160 and 4445 metres above sea level, and its peculiar hydrographical system have developed several biological

communities or plant formations: montane evergreen forest, high-mountain evergreen forest (forests of *Polylepis*), lacustrine grassland, grass paramos, paramo of clumps (Sierra, 1999) and aquatic lentic and lotic ecosystems.

The wet montane forest at Llaviuco (eastern boundary) is made up of arboreal species, shrubs and low vegetation such as *chilca*, *garao*, *huahual*, *pacarcac*, *pichul*, *pumamaqui* and *sarar*, as well as a large diversity of orchids, ferns, *huicundos* and mosses (virgin forest). The wet montane forest, which is exuberant and abundant in timber-producing species, is located in the extreme western part (El Calvario, Ducal, etc) and is in an acceptable conservation status. In the high-montane evergreen forest located within the park in the town of Surocucho, 246 species of vascular plants have been recorded of which 102 are woody (Minga, 1998). In the Mazán forest, on the edge of the national park, there is a similar pattern: 300 vascular species of which 80 are woody (Serrano, 1996).

The genus *Polylepis* has unique eco-climatic characteristics (Kessler, 1996). The Gentianaceae family is specific to the paramo ecosystem and Ericaceae and Labiatae to the chaparral. In addition, one of the populations of indigenous species is the *Podocarpus sprucey* (also called *pino de los Andes*). There are records of several invasive plants, such as *Taraxacum officinalis*, that have reached the grassland.

In the buffer area of the park, there are changes in the characteristics of the ecosystems, because grasses have been sown for grazing. During recent decades, several governmental and non-governmental institutions have promoted the planting of pine trees and even eucalyptus in surrounding areas, which change the landscape and the conditions of the paramo.

Agriculture, because of poor soil conditions and because it is on the climatic floor of the paramo, is of secondary economic importance. Most of the land is used for pasture, however, the potato, *melloco*, *mazhua*, oca and vegetables are also grown.

With regard to the trophic chains found in this wetland, there are a large number of producers and a smaller number of secondary consumers (herbivores), such as the llama (*Lama glama*). Very few secondary consumers (carnivores), such as the Andean wolf (*lobo de paramo*) (*Dusicyon culpaeus*), are found because of the limiting factors of climate and altitude at this site. In the hydrographical systems, it has been learned that production of phytoplankton and zooplankton is low, and that fish, because there are not many species and because the trout (*Onchocynchus mykiss*) has been introduced into these ecosystems, have become little productive.

17. Noteworthy flora:

Cajas National Park is one of the protected areas in Ecuador with greatest plant endemism. The "Red Book of Endemic Plants of Ecuador" (Valencia et al., 2000) lists 71 endemic species in the park and states that with exhaustive studies 145 endemic species could be found. About 30 per cent of the species registered are exclusive to Cajas; in other words, this includes 21 species unique in the world, of which 70 per cent are considered endangered and the remaining 30 per cent as vulnerable, based on IUCN criteria. One of the most important areas for

diversification of the genus *Polylepis* is Cajas National Park, because habitat for four of the seven species recorded in Ecuador is found there, forming the only site in the world where *Polylepis lanuginosa*, *P. reticulata* and *P. weberbaueri* coexist in a single area and *Polylepis incana* in nearby areas (DIFORPA, in preparation). An important species in the area that is considered endangered is the *Podocarpus sprucey*, a unique Andean conifer. The following are endangered timber-producing species: *Myrcianthes rhopaloides*, *pichul* (*Vallea stipularis*), *sasar* (*Weinmannia fagaroides*), *pacarcar* (*Hesperomeles ferruginea*), *pumamaqui* (*Oreopanax aviccennifolius*), *tililín* (*Piper andreanum*) and *jigua* (*Ocotea heterocroma*).

The wet paramo occupies the greatest area in the park, where *paja* (*Stipa ichu*), *valeriana* (*Valeriana hirtella*), *tushig* (*Gynoxis bursifolia*), *romerillo* (*Prumnopitis montana*) and *chuquiragua* (*Chuquiragua jussieui*) have been recorded. Many of these plants are used by ethno-medicine in the area.

18. Outstanding fauna:

Wege and Long (1995) identify this area as a key area for the conservation of birds in Ecuador. In this protected area, there are approximately 200 bird species, of which several have outstanding characteristics and depend directly on conservation of remnant habitats in this national park. With regard to migratory species, this is an essential habitat for the *playero de Baird* (*Calidris bairdii*), a southern migratory species, which uses this area for feeding along its migration farther south (Ridgely and Greenfield, 2001). This species visits the area of Cajas in small flocks between September and November to feed on invertebrates found on the muddy and rocky shores of the streams and lakes (Rodas, 1998).

Among the endangered mammals whose populations have significantly decreased are the white-tailed deer (*Odocoileus virginianus*), the Andean bear (*oso de anteojos*) (*Tremarctos ornatus*), *yamala* (*Mazama rufina*), puma (*Puma concolor*), ocelot (*tigrillo*) (*Leopardus pardalis*), Andean tapir (*danta de altura*) (*Tapirus pinchaque*) and coati (*cuchucho*) (*Nasua nasua*).

As for endangered species, this is habitat for two endangered, two vulnerable and four almost endangered species (Ridgely and Greenfield, 2001). One of the species of birds endangered in Cajas is the Andean condor (*Vultur gryphus*) with a recorded population of no more than 8 to 10 specimens. Among the birds, perhaps the most important species is the endemic violet-throated metaltail (*colibrí metalura gorjivioleta*) (*Metallura baroni*). It is common in the park and depends exclusively on patches of quinoa forest (*Polylepis* spp.), *piquil* (*Gynoxys*) and *quishuar* (*Buddleja*) (Rodas, 1998). In annex 4, are listed the most important bird species, which depend on conservation of Cajas National Park for survival. Bird life is being studied for implementation of the management plan.

Another endemic species restricted to Cajas National Park is the *ratón pescador* (*Chibchanomys orcesi*), which lives along streams in the paramo. This is the only species of this type that has been recorded in Ecuador (Barnett, 1997). Although this genus is distributed in the Andes of Colombia, Peru and Venezuela, it has not been found in the rest of the paramos of Ecuador, which results in a biogeographical enigma (annex 5).

The fauna that lives in these lakes is not diverse (five genera of micro crustaceans). As for fish, it seems that there are only two species: the catfish (*preñadilla*), which is disappearing, and the trout. On the other hand, the streams have a high diversity of macro invertebrates (more than 30 species, most of them in the class Insecta followed by Crustacea, Annelida, Arachnida, Turbellaria and Mollusca) that are especially abundant. There are species that act as biological indicators of clean water belong to the Ephemeroptera, Plecoptera and Trichoptera, which shows the biological integrity existing in the area (annex 6). The classes Crustacea, Insecta and Oligochaeta are found in all the hydrographical basins. The class Hirudinea is also important in Cajas. The plecoptera in the family Perlidae are found in ten of the thirteen basins studied. Among the ephemeroptera, the family Leptophlebiidae is the most frequent (12 basins). Elmidae (Coleoptera) is found in the rivers of twelve basins. Among the trichoptera, the families Leptoceridae and Hydrobiosidae are common in most of the rivers studied (12 and 9 basins respectively). The larva of diptera in the families Chironomidae, Simuliidae and Tipulidae are present at most of the sites. In thirteen hydrographical basins of the Cajas National Park, there are a total of eight different classes of benthic macro invertebrates. In the class Insecta, there are six orders and 26 families of aquatic insects. In Cajas, a greater number of taxonomic units of ephemeroptera and Plecoptera have been recorded, groups that live in clear water (Carrasco, 2002).

19. Social and cultural values:

The greatest social value of this area for the surrounding communities and, above all, for the city of Cuenca is the quantity and quality of the potential water reserve, which now supplies 275,000 inhabitants. Since establishment of the site as a protected area, it has been visited by many tourists from the city of Cuenca, the rest of Ecuador and abroad because its landscape is exceptional. This is an excellent area for hiking. There are several organizations of mountain climbers that regularly visit the site, educational centres that use the site as a recreation area and for environmental interpretation and several tour operators. In many of the communities, there are expectation that tourism could become an economic alternative to be developed, based on the greater economic importance of the activities linked with it: sale of trout, preparation of food, rental of horses and work as guides. In addition, several sports are practiced in the park, including rock-climbing, boating and, above all, training for high-altitude hikers and high-performance athletes in general. (Ecuador has an Olympic medallist who trained in this area.) Sport fishing is also one of the major pastimes begun by visitors long ago.

Livestock raising is carried out in the area between 3700 and 4200 metres above sea level. However, the high altitude makes it difficult to grow high-quality pasture. Because the soils are extremely acidic, the only option for production at these places is extensive livestock raising in the grassland, which in the medium term implies a change in land use and the biotic communities existing in the area. Fishing in several streams and lakes in the area is an economic activity in almost all the communities. Depending on access to markets for this product, it is sold or consumed as a supplement to the family diet. Formerly, the catfish was the species that was sold.

Cajas is a site dedicated to scientific research. Research has been carried out by important international institutions such as Oxford University and the Missouri Botanical Garden. In addition, the Universidad del Azuay has carried out research there, above all in the Mazan forest. There are several scientific studies on fauna and flora that have led to the following publications: "Trees and Shrubs of the Mazan Forest" (volumes I and II) (Sarrano, 1996; Minga, 2000) and "Birds of the Mazan Forest" (volumes I and II) (Toral, 1996; Rodas, 1998). Universidad del Azuay, through its school for environmental biology, frequently uses the area as a site for fieldwork.

Traces of the presence of human activity in the Andes can be found, according to reports, in ceramics from the Azuayo period (Narrío), 3000 to 500 B. C., and, even more important, there are convincing archaeological sites that are testimony of human movement in the territory that maintained very important links with the Andean culture along the Inca Trail along the crest of the Andes and on the transversal axis between the royal city of Pumapungo and the Pacific Coast, maintaining special relevance for the archaeological history of that city. Near the boundary of the wetland are the Paredones de Molleturo, a high-mountain archaeological site with economic activity, which makes it exceptional in the archaeology of the Andes. In the area of Cajas National Park, there is also human archaeological evidence in the so-called associative cultural landscapes, giving conclusive character of worshipers of lakes, mountains and rocks of its early inhabitants. There are five stone structures that made up the Inca Trail that linked Tomebamba with the river port of Bola on Río Cañar de la Costa, known as Ingañán (Molinet, 2002). Ingañán was the site of the first inn used by travellers and traders between Santa Ana de los Ríos de Cuenca and the port of Naranjal on the Pacific Coast (Chacón, 1993), called Obispo Punofia (reclined bishop) in reference to the shape of the mountains that resemble the form of a reclining priest in the west-east sense. Today, the site has been repeatedly associated with the symbolism of the Virgin Mary. In 1988, a young boy from Cuenca declared having received messages from the Virgin Mary and began a religious movement of great significance at that time in the area and later at the national and international levels. This Catholic religious movement calls itself Virgen Guardiania de la Fe.

It is important to point out that in these lakes now the so-called native witchdoctors hold collective cleansings, which consist of bathing rituals, the use of local herbs and changes of clothing.

The communities of Baños, San Joaquín and Sayausí are rural parishes of Cuenca linked with the high and cold hamlets in the mountains and with warm areas on the western side of the cordillera, as well as with the large commercial centre of Cuenca. These villages were and still are linked with what during colonial times were called *cajas de comunidad*, communal land that has survived until today in many places of Azuay. Pasture for cattle, hunting, fishing, cutting of firewood, charcoal, pasture and other products of the cold climate come out of here. In this context, it is important to point out that these relations occur thanks to the trails that lead from Cuenca to the Coast such as el Ingañán and the road called García Moreno (a recent modern road). The local economy is not a closed economy. The main economic activities that make possible reproduction of the family depend on the market; for example: the sale of

labour, services, fishing and sale of livestock, sporadic sale of farm products and national and international migration (Serrano, 2001).

20. Land tenure/ownership of:

(a) Land ownership within the park is mostly public land by declaration in accordance with resolution 057 of 1996. However, private property also exists within the park; for example 8,000 hectares of property of the Empresa Pública Municipal ETAPA and communal land reclaimed by the communities of Alto Zhin, Angas, Llano Largo, Miguir and Río Blanco.

(b) In the surrounding area, there are private properties that are basically human settlements that date from several centuries ago. Many of them are managed as communal property and others as individual property that have been built on over the past 20 years.

21. Current land use:

(a) Because this is a protected area, the approximate percentages of use given to the soil are the following: *Polylepis* forest, 3.58 per cent; native forest, 1.54 per cent; chaparral, 0.18 per cent; grassland, 90 per cent; small areas of pine and eucalyptus plantations, 0.1 per cent; wetlands, 10 per cent; and lakes, 4.15 per cent. There are even areas of eroded soil (3 per cent) with emergent bedrock in which there is a high loss of soil because of wind erosion and run-off.

(b) In the surrounding area, land use has changed as areas of paramo and forest of *Polylepis* are converted into pastures. Deforestation of the surrounding area has accelerated since construction of the Cuenca-Molleturo-Naranjal highway, above all in the area of the Río Tomebamba basin. The surrounding area was characterized by large properties until well into the 1980s. However, by the end of the 1980s and in the following decade, there was permanent erosion of the soil and consolidation of properties for production of pasture for establishment of dairy ranches or pine forest plantations (annex 7).

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

(a) Within the Cajas National Park, one of the greatest adverse factors is construction of the Cuenca-Molleturo-Naranjal highway in the 1990s. The Cuenca-Molleturo-Naranjal highway joins the cities of Cuenca and Guayaquil (the second most important city in Ecuador), and an average daily traffic of 4000 vehicles is projected. It crosses the park along 12.5 kilometres, cutting many biological corridors. A large amount of the forest cover of *Polylepis* was lost, destabilizing slopes and producing acceleration of eutrophication of Lake Ilincocha by pollution with nutrients from the camp of the Ministry for Public Works. Now functioning, the highway represents a danger because of the potential risks of pollution of the water from petroleum, the increase in the number of visitors to the area and increase in waste and burning in order to create pasture extensive grazing.

(b) In the surrounding area, the major adverse factors are high levels of poverty. Urban demographic patterns are not found here, and there is no access to the goods and services of the cities. Extensive cattle raising in the paramo is one of the few options for obtaining an economic income. The Yacutuviana forest has a large biodiversity. However, for the inhabitants of the surrounding communities it is appreciated for its timber-producing species. Indiscriminate fishing without planning for areas, volumes and closed periods makes it an unsustainable resource. The existence of conflict between the national park and the surrounding community is presented as a problem of boundaries, but it is really a conflict over management of natural resources and domination of territory. Construction of the inter-provincial highway brought with it extension of the farming frontier through slash and burn throughout the whole area of influence.

23. Conservation measures taken:

Cajas was established legally as national recreation area on 6 June 1977 by Acuerdo Interministerial No. 0203, and in July 1979 by Acuerdo Interministerial No. 0322 its boundaries were ratified. In November 1996 by resolution 057, it was declared a national park and its boundaries were established (annex 8). On 16 March 2000, the Ministry for Tourism and the Environment signed an agreement on decentralization of the management of Cajas National Park with the city of Cuenca. The objective of the agreement is to transfer the responsibilities for management and operation of Cajas National Park from the Ministry for the Environment to the city of Cuenca and strengthen municipal institutions so that they can assume the responsibility of managing, conserving and defending the environment and guaranteeing inalterable conservation of the biotic and abiotic elements, as well as maintenance of the quality and quantity of the hydraulic resources required for supplying water to the populated centres of the canton of Cuenca (annex 9).

The agreement provides for management and operation of Cajas National Park. The city of Cuenca will fulfil its obligations through municipal agencies and ETAPA. The Concejo Municipal decided on 5 April 2000 to transfer to ETAPA the obligations and responsibilities derived from that agreement. Annex 10 describes ETAPA's experience in environmental management.

As for environmental protection activities in the park, during 2001 ETAPA carried out a series of mitigation activities to reduce the negative impact of the construction of the Cuenca-Molleturo-Naranjal highway. They included construction of artificial wetlands at several strategic sites for temporarily retaining light substances derived from petroleum and found on the highway; replanting of slopes; preparation of information; horizontal and vertical signs; creation of security areas; installation of environmental monitoring equipment and absorbent rolls for petroleum; preparation of a portable kit for detection of petroleum in the water and chemical products containing suspended petroleum; construction of control posts; permanent cleaning of ditches; creation of parking areas and a system for final disposal of solid waste; rehabilitation and completion of existing buildings; identification, monitoring and resolution of conflicts that consists in identification of the most relevant socio-economic activities in the nearby communities; and creation of a list of the communities and settlements bordering Cajas National Park.

With regard to protection of renewable natural resources and biodiversity, the Ecuadorian legal framework is contained mainly in the Law on Forestry and Conservation of Nature and Wildlife Areas (passed on 14 August 1981) and in the rules and regulations derived from this law that contain norms for use, management and administration of forest resources and protected nature areas, through establishment of a national heritage of nature areas. Furthermore, the municipio of Cuenca has defined its own local legislation to support its activities in the area; for example the “Ordenanza de Ordenamiento Territorial y del Uso de Suelo” in the canton, “Ordenanza de Control” of the sub-basin of the Río Tomebamba concerning capturing water for purification in the El Cebollar plant. The city is discussing regulations for regulatory action within Cajas National Park.

24. Conservation measures proposed but not yet implemented:

On 1 April 2002, began preparation of the integrated management plan for Cajas National Park with financing from the Inter-American Development Bank (BID). The study will last for seven months and is based on the following considerations:

- (a) It is highly participatory. The new focus that will be given to the study is that of forgetting the notion of “exclusive” of former conservation policies and that of involving directly and actively those concerned;
- (b) It is integral. It includes all biophysical, socio-economic, legal and institutional aspects;
- (c) With high transfer of technology, in which both the administrators and participants receive training as part of the study.

In addition, on 8 December 2001, a request was presented to UNESCO for recognition of Cajas National Park as a World Heritage Site in light of its scenic biotic, archaeological and historical considerations (annex 11). The Concejo Municipal is discussing management regulations inside the Cajas National Park as a decentralized area.

25. Current scientific research and facilities:

Limnological studies have been carried since 1995 out by the Direction of Environmental Management of ETAPA of several lakes in the Cajas National Park; for example La Toreadora and Llaviuco (annex 12). With the Faculty for Biochemistry and Pharmacy of the Universidad de Cuenca, a study on the fungicidal characteristics of several plants in the Cajas National Park has been prepared. This study has served for a doctoral thesis for the Universidad de Cataluña. ETAPA actively participated as support for the research of the DIFORPA project (Forest diversity of the El Paute basin) made by the Universidad del Azuay through the Faculty for Environmental Biology. An agreement for support of research has been signed with that university.

Through an agreement signed in 2001 with the post-graduate programme in sustainable local development (PYDLOS) of the Universidad de Cuenca a management plan for Llaviuco was drafted for the eastern part of the park as well as the work Atlas Biofísico de Llaviuco as postgraduate thesis “Land management using geographic information systems” of the Universidad del Azuay. As an important

place for discussion and exchange of management experiences, ETAPA revived in 2001 the paramo network in Azuay and Cañar with the help of more than 16 institutions, including NGOs and governmental agencies that work in the paramos and recognize the work planned for Cajas National Park. The city of Cuenca has contracted a consultant from the Centro Nacional de Conservación, Restauración de Monumentos y Museología of Cuba in order to prepare an integrated study of the technical basis for management and conservation of the land as cultural heritage.

With support of the Ministry for the Environment and in cooperation with CERRAS recently a programme has been undertaken for re-introduction of the Andean condor, which will provide data of great importance for expanding this experience in other protected areas in Ecuador. The infrastructure that the Cajas National Park provides for carrying out research is a shelter and a room for meetings located at Lake La Toreadora and an administrative centre and research located at Lake Illincocha.

26. Current conservation education:

During this year, “La Casona de Ucubamba” was included in the formal programme of environmental education carried out with the fifth and sixth grades of the primary schools in Cuenca, including a chapter on conservation of Cajas National Park. Under this programme, visits were made to six schools in the communities closest to the national park, including Angas, Miguir, Río Blanco, San Antonio y San Miguel de Chaucha and Soldados.

A forest ranger from ETAPA participated in a one-year course on management of paramos given at the national level by a consortium of IEDECA-CAMAREN. Information will be distributed during 2002 among the rest of the staff that work in the park. In addition, other environmental education campaigns have been prepared, including an inter-institutional agreement for environmental education for prevention of forest fires (Ministry for the Environment, the provincial government of Azuay, the Army and NGOs), environmental education in the schools surrounding park through the programme for reintroduction of the Andean condor using puppets and even a painting contest was held (annex 12). A course on first aid and a campaign at Christmas for monitoring and stopping the extraction of plant species during Christmas have been organized. The campaign has succeeded in stopping noticeably trade in trees, mosses, lichens, *huicundos* and other species in local markets.

Since June 2001, ETAPA has maintained a series of daily radio messages on several local stations and at the national level with messages about prevention, conservation and public awareness about the importance of conservation of the park. The image of “Juan el Guardabosque” has reached various sectors of the population. In addition, there have been distributions of pamphlets (annex 13).

27. Current recreation and tourism:

There are tourist activities in the park, mainly recreation for inhabitants of Cuenca and visits of groups of tourists from abroad. During 2001, the number of visitors was 6,825 domestic and 2778 foreigners giving a total income from entries of \$ 31,775.

The entry fee established by the Ministry for the Environment for the park is \$10 for foreigners and \$1 for Ecuadorians.

Inter-institutional coordination has been carried out with the municipio, Office for Tourism, Ministry for Tourism and Ministry for the Environment. The process of inter-institutional coordination is ongoing and expanding, and this is considered a strong point in the integrated management of Cajas National Park, having been contacted by universities and NGOs.

ETAPA published a map of trails in the park in coordination with the Ministry for Tourism. The map has been checked in the field in order to provide better information for tourists visiting the area and interested in hiking in the park. The map has geographical coordinates and contains information needed about the park.

In order to make information about El Cajas available to tourists, efforts were coordinated with the Municipio of Cuenca, the Ministry for Tourism and the Tourist Board offering folders about the park and important species in the Office for tourist information. As part of the activities carried out it has been possible to provide an informal shelter at La Toreadora for accommodating visitors.

28. Jurisdiction:

Cajas National Park is located in Ecuador, province of Azuay, canton of Cuenca, and currently its administration and management are the responsibility of the Municipio de Cuenca through the ETAPA as the first protected area of the SNAP to have been decentralized to a municipio. It remains, nonetheless, under the policies and jurisdiction of the Ministry for the Environment.

29. Management authority:

Responsibility for control and management, taking into account the main responsibility of the Ministry for the Environment within the framework of the policy of decentralization between the ministry and the city of Cuenca, falls on the city of Cuenca directly and through its various organs and ETAPA, the commission for environmental management for inter-institutional coordination and drafting of joint management policies at the cantonal level, headed by the city of Cuenca and in which several agencies of the national government and the main universities in Cuenca participate. Control and management of tourist activities, linked to other activities to each other have been transferred by the agreement on decentralization from the city of Cuenca to the organ created by municipal ordinance: the Tourist Board of Cuenca. Within the area the coordinator of the park and the head of the park act with full administrative autonomy. They carry out the functions defined in the law and act as initial judicial authority for minor disputes and sanctions.

The environmental division of ETAPA is located in Ucubamba at kilometre 5.5 of the Pan-American North highway in the city of Cuenca.

30. References: