

Information Sheet on Ramsar Wetlands

1. **Date this sheet was completed/updated:** 2 December 1996

2. **Country:** PERU

3. **Name of wetland:** Lake Titicaca (Peruvian sector)

4. **Geographical coordinates:**

15°50'S

69°30'W

5. **Altitude:** 3,810 metres above sea level

6. **Area:** 460,000 hectares (Peruvian portion); The total area of the lake is 830,000 hectares.

7. **Overview:**

Lake Titicaca is the largest lake in Peru and also the most important because of its biodiversity and socioeconomic role. Figure 2 gives information on the four most important lakes in Peru (ONERN, 1985 and Scott and Carbonell, 1986). It is considered to be the highest navigable lake in the world.

Figure 2 **** Major Peruvian lakes

Lake	Watershed	Altitude (above sea level)	Area (hectares)
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Shared with Bolivia, the lake is an important source of natural resources (birds, fish and bulrushes) for the rural inhabitants that live around it. The fact that the lake is navigable favours the integration of the populations in both countries, especially for trade and tourism.

Vegetation is mainly high-Andean bulrushes concentrated on the Peruvian side of the lake and protected in the Titicaca National Reserve. This reserve of 36,180 hectares was established by law in October 1978 as a protected nature area to guarantee the conservation of natural resources and the scenic beauty of Lake Titicaca, to ensure the socioeconomic development of the surrounding populations through the wise use of resources of wild fauna and flora and to promote local tourism.

8. **Wetland type:**

4, 5, 10

9. **Ramsar criteria:**

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
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The Universidad Nacional Agraria La Molina is responsible through the Conservation Data Centre (CDC-UNALM), for compiling the information in this document.

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

The criteria of the Ramsar Convention for consideration of its designation as a Ramsar site are (Davis, 1994):

1. Criterion of a representative or unique wetland

a) *is a particularly representative example of a natural wetland or almost natural characteristic of a specific biogeographical region*

Lake Titicaca has given its name to the biogeographical province Titicaca (Udvardy, 1975). This lake, shared by Peru and Bolivia, is the third largest lake in Latin America (Only Lagoa dos Patos (985,000 hectares in southeaster Brazil) and Lake Nicaragua (870,000 hectares in Nicaragua) are larger. Among the world's lakes, Lake Titicaca is the 22th largest lake. Some of the world's most famous lakes are Lake Victoria (Kenya, Tanzania and Uganda), Lake Songkhla (Thailand) and Lake Chad (Cameroon, Chad, Niger and Nigeria). The Lake Titicaca drainage basin is on a large altiplano between 3,812 metres (level of the lake) and 4000 metres above sea level. Temperatures are higher than at similar altitudes outside the basin, because of the mitigating influence of the lake on temperature. At night there is a flow of heat from the lake to the surrounding area. This lake is by far the largest and most important lake in Peru and Bolivia (see figure 2 for information on large lakes in Peru).

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

Lake Titicaca is a permanent, high-Andean, freshwater lacustrine/vegetative environment considered characteristic of the subtropical puna. Its large size and variety of natural associations gives it special importance in the region. It is also especially relevant from the socio-economic point of view. For example, it is the highest navigable lake in the world. Navigation on the lake is important between Peru and Bolivia and between domestic ports in both countries. In Peru alone there are about 90,000 head of cattle (which consume 50,000 tons of bulrush per year). In Peru, there are 160 Uros-Chulluni families (Aymara-speaking and descendants of earlier generations of inhabitants of the lake).

2. Criteria based on plants or animals

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

Lake Titicaca does not form a separate body of water with a special community of birds. Nonetheless, in spite of the majority of its fauna being well distributed in the high Andes, the large size of the lake makes it ideal for the concentration of aquatic birds. There is an extensive area of bulrushes, beaches and shores and large areas of shallow water, which facilitate the development of populations of ducks, flamingos, *zambullidores* and *somorgujos*. Among these is the *zambullidor del Titicaca* (*Rollandia microptera*), endemic to the Titicaca-Desaguadero-Poopó system.

While it is generally recognized that there are various species of fish endemic to Lake Titicaca and its tributaries, specialists do not agree on the total number of endemic species. Ortega and Vari (1986), for example, record 32 species of the genus *Orestias* in the Titicaca basin. Morales et al. (1989) and others indicate a total of 16 to 20 species for all of the lake. Of these, *Orestias cuvieri* (apparently extinct), *O. mulleri*, *O. pentlandii* and two or three other species are of restricted distribution or native to the lake.

3. Criteria specifically based on aquatic birds

a) *is regularly host to significant numbers of specimens of particular groups of species of aquatic birds that are indicators of the value, productivity or diversity of the wetland*

The populations of aquatic birds in the Puno section of the Titicaca National Reserve (29,159 hectares or 6.4 per cent of the Peruvian portion) have been estimated to be 90,000 to 140,000 specimens (1988 and 1989 censuses). The greatest number of specimens is observed with the arrival of migratory species which begins in August (remaining in some cases until March). The following birds have been recorded in this sector: 8000 *Anas versicolor*, 7000 *Oxyura jamaicensis*, 7000 *Tringa flavipes*, 5000 *Phoenicopterus chilensis* (no reproducers), 3000 *Rollandia rolland*, 3000 *Anas flavirostris* and 450 *Rollandia micropterum*.

13. General location:

Lake Titicaca is situated on the altiplano forming part of the border between Peru and Bolivia. In Peru, the lake is in the department of Puno and the Moquegua-Tacna-Puno region. Out of a total of 1,079,849 people recorded in the province of Puno in the 1993 national census, roughly 500,000 live around the lake (32.33 per cent urban population and 67.7 per cent rural population).

Figure 1 **** Population around Lake Titicaca

There is direct access to the lake through the city of Puno whose bay is the lake port used primarily for tourism. There is also access to the lake by the rivers and ports of the main towns along the edge of the lake that are linked by roads.

Puno is reached from Lima by aeroplane through the airport of the city of Juliaca, approximately 50 minutes by road from the city of Puno. Another access is by train from Arequipa on the Ferrocarril del Sur, which continues on to Cusco.

14. Physical features:

Geology and soils: The land surrounding the lake is covered with alluvial deposits and soils with rock outcroppings (silicates, basalt and andesite) dispersed during the Devon, Cretaceous and Tertiary periods.

According to a soil use map (ONERN, 1981), the soils of the broad flatland surrounding the lake are appropriate for grazing and high-quality agriculture. Climate is the limiting factor for agriculture.

Origin: Lake Titicaca formed in the centre of a tectonic fault on the Andean altiplano, probably during the Pleistocene in the Cenozoic era (6 to 8 million years ago). On the altiplano, there are the two depressions of Lake Titicaca (Peru and Bolivia) and Lake Poopó (Bolivia). It is defined on the east by the eastern cordillera.

15. Hydrological values:

The Lake Titicaca basin has an area of 56,270 km², of which 8,400 km² belong to the lake itself. Three-quarters of the total basin belong to Peru. The lake can be divided into three areas: the larger section of the lake of 6,311 km² with the deepest point of 281 metres, the smaller section of the lake of 1,292 km² with the deepest point at 45 metres and the bay of Puno of 564 km² and a maximum depth of 30 metres. There are five main tributaries: the Coata, Huancané, Ilave, Ramis and Suches rivers and the outlet of the Desaguadero river. The lake is 176 kilometres long and has a maximum width of 70 kilometres and an average width of 50 kilometres. The rivers have gravel beds with deposits of fine sand, silt and fine sediments.

The Huancané and Ramis rivers are the main tributaries of Lake Titicaca and drain approximately 40 per cent of the Titicaca basin in the area of the larger part of the lake.

Water quality: The lake and its tributaries have slightly saline water (less than 1000 mg/l), a pH of 8.6, 250 mg/l of chlorine, 282 mg/l of sulphate, 66 mg/l of calcium, 34 mg/l of magnesium and dissolved oxygen of 3.5 mg/l. There is no or only very slight contamination in the lake, but in the tributaries there is organic material and bacteria from the cities of Puno and Juliaca.

Annual fluctuation of depth: The maximum depth of the lake is 283 metres. Water level fluctuates in function of climatic changes, producing years of flooding and years of drought.

Limnology: There are some 48 species of microscopic phytoplankton including chlorophytes, cyanophytes and bacillariophytes and 18 species of zooplankton: copepods, cladoceros and other species of invertebrates important for the food chain of the fish associated with the predominant aquatic vegetation of reeds and *llachos*. The average primary daily productivity is 1.34 g/cm²/day.

Geomorphology: The topography of the emergent landforms in Lake Titicaca is quite varied. It is formed by islands, peninsulas, beaches and surrounding land of large altiplanos and hills near the lake. The lake is a body of water with areas of shallow water, offshore areas and coast.

Climate: The climate is cold and dry, but slightly more humid than the Andes outside the Titicaca basin (relative humidity of 53 per cent, fluctuating between 50 and 62 per cent). The lake acts as a thermo-regulating influence, creating a microclimate releasing heat at night near the lake and the surrounding area. The temperature near the lake is about 2.5°C greater than the temperature of the mountainous area. The average annual minimum temperature is -3.5°C and the average annual maximum is close to 15°C.

Precipitation: The months of greatest rainfall are between December and March (75 per cent of total precipitation is from rain), and the driest months are from June to August with strong solar radiation during the day and sudden drops in temperature at night below 0°C. From September to November, there are periods of snow and hail accompanied by strong winds. The total average annual rainfall in the Titicaca basin is around 670 mm.

Water as a resource is important to sustain the system of wetlands in the lake. It permits the growth of bulrushes, aquatic birdlife and biological resources as well as making water available for humans for agricultural and grazing. Extreme climatic events--flooding and drought--that occur

occasionally have repercussions on the regional economy and the population living around the lake.

16. **Ecological features:**

Lake Titicaca belongs completely to the biogeographical province of Titicaca (Udvardy, 1975) and to the region in the subtropical latitudes as shown on the ecological map of Peru (ONERN, 1976).

In the land area around the lake, there are areas of subtropical humid montane forests (bmh-MT) and subtropical, subalpine very humid paramo (pmh-SaS) in the higher parts of the altiplano.

Lake Titicaca has lacustrine, marsh and shore areas of ecosystems of large vegetative communities of emergent plants (bulrushes), according to Ramsar criteria (1994). These aquatic environments are inland wetlands, and the main types are herbaceous shrub marshes (type 10), permanent freshwater lake (type 5) and shore flatlands (type 4).

The altiplano does not have micro areas of evolution, but there is endemism in birds and fish.

17. **Noteworthy flora:**

Among the aquatic flora, there are submerged plants such as *Chara fragilis* (*urima*), *Elodea potamogeton*, *Myriophyllum elatinoides*, *Potamogeton strictus* (*llachos*) and emergent vegetation of *Scirpus californicus*, which occupies all of the edge of the lake, especially Puno bay. There is an abundance of phytoplankton (surface algae), and in the area around the lake there is terrestrial flora of herbaceous plants and a few woody species.

Aquatic vegetation plays an important economic and social role in the rural communities. In Lake Titicaca, especially in the reserve, there are floating islands of bulrushes, which have formed by an accumulation of floating or cut bulrushes. They form a base for floating islands inhabited by the Uros community. Another plant used for forage is the *llacho*, taken from the water surface.

In Puno bay, near the Titicaca National Reserve, there is a high density of *lenteja de agua* that is a response to contamination of the water (concentration of organic material) by processes of eutrophication of the lake, discharge of waste water from the city of Puno, a low water level and a high content of nitrogen and sulphates. These factors make the primary production of phytoplankton difficult, affecting the presence of aquatic fauna in this area.

It is estimated that there are 10 species of aquatic macrophytes, 48 species of phytoplankton and 43 species of terrestrial flora.

Flora of Lake Titicaca

Aquatic plants

Terrestrial plants

Woody plants

Cultivated plants

Herbaceous

Woody

18. Noteworthy fauna:

Lake Titicaca has a rich endemic fish population and is the centre of the distribution of the genus *Orestias* (known as *carachi*, *challhuas* and *ispi*) on the altiplano. Other species of native fish are *suche* (*Trichomycterus rivulatus*) and *mauri* (*T. dispar*). There are four species of trout, introduced species in the *Salmo* and *Salvelinus* genera and *Basilichtys bonaeriensis* known locally as *pejerrey*.

Amphibians found here are in the genera *Bufo*, *Gastrotheca* and *Telmatobius*. Among the mammals, there are two species of carnivores: Andean wolf (*Pseudalopex culpaeus*) and *añas* (*Conepatus chinga*) and five species of rodents in the genera *Akodon*, *Andinomys*, *Calomys*, *Cavia* and *Phyllotis*.

The fish and birds are the most important groups of animals; their meat is a source of protein and forms part of the diet of the rural population.

There are 210 species of birds on the Peruvian altiplano (Venero, 1983). In Lake Titicaca, the protected aquatic vegetation in the reserve is an especially significant habitat for aquatic birds in the high Andes and migratory species from the Neoarctic. The total number of species has still not been determined. A total of 51 species have been recorded, but it is felt that there are at least 60 species (Goyzueta, 1955). Of the recorded 51 species, 35 are resident species and 16 are migratory (Goyzueta, 1990).

Surveys of aquatic birds carried out in the reserve in the summers of 1988 and 1989 reported populations of 137,898, 120,000 and 87,484 birds. The greatest concentration is at the time of the arrival of the migrations in August, which remain at the lake until December and in some cases until March.

Among the most numerous species are the *Anas cyanoptera*, *A. flavirostris*, *A. georgica*, *A. puna*, *Charadrius alticola*, *Chloephaga melanoptera*, *Fulica ardesiaca*, *F. gigantea*, *Larus serranus*, *Nycticorax nycticorax*, *Oxyura ferruginea* and *Rollandia rolland*.

A total of 15,500 flamingos of the Phoenicopteridae family have been recorded. The flamingos migrate in the high Andean area. There are also several thousand specimens in the Charadriidae and Scolopacidae families (*chorlos* and *playeros migratorios*, which nest in North America) and *Calidris bairdii*, *C. melanotos*, *Phalaropus tricolor*, *Pluvialis dominica*, *Tringa flavipes* and *T. melanoleuca*.

Resting and feeding areas for birds are the shore, bulrushes, water (with *llanchos*) and the islands (Carata, Mocco and Foroba). The large number of visitors to the reserve has decreased the presence and abundance of birds because of disturbances by the noise of motors. They take refuge in safer areas and in thick bulrushes, which are subject to flooding and are inaccessible to boats.

At the national level, the flamingos *Phoenicopus andinus*, *P. chilensis* and *P. jamesi* are endangered species. *Fulica gigantea*, *Larus serranus*, *Phalacrocorax olivaceus* and *Rollandia micropterus* are vulnerable. The *Recurvirostra andina* is rare (R.M. 01082-90-AG). Of all the species present in the reserve, *Rollandia micropterus* is endemic to the system of lakes in this region of Bolivia and Peru (lakes Arapa, Poopó, Titicaca, Umayo, Uru-

Uru and the Río Desaguadero) (Fjeldsa and Krabbe, 1991). This species is rare and is probably becoming extinct (Canales, 1992).

It is felt that there are up to 60 species of birds, 8 of mammals, 15 of amphibians, 1 of reptiles, 12 of fish and 18 species of zooplankton, in addition to an unknown number of species of invertebrates.

Fauna of Lake Titicaca

Scientific name

Common name

Birds

Casmerodius albus	Great white egret
Phoenicopterus andinus	Andean flamingo
Phoenicopterus chilensis	Chilean flamingo
Phoenicopterus jamesi	James's flamingo
Phalacrocorax macrorhynchos	Mountain caracara

Amphibians

Mammals

19. Social and cultural values:

Lake Titicaca plays an important role in the social and economic life of the region and provides local inhabitants with many natural resources. The fish and birds in the lake are important components of the diet of the rural population, which carry out small-scale fishing and subsistence hunting (smoking of meat for preservation). In some markets, birds are sold in small quantities. While indigenous fish are often sold, there is greater demand for introduced species such as pejerrey and trout.

Local inhabitants use the bulrush as emergency fodder during periods of drought, when a large part of the crops in the area surrounding the lake are lost and there is a lack of green pasture.

Local communities of Uros-Chulluni live on floating islands of bulrush inside the reserve and use bulrushes for shelter (blankets and mats), forage and as a substrata for growing crops. In some cases, the root is used as food.

In the Titicaca National Reserve, local inhabitants of the Uros-Chulluni communities protect and manage the lake's natural resources, with the government directly responsible for conservation in the area. There are several NGOs working to improve the living standards of the local population.

20. Land tenure/ownership of:

The main population centres are along the periphery of Lake Titicaca (Peruvian portion) in the provinces of Chucuito, El Collao, Huancañé, Puno and Yunguyo, in the department of Puno. The inhabitants in the shore settlements are primarily communities of Aymara-speaking Indians and some Quechua-speaking communities (Ramis and Taraco), which use the natural resources of the flatlands, rivers and lakes.

The Special Project for Registering Land and Rural Census (PETT) of the Dirección Regional Agraria-Puno is registering the land of the rural communities living on the edges of Lake Titicaca; for example, the community

of Uros-Chullunis. The area of floating islands and the territory of the Titicaca National Reserve are government property.

21. Current land use:

The local inhabitants occupying the surrounding shore areas live from agriculture (barley, *cañihua*, oats, potato and *quinua*) and livestock in the grasslands (sheep, llamas and alpacas) using the extensive pastures on the uplands and the harvesting of natural pastures (*llachos* and bulrushes from the surface of the lake), supplemented by small-scale fishing and subsistence hunting.

The large areas of emergent aquatic vegetation are partly managed by the local communities through concessions.

In some of the towns along the lake, such as Huanané (Puno), there are hills with forest plantations of introduced species such as eucalyptus, pine and cypress in good conditions.

In the Puno section of the Titicaca National Reserve, there are 10 to 15 rural communities. The most important is Uros-Chulluni (78.25 hectares) with 1700 inhabitants, 500 within the reserve on floating islands of bulrushes, using ancestral ways of exploiting the natural resources of the lake (forage, fishing and subsistence hunting) and selling handicrafts to tourists visiting the reserve.

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

In the Peruvian sector of the lake, the following projects are being carried out.

Management and development programmes

There are several projects related to the conservation of natural resources: environmental management and monitoring programmes; research programmes (biology, culture, sociology); public use programmes; environmental education programmes; fisheries development programmes (Ministry for Fisheries, Ministry for Agriculture, Ministry of Education, Proyecto Especial Lago Titicaca-PELT).

In the area of flood control and irrigation, PELT carries out projects under the Binational Master Plan for Protection and Prevention of Flooding and Use of the Water Resources of Lake Titicaca, Rio Desaguadero, Lake Poopó and Salar de Coipasa (T.D.P.S. system). In Peru, the main projects are the Lagunillas dam, irrigation along the Lagunillas, Chihuane dam, irrigation along the Ilave and a sluice at Desaguadero-Aguallamaya.

There are also several projects for the recovery of land, Andean technologies for agriculture, *waru-waru* (high-altitude fields), agricultural systems in the area around the lake and the PELT-PIWA project (Waru-Waru Inter-institutional Programme).

Pollution control programmes

An attempt is being made to treat waste water entering the lake, especially in the bay of the city of Puno (Superintendencia de Servicios de Saneamiento, SEDAPUNO, Ministry of Health, City of Puno, Ministry of Education).

The Ministry for Industry, Ministry for Energy and Mining, Ministry for Health, Ministry for Fisheries and the Ministry for Agriculture seek to coordinate action for the management of industrial and mineral waste of the city of Juliaca, which empties waste in the Rio Coata and then flows into the lake.

Because of the alternation of flooding and drought in the region of the altiplano, the growth of vegetation (bulrushes) on the surface of the water changes. Both the use of these resources and pollution can influence the size of these areas.

When the water level drops in times of drought, some of the exposed land is used for grazing and areas of bulrushes are cut. During periods of flooding, the depth of the lake increases where bulrushes grow (increasing to 7 metres, while the normal depth is between 2.5 and 4.5 metres) and parts of the mass of bulrushes break off at the root and are carried by the wind toward the coastal areas.

In some areas where there is sparse bulrushes and navigable channels, the species used for forage (bulrush and *llacho*) are displaced by other aquatic plants such as *urima* (*Chara fragilis*), without importance as a forage, easily propagated and abrasive (caused by the presence of silex), wearing the bulrush rafts and causing irritation to the skin.

The department of Puno suffers regularly from seasons of extreme drought. In extreme cases, a decrease in the lake's level has led to the drying of up to 50 per cent of bulrushes. When large areas dry, the local inhabitants burn areas of dry bulrushes (currently prohibited) in order to use the land for pasture. It is believed that by burning, vegetation will reappear. These areas do not satisfactorily recover in periods of greater availability of water. The result has been to produce areas of sparse vegetation that facilitate the illegal hunting of birds.

The use of the bulrush for forage, boats and housing, the illegal hunting of birds and the gathering of eggs are usually practised spontaneously and without control. In 1983 during a period of one of the worst droughts in the region, thousands of local inhabitants cut 600,000 kilos per day of bulrush for forage, given a lack of pasture in the area around the lake.

Environmental pollution produced by the presence of waste water is causing eutrophication in the Puno bay over approximately 16 km². This area is saturated with organic material and mud where a high density of *lenteja de agua* (*Lemna giba*) grows, reaching Esteves Island in a cover 3 cm thick. This condition increases when water level decreases. The lack of sewage treatment in Puno bay allows this small plant to prosper, giving off a strong smell in the area (caused by accumulation and rotting) and creating problems for the propellers of boats, thus affecting tourism. Contamination of the water also influences the biological resources in the water, including the fish that live in the bay.

In Pirim on the Capachica peninsula near the Ramis section of the reserve, there is leakage from former oil wells. The seepage is making the soil saline and creating runoff into the lake, leading to a deterioration of the fauna, flora, water and soil in this area (Merino, 1993).

23. Conservation measures taken:

In the area of Lake Titicaca, the Titicaca National Reserve (36,180 hectares, approximately 8 per cent of the Peruvian portion of the lake) including the Sector Ramis (7,030 hectares) and the Sector Puno (29,159 hectares) is protected. The Titicaca National Reserve (the equivalent of

IUCN category VI, Protected Area with Manageable Resources) was created in 1978 to guarantee the conservation of its natural resources because of the existence of exceptional characteristics of wild fauna and flora, scenic beauty and traditional use of natural resources in harmony with the environment. In addition, its creation was to promote the socio-economic development of the neighbouring populations through the wise use of natural resources and the promotion of tourism.

In 1966, the Aymara-Lupaka reserve was established by decree 2-96-AG in the provinces of Yunguyo and Chucuito (300,000 hectares). The decree establishes a status quo in the area until the government makes a decision about its use. This area is in the southern part of the lake on land and is the home to a relict population of Darwin's rhea (*Rhea pennata*) as well as other species of fauna and flora from the region. The Special Bilateral Lake Titicaca Project (PELT), through the representative of Peru, has promoted conservation plans in this area and has been the promoter of its declaration as a reserve.

24. Conservation measures proposed but not yet implemented:

The Peruvian sector of the lake is being proposed as a Ramsar site (wetland of international importance). The Special Bilateral Lake Titicaca Project (PELT) has prepared a bilateral master management plan, which is being implemented in both Peru and Bolivia, concerning aspects of protection, flood prevention and use of the resources in Lake Titicaca, Río Desaguadero, Lake Poopó and the Salar de Coipasa lake (T.D.P.S. system).

In December 1996, the United Nations Development Programme (UNDP) announced the allocation of 4 million dollars for the establishment of new protected areas for the lake's biodiversity and for the promotion of rational and sustainable use of existing natural resources. These resources are to be administered by PELT and will provide for the study of the possibility of diverting waste water that empties into the lake towards other areas where there is no risk of contamination.

25. Current scientific research and facilities:

Recent research includes studies on:

- pollution and purification of Puno bay
- limonolgy and fisheries studies
- surveys of bird populations
- management of forage
- management of *lenteja de agua* and other plants

In 1995, because of the high pollution of Puno bay, the director of the port promoted the cleaning up of the *lenteja de agua*, forming a technical committee with the participation of the Universidad Nacional del Altiplano (UNA), INRENA, EMSA-Puno, the Proyecto Especial Lago Titicaca (PELT), the Colegio de Biólogos and the Instituto de Ecología y Medio Ambiente de la UNA.

As a result of the campaign "Save the Lake" ("Salvemos el lago"), the inhabitants of the city of Puno were made aware of environmental and reclamation topics. Several technical reports were prepared, with alternatives for recovery of the bay (construction of oxidization ponds, treatment of sewage water using bulrushes as a filter for irrigation water and recovery of bulrushes in non-flooded areas). In the case of the use of surface water, studies indicated that the best alternative is to use this as processed forage for chickens (cattle will not eat it) and green fertilizer, but yields are still being studied.

The Special Bilateral Lake Titicaca Project (PELT) is providing assistance for the management of pastures (cultivated pastures under irrigation and permanent pastures), genetic improvement of alpacas, animal health and winter feeding. In the Titicaca National Reserve, several types of assistance are provided, such as a rotating fishing fund to work with the Uros-Chulluni community. For fish farming outside of the lake, attempts are being made to recover traditional methodologies (for example, management of waru-waru) to control the use of water for agriculture. In addition, PELT works in the conservation of ecosystems such as Lake Titicaca and the Aymara-Lupaka area, recently creating a reserve (300,000 hectares).

PELT has a canning factory in Puno with industrial production of fish resources and a pilot project producing bakery goods. There have been trials for processing tinned *titora* (similar to heart of palm) and a jam made from *lenteja de agua*.

In 1995, the government, through the Ministry for Transportation, Communications, Housing and Construction, improved the roads in the area, paving the Puno-Juliaca highway and the Juliaca-Huancané highway.

26. Current conservation education:

The Instituto Nacional de Recursos Naturales (INRENA), responsible for management of the Titicaca National Reserve, has prepared an annual work plan financed by the government that makes it possible to carry out measures for the administration of the protected area.

The National Reserve has a director and a park ranger, plus a staff of 8 to 10 local inhabitants as voluntary park rangers in the Puno section. The Uros community administers the entrance of visitors to the National Reserve. Voluntary park rangers help manage the reserve in other sectors, through their organization into the Paucarcolla and Huata-Coata committees. In the Ramis sector of the reserve, there is no effective presence of the administration, only links with the Ramis community concerning activities of environmental education. The reserve has a visitors' centre, small museum and an office with accommodations on Isla Foroba. There is also a wooden boat and two fibreglass boats.

27. Current recreation and tourism:

There is accommodation for tourists (hotels and hostels) in the city of Puno of various categories and prices. There are also several tourist companies that propose regular visits to the lake. The months of June to September are the best period, because these are no rains. However, tourists arrive in Puno at any time of the year to visit primarily the lake and the islands of Amantani and Taquile. The folklore festivals, such as the Virgen de la Candelaria, attract thousands of tourists to the cities of Puno (Peru) and Copacabana (Bolivia).

In 1995, about 60,000 tourists visited the reserve and the floating islands of the Uros-Chulluni communities to observe traditional forms of life and to buy regional handicrafts. Recently, houses were constructed on the islands for tourists who want to spend time there. In 1995-1996, the Uros received solar panels for producing electricity, schools and infrastructure for receiving tourists.

In Puno, there are several points of interest for tourists not widely known that can be included in a package or itinerary of visits to the lake (places from which to observe wildlife and areas of archaeological and cultural interest).

The Puno Agraria Region has agrotourist projects for the region (Amantani, Charcas-Ilave, Pircuyo and the Taquile islands) and a project for the rural sectors along the periphery of the lake with the intention of consolidating available services. In Piata, on the left edge of the Ramis Section of the reserve, there is a population of approximately 400 specimens of *Puya raimondii* on the intermediate slopes of the hills that reach the lake. This is an outstanding point of interest for visitors appreciating wild landscapes.

28. Jurisdiction:

The subregional office of the regional government for the Moquegua-Tacna-Puno region of the Puno Province, local governments (municipalities along the edge of the lake) and the regional offices of the ministries for Agriculture, Fisheries, Industry, Tourism, Commerce and Integration, plus the office of the president have jurisdiction over this area.

The navy controls navigation on all of the lakes in Peru, including boats that visit the reserve. It also patrols and monitors the border, as well as ensuring compliance with legal regulations on hunting bans and the use of wildlife resources from the lake.

The Joint Subcommittee for the Development of the Zone of Integration of Lake Titicaca (SUBCOMILAGO) is a bilateral agency ratified by the governments of Peru and Bolivia. The Special Bilateral Lake Titicaca Project acts as technical secretariat for Peru.

29. Management authority:

Dirección General de Areas Naturales Protegidas y Fauna
Silvestre
Instituto Nacional de Recursos Naturales (INRENA)
Ministry of Agriculture
Lima

30. Bibliographical references: