

## Information Sheet on Ramsar Wetlands

1. **Date this sheet was completed/updated:** 2 December 1996
2. **Country:** PERU
3. **Name of wetland:** Junín National Reserve
4. **Geographical coordinates:**

11°00' S

76°08' W

5. **Altitude:** between 4080 and 4125 metres above sea level
6. **Area:** 53,000 hectares
7. **Overview:**

Lake Junín is known locally as Chinchaycocha. "Chinchay" is the Andean cat (*Oncifelis colocolo*) and "cocha" means lake in Quechua. The Spanish called the lake the Lago de los Reyes.

Lake Junín (Chinchaycocha) is the second largest lake in Peru. Only Lake Titicaca is larger and has a greater natural diversity and socioeconomic importance. Lake Junín not only has an important population of wild birds (ducks, flamingos, and gallaretas) but traditionally it has been the basis for resources and the source of work for the rural population settled around the lake. A summary of the diversity of the area is given in figure 1.

Group	Species	Family	Genera
Spermatophyte plants		37	
	86                      146		
Cryptogamous plants			2
	8                                      9		
Birds		35	
	92                                      126		
Mammals			9
	16                                      17		
Amphibians		3	
	5                                      5		
Reptiles			1
	1                                      1		
Fish			4
	4                                      6		

**Figure 0** Diversity of wild fauna and flora

Lake Junín constantly receives (at least since 1933) waste from mineral processing transported by the San Juan and Colorado rivers from mines upstream. Both vegetation and wildlife (above all the fish and aquatic birds) are affected throughout the lake.

This high Andean lake is an enclave in the central puna. It is triangular in shape (35 kilometres long from northwest-southeast and 20 kilometres maximum width).

**8. Wetland type:**

5, 10

**9. Ramsar criteria:**

1. Criterion of representative or unique wetland

a) *is an especially representative natural or almost natural wetland characteristic of a specific biogeographic region*

Lake Junín is the second largest lake in Peru, after Lake Titicaca (see figure 2). It is largest lake in the biogeographical province of Puna. (Lake Titicaca is in the biogeographical province of Titicaca.) Because of the variety of landscapes, size and biota, it is a representative environment of this biome and biogeographical province.

<u>Lake</u>	<u>Watershed</u>	
<u>Altitude</u>	<u>Area (hectares)</u>	
Titicaca 3810	Titicaca 460 000	
Junín	Atlantic 30 000	4080
Arapa	Titicaca 16 300	3810
Salinas 4295	Pacific 7 100	
Parinacochas	Pacific 6 700	3273
Lagunillas	Titicaca 5 090	4160

**Figure 0** Largest lakes in Peru

The total area of Lake Titicaca is 830,000 hectares, of which 370,000 hectares are in Bolivia and 460,000 hectares are in Peru.

The National Office for the Evaluation of Natural Resources (ONERN, 1980) recognizes three basic watersheds in Peru: Pacific (279,689 km<sup>2</sup>), Atlantic (956,751 km<sup>2</sup>) and Titicaca (48,775 km<sup>2</sup>). There are a total of 2332 pools in the Río Mantaro, making it the river basin in the Atlantic watershed with the largest number of pools. The number of pools in the other river basins are: Marañón (1247), Pampas (924), Apurímac (747), Perené (533) and Huallaga (504) (ONERN, 1980).

The basin of the Río Mantaro has the largest number of pools with more than 400 hectares. The others are Río Santa (82), Río Marañón (79) and Río Pampas (52).

Lake Junín has a very representative biology with a total of 126 birds identified in the area of which 55 are clearly aquatic and typical of the lakes and pools of the puna. The families with the largest number of species are ducks (Anatidae), *pollas* and *gallaretas* (Rallidae), *zambullidores* (Podicipedidae), *chorlos* (Charadriidae), *playeros* (Scolopacidae) and *garzas* (Ardeidae). Also present are flamingos (Phoenicopteridae) and ibises (*bandurrias*) (Threskiornithidae).

b) *is a particularly representative example of a natural or almost natural wetland common to more than one biogeographic region*

The information supporting the previous criterion is also valid for this criterion. Among the eight biogeographical provinces represented in Peru (Amazon, Dry Equatorial Forest, Lake Titicaca, Northern Andes (paramo), Pacific Desert, Puna, Southern Andes and Yungas), Lake Junín is a typical Andean aquatic environment, that can represent the lakes and pools of at least the Southern Andes, Northern Andes and Puna, given the landscapes and life forms characteristic of these large groups of ecosystems. Its large size, biological variety and socioeconomic values are the best and strongest arguments.

## 2. General criteria based on plants and animals

a) *is of special value for one or more endemic species of animals or plants or endemic communities*

Lake Junín is home to a unique world population of the *zambullidor de Junín* (*Podiceps taczanowskii*) (Fjeldsa, 1981b, 1983b; Valqui, 1994), whose population has declined from approximately 300 individuals a decade ago to 50-75 specimens recently (Tueros, personal communication, 1996).

Another endemic bird is the *gallinetita negra de Junín*, described as a subspecies (*Laterallus jamaicensis tuerosi*) by Fjeldsa in 1983 (see Fjeldsa and Krabbe, 1990), but considered as a species (*Laterallus tuerosi*) by Collar and Andrew (1980, cited in Collar et al., 1992). In both cases, it is recorded as limited to the *bofedales* that surround the lake.

Lake Junín and surrounding lakes and streams in the area are the only habitat of the *rana de Junín* (*Batrachophrynus macrostomus*), an amphibian hunted for decades for its flesh.

No endemic species of fish have been reported, contrary to Lake Titicaca where there are endemic species of the genus *Orestias*.

### 3. Criteria based on aquatic birds

a) regularly supports significant numbers of specimens of certain or special groups of aquatic birds that are indicators of value, productivity or diversity of the wetland

Lake Junín is not particularly important because of large populations of birds. Nonetheless, it is home to endemic or characteristic species of the Central Andes of Peru. Some examples are: *Anas discors* (small numbers), *Anas flavirostris* (8,000-10,000), *Anas georgica* (6,000), *Anas puna* (up to 50,000), *Chloephaga melanoptera* (1,000), *Fulica ardesiaca* (15,000), *Gallinula chloropus* (at least 50,000), *Larus serranus* (3,000), *Nycticorax nycticorax* (several hundred), *Oxyura jamaicensis* (2,000-3,000), *Phoenicopterus chilensis* (up to 5,000), *Plegadis ridgwayi* (8,000), *Podiceps taczanowskii* (50-75 specimens), *Rallus sanguinolentus* (thousands) and *Rollandia rolland* (3,500-4,000) (Scott and Carbonell, 1986).

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

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

Dirección General de Areas Naturales Protegidas y Fauna Silvestre  
Instituto Nacional de Recursos Naturales (INRENA)  
Ministerio de Agricultura

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

13. General location:

Politically, the reserve is in the departments of Junín and Pasco in the region of Andrés Bello Cáceres, six hours by road from Lima, the capital of Peru. Figure 3 gives the political division of the geographical areas occupied by Lake Junín, total population and rural population of the five districts involved.

<u>Department</u>		<u>Province</u>		<u>District</u>	
<u>Urban</u>	<u>Rural</u>	<u>Percent</u>			
<u>populations</u>		<u>rural</u>			
Junín	Junín	Junín	16643	3201	
	19%				
9072	1068	11%			Carhuamayo
4035	1764	44%			Ondores
Pasco	Pasco	Vicco	3293	636	
	19%				
4112	2180	53%			Ninacaca

**Figure 0** Total population and rural population in the districts around Lake Junín

Access from the city of Lima is relatively rapid by the Central Highway (Valley of the Río Rímac) leading from Lima to La Oroya and Junín and then from Junín to Ondores or Carhuamayo, settlements on the southeastern and northeastern shores of the lake; or by the Cordillera de La Viuda following the Lima-Canta-Huayllay-Ondores-Carhuamayo road. Travel on this road is longer because of the poor condition of the road.

**14. Physical features:**

**Geology and geomorphology** - By their origin and composition, the geological formations are part of continental and marine sedimentary deposits. The continental deposits are sediments from the Quaternary, while the marine deposits are

limestone (south, east and north of the lake) formed by sedimentary rocks from the Pucará group (INGEOMIN, 1977), also from the Quaternary.

**Soils** - The most prevalent soils in the Junín National Reserve are eutrophic histosols (soils developed from lacustrine sediments with almost level topography, a slope of about 2 per cent and permanent hydrophile conditions); phaeozems (soils developed from materials produced from the breaking down of sandstone, quartzite, and occasionally limestones and lutite); and eutrophic litosols (soils developed from limestone, lutite, calcareous sand, volcanic material and intrusive materials) (ONERN, 1976; Hansen, 1984).

**Origin** - The origin of Lake Junín is not well known. Some theories hold that the origin is tectonic, while others hold that it formed in a depression during the development of the Andes (Tovar and Ríos, 1981). The Oriental, Central and Western Cordilleras converge to the north of Lake Junín at the Nudo de Pasco. The large flatland that this forms is known as the Meseta de Bombón, a name with references to former inhabitants in this region, known as the Pumpus or Pun-Pun. The origin of the uplands or plateau and the lake goes back to the last glacial period, during the Pleistocene, 12,000 to 15,000 years ago. In the far north, glaciers converged from the cordilleras on both sides of the high plain, and moraines formed a dam in this area. In the far south, depositional fans made drainage difficult leading to the formation of Lake Junín (Hansen, 1984).

**Hydrology** - Lake Junín is sunken into the drainage basin of the Río Mantaro. This lake, which is drained toward the northwest by the Río Mantaro, first called the Upamayo (Tovar, 1990), forming farther downstream one of the most important Andean tributaries in the Amazon basin. The main tributaries to the lake are the Colorado and San Juan rivers, plus another ten smaller rivers and twenty streams (Valdivia and Alvarino, 1991).

**Depth, fluctuations and permanence** - The maximum depth of the lake is 12 metres, with transparency to 6-8 metres. The Upamayo dam (in the natural drain of the lake) regulates the level of water to the Malpaso hydroelectric station. The level of the lake can drop 1.5 to 2 metres, which means

<u>Water quality</u>	<u>Upamayo</u>	<u>Pari</u>	<u>Puente</u> <u>Water</u>
		<u>to Ondores</u>	
Dissolved oxygen (%)	73	120	72
pH	7.95 8.1		8
Turbidity (n.t.u.)	0.5	0.7	1.5
Hardness (total CaCO <sub>3</sub> /mg/l)	200	164	180
Ammoniac nitrogen (mg/l)	0.02	0.02	0.09
Nitrites (mg/l)	0.002	0.002	0.002
Nitrates (mg/l)	0.20	0.20	0.25
Phosphates (mg/l)	0.01	0.01	0.01
Iron (mg/l)	0.11	0.09	0.45

**Figure 0** Water quality in three sections of Lake Junín

Carhuamayo. These influences are not noticeable in the middle of the lake because of the greater depth and aeration. The discharge of residual domestic sewage means an addition of phosphorous. The ammoniacal nitrogen is also greater toward the northwest as the result of the decomposition of organic material on the bottom.

Lake Junín is a body of water in a process of ageing (eutrophication) and under these conditions any addition of nitrogenous compounds and phosphates accelerates succession. This is the reason why the discharge of sewage is a serious problem that can lead to an acceleration of the ageing process of the lake.

The projected deviation of the Río Mantaro toward the Río Rímac includes an alternative of the possibility of raising the level of water one metre, which would mean a renewing of the lake from the point of view of succession provided that there is less drainage. The differences in water level that occur at the present time, approximately two metres, would be the maximum permissible fluctuation.

Obviously, the amount of iron is greater at the Upamayo bridge, as a result of the water from the mineral processing plants. This greater quantity of iron also explains the smaller quantity of dissolved oxygen in this sector (greater the presence of iron, less the dissolved oxygen).

Turbidity is also greater at the Upamayo bridge as a result of the suspended materials from the processing plants. At this site, the pH tends to be less, although it is almost neutral.

**Topography** - The lake is surrounded by large areas of swamp and bulrushes (*Scirpus californianus* and *Scirpus rigida*). While its shores are usually

flooding or drying of large areas. In years of abundant rain, changes in water level are not large, but in dry years the changes can be dramatic.

**Water quality** - A study of the characteristics of the lake measured the following parameters of pollution in the extreme northwest part of the lake (Tovar and Rios, 1981).

**Limnology** The temperature at the surface of the lake (at 15 centimetres) is 17.0°C. At one metre, the temperature is 15.5°C, at 3 metres 15.0°C and at 6 metres 14°C.

There is a strong influence of the pollution from the mineral processing plants on the northwest side of the lake. The oxygen available here is less in this sector (see figure 4) because of the greater decomposition of immersed vegetation and the influence of the discharge of sewage water from the towns of Junín and

flat, hills (100 to 250 metres) reach the shore along the northern and northwest sections. The open water plus bulrushes is the equivalent of 65 per cent of the area.

**Climate** - The region's climate corresponds to the lower stage of the puna (Tovar, 1990), where temperature ranges between 3 and 7°C, with the coldest months between May and September. Annual rainfall is an average of 940 mm. While the months of December to April are the rainiest months, the months of June to September are the driest.

#### 15. **Hydrological values:**

It is important to point out that the Río Mantaro begins in Lake Junín and is the most important valley of the Peruvian central Andes. As mentioned earlier, it is a main tributary of the Amazon River (the Apurímac-Ene-Tambo-Ucayali system). The Mantaro basin is in the departments of Junín, Huancavelica and a small part of Ayacucho, between 500 and 4850 metres in altitude at the confluence of the Mantaro and the Apurímac rivers (Tovar, 1990).

In general, the birdlife of the Peruvian puna is poorly known, although several outstanding studies have been made, such as those of Fjeldsa and collaborators. Very little is known about the habits and behaviour of most species in this area. Huascarán National Park (9°30'S), Pampa Galeras-Barbara d'Achille National Reserve (14°45' S) and Titicaca National Reserve (15°30'S) are the only reserves with lists of species (Maldonado, 1990; Schulenberg, 1986; Canales, 1991; Ascencios, 1996). The birdlife of Lake Junín is one of the best known on the national level (see Harris, 1980 and 1981; Tovar and Ríos, 1981; Fjeldsa, 1983b).

#### 16. **Ecological features:**

Lake Junín covers approximately 0.21 per cent of the biogeographic province of the Puna (Udvardy, 1975). This province covers approximately 5 per cent of the total area of the country and is represented in several protected nature areas of Peru. According to the ecological map of Peru (ONERN, 1976), it is included in the tropical latitudinal region. The reserve is in the very humid sub-Alpine tropical paramo life zone (pmh-SaT) (ONERN, 1976).

#### 17. **Noteworthy flora:**

The vegetation around Lake Junín is that of a high Andean landscape or low puna. There are natural associations of characteristic vegetation, such as dense pastures with *bofedales* or *oconales*. The *bofedales* or *oconales* are areas of very humid grass (an association of grasses), puna grass and bulrushes in the water and along the shore, where saturation of the soil is evident, with light runoff of water toward a stream or lake. They are the preferred habitat of livestock and native aquatic birds.

There are four vegetative zones from the centre of the lake outward.

1. **Water surface** - In Lake Junín, there are several underwater aquatic plants, including *Elodea potamogeton*, *Myriophyllum quitense*, *Potamogeton ferrugineus*, *P. filiformis*, *Utricularia* spp. and several algae including *Chara fragilis*, *Mougeotia* spp., *Scytonema* spp. and *Zygnema* spp. There are also several floating plants such as *Azolla filiculoides*, *Lemna* spp. and *Spirodela* spp.

2. **Bulrushes** - Bulrushes cover large areas of the shores of the lake and are formed by two robust species up to 2 metres in height: *Scirpus californicus* var. *tatora* and *Juncus articus* var. *andicola*.

They are usually dense to the point of being almost impenetrable. During the dry season when the level of the lake drops, they dry partially or totally in some of the shallow sectors. Around the outside of the bulrushes, there are herbaceous plants such as *Alchemilla diplophylla*, *Eleocharis* spp., *Hydrocotyle ranunculoides*, *Hypsella reniformis*, *Isoetes andicola*, *Juncus* spp., *Lilaeopsis macloviana*, *Ranunculus flagelliformis*, *Rorippa nasturtium-acuaticum* and *Scirpus* spp., which occupy parts that are not flooded or only temporarily flooded.

3. **Pampa** - This is located in the area surrounding the lake where there are wetlands or *oconales* and formations of Puna grass on rather dry soils (Weberbauer, 1945).

a. The wetlands or *oconales* appear in just a few places of the pampa around Junín, where there are springs or small irrigation channels that flow into the lake. The characteristic vegetation of these places are herbaceous plants growing in clumps such as *Alchemilla diplophylla*, *Distichia muscoides*, *Hypsella reniformis*, (*champa estrella*) *Plantago rigida* and *waca curu*. Along the edges of the ponds or puddles are often algae such as *llullucha* (*Nostoc sphaericus*) and *cocha yuyo* (*Nostoc comune*).

b. The Puna grass, the dominant vegetative formation on the pampa, is formed by low vegetation, with *crepillo* (*Calamagrostis vicunarum*) as the dominant component. It is approximately 8-15 centimetres high. Together with this species there are other Gramineae with smooth leaves. The following small plants are also found: *Alchemilla pinnata*, *Astragalus backenridgei*, *cuchipelo* (*Scirpus rigidus*), *Lupinus brachyphyllus*, *Paranephelius ovatus*, *putki* (*Geranium sessiliflorum*), *Werneria nubigena* and in drier spots *garbancillo* (*Astragalus garbancillo*), *huarajo-quichca* (*Opuntia floccosa*) and *yareta* (*Azorella diapiensioides*), among others.

4. **Low surrounding hills** - These hills are characterized by clay-gravel soils in the low hills and rocky-gravel soils in the surrounding hills. The dominant vegetative formation is Puna grass, characterized primarily by *ichus*, Gramineae with hard and pointed leaves of which the most common are *Calamagrostis recta*, *Calamagrostis rigida*, *Festuca dolychophylla*, *Stipa ichu* and *Stipa obtusa*. There are other herbaceous plants near the ground.

Sporadically in the rocky soils, there are resinous shrubs such as *taya* (*Baccharis tricuneata*), *Chuquiraga spinosa* and *Ribes cuneifolium*. Wild *Polylepis* has not been recorded, although it is common in other parts of the puna. Nonetheless, it is cultivated around houses in this area.

In a recent study of vegetation types and floral variety in the Mantaro basin (Tovar, 1990), 1460 species of plants were recorded, grouped in 120 families and 560 genera in the basin (from Lake Junín to the Apurímac River). There are still many species not yet identified from this area in the collection of the San Marcos Herbarium (USM).

As for the vegetation in the upper Mantaro basin around Lake Junín, information is available from Tovar, 1990-1993; MacBride, 1936-1959; Dillon and Sagástegui, 1991 on a total of 155 vegetative species in the area of the national reserve. The botanic families best represented are : the Poaceae (43 species, 13 genera), Asteraceae (15 species, 12 genera) and the Fabaceae (10 species, 5 genera).

The best high-Andean pastures are in the Puna grass formation, where the local population grazes their livestock. Unfortunately, the Lake Junín pampa has been deteriorated by excessive grazing.

In the area of Carhuamayo (northeast of the lake), *maca* (*Lepidium meyenii*), a small herbaceous plant with a yellowish-white, tubular root similar in form to a radish, endemic to the Bombón plateau, is considered an important food, rich in amino acids and carbohydrates. Local inhabitants use it as a powerful tonic that cures infertility.

Medicinal plants form a group of great importance in the traditional use of plant resources in the region. Another important economic group is the cultivated plants. Agriculture is carried out in the low hills near the pampa, in the flat parts there is no cultivation. Because of the cold climate, potatoes, barley (for forage), *olluco*, *mashua* and *oca* are grown.

In Ondores, southwest of the lake, in a rocky outcrop near the edges, beans are grown. There are native bushes such as *mutuy* (*Cassia* spp.) and *huamanpinta* (*Chuquiraga spinosa*). A condiment, *hualnish* or *amañacay* (*Senecio condimentarius*) is grown here. It has the fragrance of coriander (*Coriandrum*).

Vegetation here is affected both by pollution from the mineral processing plants and from the extraction of peat from the bogs, which serves as fuel in the region.

Most important useful plants in the Junín National Reserve

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#### 18. Noteworthy fauna:

The best represented animal species and of greatest importance in the national reserve are the birds. For many years, local inhabitants have complemented their diet with meat and eggs from these animals. The reserve is home to a diverse and numerous population of resident and migratory birds. There is one endemic species, the *zambullidor de Junín* (*Podiceps taczanowskii*), which is close to extinction (according to the most recent survey, there are only 50-75 specimens left).

Among the aquatic birdlife are the *pato sutro* (*Anas flavirostris*), *pato jerga* (*A. georgica*), *pato puna* (*A. puna*), *pato rana* (*Oxyura jamaicensis*), *huallata* (*Chloephaga melanoptera*), *gallareta* (*Fulica ardesiaca*), *pollo de agua* (*Gallinula chloropus*), *gallinetita negra* (*Laterallus tuerosi*), Chilean flamingo (*Phoenicopterus chilensis*), *zambullidor de Junín* (*Podiceps taczanowskii*), *zambullidor blanquillo* (*Podiceps occipitalis*), *zambullidor pimpollo* (*Rollandia rolland*), *lique-lique* (*Vanellus resplendens*) and *gaviota andina* (*Larus serranus*).

Mammals are scarce in the reserve, but the most characteristic are the Andean wolf (*Pseudalopex culpaeus*), *comadreja* (*Mustela frenata*), *zorrino* (*Conepatus chinga*), Chilean Pampa cat (*Oncifelis colocolo*) and *cuy silvestre* (*Cavia tschudii*). Among the best known amphibians on the lake are the *rana de Junín* (*Batrachophrynus macrostomus*), an edible species. Among the fish are the *challhuas* (*Orestias* spp. and *Trichomycteris oroyae*)

Wild fauna in the Junín National Reserve

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<u>Species</u>	<u>Common name</u>
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Birds

Mammals

Amphibians

Reptiles

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Species of endangered wild fauna in the Junín National Reserve

Species

Common name

Status

Birds

Mammals

Amphibians

19. **Social and cultural values:**

Official category

Ministerial resolution 1082-90-AG, passed in 1990, assigns official categories of conservation status, in accordance with the regulation entitled "Conservation of Wild Flora and Fauna" (D.S. 158-77-AG) of the Forestry and Wildlife Law. The following definition has been given to the categories.

**E:** Endangered species subject to immediate extinction and whose survival is impossible if present conditions continue.

**V:** Vulnerable species, which because of excessive hunting, destruction of habitat and other factors are in danger of becoming endangered species.

**R:** Rare species whose natural populations are scarce, because of their endemic nature or other reasons and could become vulnerable.

**I:** Species with an unknown status but thought to be in one of the previous categories for which insufficient information is available.

Hunting, capture, transportation, sale and export are indefinitely prohibited for all species listed in the ministerial resolution, with the exception of cases related to scientific or cultural purposes and in agreement with the provisions of Decreto Supremo 158-77-AG.

**Fishing and hunting** - There is little subsistence fishing within the reserve. Hunters and fishermen concentrate on the capture of frogs in Junín, although there is some use of ducks and *gallaretas*.

**Forests** - Pastures represent 35 per cent of the area of the national reserve. There is small-scale exploitation of peat (*champa*) for use as a fuel given the lack of firewood in the region. Bulrushes are not used contrary to the situation on Lake Titicaca or other high Andean lakes. Up to 20-25 years ago, fishermen on the lake built their boats (*caballitos*) from bulrushes, but now they use *calamina*.

**Cultural values** - On the Ondores-Upamayo dam road (even under land that is currently flooded) arrows, fossils collected by earlier Peruvians, wooden bowls, the ruins of old quays, ramps and other constructions have been found (Rick, 1983; Tueros and Francisco, personal communications, 1995).

In this region is the Pampa de Chacamarca, where the battle of Junín took place, which led to the independence of Peru, confirmed several months later in 1824 by the battle of Ayacucho. At the time of the 150th anniversary of that battle in 1974, the Junín National Reserve, the Chacamarca Historic Sanctuary and the Huayllay National

Sanctuary were established.

## 20. Land tenure/ownership of:

The land around Lake Junín belongs to the communities of Carhuamayo, San Juan de Ondores, San Pedro de Pari and Vicco. The bodies of water (such as Lake Junín) belong to the government, and the local population does not have right to this area.

As for the population living in the reserve, the lake is in the province of Junín (department of Junín) and the province of Pasco (department of Pasco). The largest population is in the district of Junín, primarily because of the presence of the city of Junín, while the area of least population is Vicco (Pasco).

The main activities of the population are the raising of small livestock (primarily sheep), fishing and hunting. The town of Ondores has had an association of hunters and fishermen for the past 25 years. Transportation of freight in lorries is the main activity in Carhuamayo. Agriculture is not well developed and is limited to small cultivated fields and family plots.

**21. Current land use:**

The raising of sheep, and to a lesser extent of llamas and guanacos, is the main use of land around the lake; for example, in Carhuamayo, Junín and Ondores. The department of Junín occupies third place after the departments of Puno and Cusco in the production of sheep, with an estimated 60,000 to 70,000 head around the lake. Agriculture is poorly developed in this area.

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

The only large-scale project is that to divert the Río Mantaro to the Río Rímac to provide more water to Lima, the Peruvian capital. There is also a possibility of constructing an asphalt highway around the national reserve. The central highway, which passes to the north of the lake, has been recently repaired and is in excellent condition.

The most important threat is pollution by mineral processing from the mines of Animón, Brocal, Centromín and Huarón, above all in the northwest where the Río San Juan empties into the lake. Its water is a characteristic red-brick colour, which has created large abiotic and desolate areas on the shore of the lake. Next in importance is variation in the water level created by the Upamayo dam for the Malpaso hydroelectric station. Another aspect adversely affecting the site's ecological character is the indiscriminate hunting of frogs by some fishermen and the excessive collection of aquatic bird eggs. It is important to point out that fishermen at Ondores and other areas are aware of the problem and have fixed non-hunting periods during the first 3 to 4 months of the year. Next in importance is the extraction of peat (*champa*) and overgrazing. Furthermore, infrastructure and regulation are insufficient. Even today, there are conflicts among local minors.

Lake Junín is seriously threatened by mining activities that discharge waste or waste water into the water feeding the lake, producing not only chemical pollution but also turbidity from particles in suspension, making it impossible for algae or aquatic plants to carry out photosynthesis, resulting in mortality. Chemical wastes dissolved in high concentrations have deteriorated one third of the lake.

This effect is even more evident in the Upamayo section because water in the Río San Juan enters contaminated in the lake behind the Upamayo dam and part of the lake, the exit at Río Mantaro.

Fluctuation in the level of water regulated by the Bombón dam is also a threat, because many times when water level rises, it floods bird nests and when it drops, it leaves the young of fish or amphibians in dry areas and exposes the nests of aquatic birds to predators.

Derivation of irrigation canals, intakes and outlets for cities and populations living near the lake raise the content of organic material, causing an unusual increase in vegetative material in the lake, increasing eutrophication and the concentration of ammonia, causing, as a result, depletion of dissolved oxygen in the water and the death of many organisms.

Overexploitation of resources such as the gathering of eggs and hunting is one of the causes of the small populations of some frogs and certain species of birds. For example, in Ondores, in spite of there being a closed hunting season established by the Asociación de Pescadores y Cazadores, that prohibits the hunting of birds from August to October, frogs from January to April and the gathering of eggs, frogs and birds are hunted and eggs are collected illegally and excessively.

Another threat, although less important, is overgrazing in the pampas around Junín, especially around the lake. There is a heavy load of livestock, primarily sheep, and very little management of pastures (Tovar, 1990). The local inhabitants also mention the damage caused by pigs (not very numerous) who eat the roots of the plants that grow in flooded areas, preventing natural regeneration.

The project to divert the Río Mantaro to supply water to the city of Lima is also a potential threat because it will divert water toward the Rímac valley. The project plans to dam the water on the western edge of the lake. This would raise the water level, flooding a large part of the surrounding area and affecting a large region.

### **23. Conservation measures taken:**

**Legal status** - The Junín National Reserve was established over 53,000 hectares by decree 750-74-AG on 7 August 1974 at Lake Junín with the objective of conserving wild fauna and flora and the scenic beauty of this great lake, as well as to promote the use of the populations of birds, frogs and bulrushes.

**Management category** - This area has been officially designated a national reserve (according to current forestry legislation, it is an area for the protection and propagation of wildlife whose conservation is of national interest), which can be considered the equivalent of category VI (Protected Area with Managed Resources) ("Managed primarily for the sustainable use of natural ecosystems," IUCN, 1994 and Suárez de Freitas, 1994).

**Management practices** - For many years, the administration of the national reserve has been limited to a director and a park ranger who have not been able to do much management because of low budgets and motivation. Their activities affect only the inhabitants of Junín, Ondores and other settlements near the lake, but few people in Carhuamayo, Pari, Shelby, Vicco and other important settlements on the shore of the lake are aware of the existence of the protected area. Along the road from Junín to Ondores (the road most used by visitors), they have placed signs--small concrete walls--showing the limits of the national reserve. There is no other type of indication in the other sections of the lake. Nonetheless, the administration has carried out environmental education activities in Ondores (based on the conservation of natural resources) in schools and the general community, which is well received by the local inhabitants.

### **24. Conservation measures proposed but not yet implemented:**

The fragility of the lake is deteriorating as witnessed by concentrations of yellow foam among the vegetation and floating islands. The edges of the bulrushes are retreating. According to Francisco Tueros Aldana, a long-time resident of Ondores, earlier it reached the shore of the lake. The lake is deteriorating from north to south, because the Río San Juan carries a large quantity of minerals in suspension (red ochre in colour) that are deposited on the northwestern shores of the lake.

Traditionally, there was no willingness on the part of the national or local governments to reverse the situation because a greater priority was assigned to mineral exploitation, although to the detriment of the environment. Nonetheless, several local organizations (Cerro de Pasco, Huancayo and Junín) have proposed alternatives to the deposit of waste from mineral processing in the lake's water and changes in the level of the water.

#### **25. Current scientific research and facilities:**

The water and shores of Lake Junín has been studied by many scientists for several decades--Taczanowski was among the earliest researchers--and then de Macedo (1950 and 1976), Vellard (1951), Rodríguez (1974), Sinsch (1986), Conde (1988), Guevara (1991) and Victorio (1992). Others have contributed to knowledge of amphibians, especially the Junín frog (*Batrachophrynus macrostomus*). Taczanowski (1874), Graf von Berlepsch and Stolzmann (1894), Morrison (1939 and 1940), García (1966), Dourojeanni et al. (1968), Harris (1980 and 1981), Tovar and Ríos (1981 and 1982), Fjeldsa (1981a, 1981b, 1982 and 1983a) and Valqui (1994) have studied the birds; Fjeldsa (1983b) the vertebrates in general; also Valdivia and Alvaríño (1991), Tello (1993) and Rojas (1994) have contributed with work on pollution in Lake Junín. Rick (1983) and Wheeler (1984) have studied the archaeology and history of the region.

Recent research in the area include studies on the biology and surveys of birdlife in the lake (for example, the *zambullidor de Junín*); a study of lacustrine vegetation in the national reserve; research on the *rana de Junín*; main pollutants and socioeconomic study (Universidad Nacional Daniel Alcides Carrión, Cerro de Pasco); study of sediments in the Río Mantaro (Department of Natural Resources and Environment, Department of Forestry Engineering, Universidad Nacional del Centro del Peru); pollution of the lake by mineral processing (Universidad de los Andes, Huancayo); study of the *huallata* (*Chloephaga melanoptera*) Ricardo Menacho, Department of Forest Engineering, Universidad Nacional del Centro).

In the town of Ondores, there is an administrative centre for the national reserve (Ministry for Agriculture, National Institute for Natural Resources (INRENA), which occupies a building that is shared with the Community of San Juan de Ondores (the local comuna). There are roads around all of the lake.

In the town of Ondores, there is a small hotel with 20 beds (10 rooms), 100 metres from the Plaza de Armas. In both Carhuamayo and Junín there are two guesthouses.

The cities and towns near the national reserve are Junín (7 km), Ondores (1 km), San Pedro de Pari (at the lake), Vicco (8-9 km), Shelby, Ninacaca (10 km), Carhuamayo (6 km), Huayre (3 km) and other nearby small settlements (Huarmipucu, Las Vegas and Upamayo).

#### **26. Current conservation education:**

There is no official or formal programme of environmental or conservation education in the area of Lake Junín. Nonetheless, because of its proximity to Lima this nature area is frequently visited for academic reasons by groups of students and professors of several universities from Lima (Universidad Nacional Agraria La Molina-UNALM, Universidad Nacional Mayor de San Marcos-UNMSM, Universidad Particular Ricardo Palma-UPRP) as well as from local cities (Universidad Nacional del Centro-Huancayo and Universidad Nacional Daniel Alcides Carrión-Cerro de Pasco).

In the town of Ondores, Mr Francisco Tueros Aldana, an experienced hunter who has become the "official" guide for visitors studying the area, has on

his own initiative built accommodations for a small number of visiting students or scientists.

**27. Current recreation and tourism:**

Before the creation of the Junín national reserve, the lake was the preferred place for hunters, but hunting was prohibited when this protected area was established. Its proximity (7 hours) to the city of Lima makes it potentially important as an attraction for a large number of domestic and international visitors. At the present time, tourism is not important.

There is no budget for the national reserve and the staff is seriously limited and restricted to giving information about the value of the wetland.

In the last months of 1995, a small observation platform was constructed in an area of concentration of birds. The platform also serves to observe visitors. Several parts of the reserve near the most important settlements have been posted.

The Asociación de Cazadores y Pescadores of Ondores (whose members capture frogs and aquatic birds) has agreed to assume the functions of regulation, surveillance and conservation of the lake, in light of the slight presence of the administration of the national reserve in this area.

**28. Jurisdiction:**

The Junín National Reserve, as a component of the National System of Government-Protected Nature Areas (SINANPE), is administered under the responsibility of the National Institute of Natural Resources (INRENA, Ministry for Agriculture).

The Dirección Regional Agraria de Huancayo (Junín) has jurisdiction over the national reserve, although it is always submitted to the authority of INRENA.

**29. Management authority:**

Dirección General de Areas Naturales Protegidas y Fauna  
Silvestre  
Instituto Nacional de Recursos Naturales (INRENA)  
Ministerio de Agricultura

**30. Bibliographical references:**