

## Information Sheet on Ramsar Wetlands

1. Date this sheet was completed/updated: 25 June 2002

2. Country: Bolivia

3. Name of wetland: Lakes Poopó and Uru Uru

4. Geographical coordinates:

Lake Poopó            18° 21' – 19° 10' South latitude  
                              60° 24' – 60° 50' West longitude

Lake Uru Uru         18° 03' South latitude  
                              67° 04' West longitude

5. Altitude: 3686 metres above sea level

6. Area: 967,607 hectares

7. Overview: The salinity, shallow water, biotic characteristics and the typical climatic conditions of the Puno at this altitude make this wetland a strategic place for the conservation of many species. It is one of the main bodies of water where the Chilean flamingo (*Phoenicopterus chilensis*) and the Andean flamingo (*Phoenicopterus andinus*) reproduce. It is an important habitat for ducks, shore birds and migratory birds. Two of the oldest ethnic groups in continental South America, the Uru Muratos and the Chipayas, live in this environment.

8. Wetland type: M, N, Q, R, Ss and Zg

Types of wetlands by decreasing order of importance: Q, R, Ss, M, N, Zg

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

Criteria that best characterize the site: 5

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

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

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region. Poopó and Uru Uru lakes form a large wetland characteristic of the Puna biogeographic region of great importance because of high densities of many species of resident and migratory waterfowl, native fish and because of the local inhabitants who still depend in large part on their resources for survival.

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities. Of the six species of flamingos existing in the world, three live at the Lakes Poopó and Uru Uru: the Chilean flamingo (*Phoenicopterus chilensis*), Andean flamingo (*parina grande*) (*Phoenicopterus andinus*) and James's flamingo (*parina chica*) (*Phoenicopterus jamesi*). These three species of flamingos are listed in Appendix II of CITES. *P. andinus* and *P. jamesi* are the rarest of the six species of flamingo in the world (Rose and Scott, 1997). Both species have also been included in Appendix I of the Convention on Migratory Species (Johnson, 1996). According to BirdLife International and IUCN, *Phoenicopterus chilensis* is classified as vulnerable and *P. jamesi* and *P. chilensis* are in the low risk category. Among other species of endangered birds are the Darwin's rhea (*suir*) (*Rhea pennata*) in the endangered category; the Andean condor (*Vultur gryphus*) and the soca cornuda (*Fulica cornuta*) are in the low risk category. The grebe (*zambullidor*) (*Rollandia microptera*), endemic to the Titicaca-Poopó basin, is listed as vulnerable according to O'Donnel and Fjeodså (1997) in the Action Plan for Conservation of the Podicipedidae (IUCN/SSC Grebes Specialist Group) and Rocha and Quiroga in Fauna Amenazada de Bolivia (in preparation).

Two species of mammals are considered endangered by IUCN (2000), the vicuña (*Vicugna vicugna*), persecuted for its fine wool and hunted unscrupulously, is classified as vulnerable (IUCN, 2000). The *quirquincho* (*Chaetophractus nationi*) is an endangered species killed for making musical instruments and decorations (IUCN 2000).

As for the vegetation around Lake Poopó, there are three species of *Parastrephia*, locally called *thola*, which, according to the U.S. Department of Interior and U.S. Fish and Wildlife Service (1996), is endangered. All three species are used as fuel. Large-scale extraction of *thola* in this area is seriously degrading the land, especially sandy areas where erosion is more evident and directly affects the fauna by causing a drastic change in its habitat. *Parastrephia lepidophylla* is an endangered species although data is insufficient. *P. lucida* is less frequent and is considered an endangered species although data is insufficient, while *P. quadrangularis* is considered a vulnerable species.

The cacti in the *Opuntia* and *Trichocereus* genera are also commonly found on some of the hills in the Poopó basin and are listed in Appendix I of CITES.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region. The Lake Poopó basin has broad biological diversity, especially with regard to the bird life and is considered a centre for endemic species of fauna and flora. At the proposed Ramsar site, 75 species of birds have been recorded of which 36 are from aquatic environments and 38 from terrestrial environments. Among the endemic birds that live near the lake are the grebe (*zambullidor*) (*Rollandia microptera*), endemic to the Lake Titicaca-Poopó basin, and the *gallareta cornuda* (*Fulica cornuta*), which is considered endemic to the high-Andean lakes of the Argentine, Bolivian and Chilean puna. Also, two of the three species of flamingos (*Phoenicopterus andinus* and *P. jamesi*) that live near these lakes are endemic to the Puna and almost restricted to the high-Andean saline lakes.

The fish fauna has endemic species in the *Orestias* and *Trichomycterus* genera.

In the most recent National Census of Vicuñas, a population of 33,844 vicuña was recorded in 1996, distributed in 76 census areas divided into nine conservation units on the Bolivian altiplano. In the department of Oruro, a total of 3,560 vicuña were recorded. In the Desaguadero-Poopó unit, 2198 specimens were recorded (DNCEB, 1997). This is six per cent of the total population in the country and 61.7 per cent of the population in the department of Oruro. The vicuña population in this conservation unit from 1996 to the present has remained above 2000 specimens.

With regard to endemic high-Andean species found in the basin, there are two species, *Chersodoma candida* and *C. jodopappa*, and two species in the genera *Lampaya* and *Parastrephia* (Cabrera and Willink, 1993). There are also endemic species in the genus *Senecio*, which are also endangered because of changes in the habitat. The family of Cactaceae, whose most frequent representatives in the basin are in the genera *Opuntia* and *Trichocereus* are listed in Appendix I of CITES. Very specialized halophytic species that grow on the shores of Lake Poopó are *Sarcocornia pulvinata*, *Suaeda foliosa*, representatives of the genus *Atriplex* and the Compositae *Senecio viridis*, *S. humillinus* and *Hymenoxys robusta*.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions. Poopó and Uru Uru lakes are an important stopover for many northern migratory birds, such as *Calidris bairdii*, *Phalaropus tricolor*, *Pluvialis dominica*, *Tringa flavipes*, *T. melanoleuca* and *T. solitaria*. They are also the habitat for resident birds and a nesting site for several species such as the Chilean flamingo (*Phoenicopterus chilensis*), the Andean flamingo (*Phoenicopterus andinus*) and other species of aquatic birds. In the reed beds (*Shoenoplectus californicus totora*), several species of fish in the genera *Orestias* and *Trichomycterus* breed. This type of vegetation is also the preferred site for nesting of several species of birds.

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more water birds. In July 1997 and 1999, two aerial surveys were made in Poopó and Uru Uru lakes where 120,000 and 75,000 specimens were recorded respectively out of total for the three species of flamingos (*Phoenicopterus andinus*, *P. chilensis* and *P. jamesi*). As a result, it can be stated that the two lakes

are the habitat with the highest concentration of flamingos in the winter season on the Bolivian altiplano and also probably for all the high-Andean region of South America where they live.

One abundant species in the rainy season is the *falaropo tricolor* (*Phalaropus tricolor*) with 9,134 specimens recorded at Lake Poopó in January 2002 and also observed in large concentrations on Lake Uru Uru with several specimens with post-nuptial feathers (April 2002).

As a result of eight land surveys, a total of 134, 627 adult flamingos of three species, with the most abundant the Chilean flamingo (*Phoenicopterus chilensis*) with 69 per cent of the total of the three species with sightings of 18,809 specimens (July 1999). The Andean flamingo (*Phoenicopterus andinus*) is the second most abundant species with 19 per cent of the total and recorded sightings of 9,829 specimens in September 2001, which is the record for the largest number of this species at any single wetland. The James's flamingo (*Phoenicopterus jamesi*) is the least abundant species with a total of 12 per cent of all the three species of flamingo. There are always juveniles with an average of 971 specimens in each census.

In lakes Poopó and Uru Uru, a total of 34 species of waterfowl have been recorded, in 11 families (Anatidae, Ardeidae, Charadriidae, Laridae, Phalacrocoracidae, Podicipedidae, Phoenicopteridae, Rallidae, Recurvirostridae, Threskiornithidae and two species of Tyrannidae (*Lessonia oreas* and *Tachuris rubrigastra*) associated with aquatic environments. *Tachuris rubrigastra* is associated exclusively with patches of bulrushes (*Schoenoplectus californicus tatora*).

A total of 199,074 specimens were recorded during eight field visits to the proposed Ramsar site. The most abundant were the Chilean flamingo (*Phoenicopterus chilensis*), 94,227 specimens, the Andean flamingo (*Phoenicopterus andinus*) 24,943 and a northern migratory species, *Phalaropus tricolor*, with 21,805 specimens. Among those of moderate abundance are the Anatidae, the *pato puna* (*Anas puna*) (5,165), *pato real* (*Anas specularioides*) (4,328 specimens), *Anas flavirostris* (4,196 specimens), the *chorlito* (*Calidris bairdii*) (4,198), the shore bird *Tringa flavipes* (3,655) and the *zambullidor* (*Podiceps occipitalis*) (2,732). Among the least abundant species are the *avoceta Andina* (*Recurvirostra andina*) (713), the *tero real* (*Himantopus mexicanus*) (257), *Anas cyanoptera* (389) and the *zambullidor* (*Rollandia microptera*) (265) (Rocha in press).

Taking this into account, the proposed Ramsar site regularly provides habitat for more than 20,000 aquatic birds.

Criterion 6: A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterfowl. The high population densities of the three species of flamingos and other waterfowl, regularly present in the wetland are more than 1 per cent of its total population.

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history

stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity. The ichthofauna of lakes Poopó and Uru Uru is formed by native and exotic species. The native species are in the Trichomycteridae family and the Ciprinodontidae family in the genus *Orestias* with 23 species endemic to the basins of lakes Titicaca and Poopó, contributing fundamentally to the biodiversity of the high-Andean region.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend. Bulrushes and other aquatic vegetation contribute to the productivity of lakes Poopó and Uru Uru as a biotype. It is the environment and natural habitat where many fish species and the bird life described earlier mature. Because of its characteristics, it offers a substratum and protection for nests, breeding and maturing that helps make up a natural ecosystem and fulfils functions of shelter, food and environment appropriate for reproduction.

### 13. General location:

Lakes Poopó and Uru Uru are within the limits of the department of Oruro, which is located in the west-central part of Bolivia, bordering on the north with the department of La Paz, on the east with the departments of Cochabamba and Potosí and on the west with Chile. Both lakes are located in the large basin of the fluvial-lacustrian altiplano, formed by the hydrological basins of Lake Titicaca, Río Desaguadero, Lake Poopó and Salar de Coipasa. Geographically it is contained within the coordinates of 14° 03' and 20° 00' South latitude and 66° 21' and 71° 07' West longitude.

### 14. Physical features:

This basin has the form of an elongated strip, 200 kilometres in average width over approximately 1000 kilometres. Its relief is characterized by a large enclosed central plain, between 3500 and 4000 metres in altitude. It is surrounded on the east and west by the Eastern and Western mountain ranges, whose summits almost reach 6000 metres above sea level (Quintanilla, 1985).

The alluvial and colluvial soils are heterogeneous because they are of lacustrian-fluvial origin. On the hills, small mountains and steep cliffs, the soils are shallow and poorly developed. Those situated near rivers, lakes and at the base of the hills are more evolved.

In the areas near Lake Poopó, the saline soils have a thin cover of salt of six to eight millimetres on clay and sandy sediments. Vegetation is non-existent in this area or is very sparse forming a seasonal herbaceous broadleaf habitat (PROBONA, 1995). The soil structure is weak with heavy compaction and low porosity that prevent infiltration of water. Storage of water produces runoff with a risk of erosion. They are shallow soils with low retention of water and nutrients. The hills are very rocky, while the plains have clay soils with problems of salinity (Luther, 1993).

The average salinity of Lake Poopó is 25 grams per litre because of its role as final sump for the water from Río Desaguadero and other rivers that drain saline land in the southern part of the basin (UNEP/OAS, 1996).

The climatic conditions of this area are rather harsh because the climate is cold and dry in general with annual average temperatures below 10° C, wide ranges of temperature between day and night and precipitation that ranges between 200 and 400 millimetres (Biosca, 1998). At the meteorological stations closest to lakes Poopó and Uru Uru and the station at Oruro, there is an average precipitation of 346 millimetres and at the station of Challapata of 373 millimetres (Navarro, 1993). The area surrounding lakes Poopó and Uru Uru, where there are permanent wetlands or flooding, has a cyclical humidity between dry and wet seasons (Ribera, 1992). The many natural risks are climatic in origin and produce intense and prolonged dry spells, rainy seasons with a high frequency of hail and frosts.

#### 15. Hydrological values:

Lake Poopó is part of the endorheic lacustrine system of the Bolivian altiplano. It has several sources of water (rivers and precipitation) and exits (evaporation and groundwater that lead to Río Laca Jahuirá). Loss of water is less than contributions of water. The lacustrine basin is very flat, and its shores can move over large distances in function of the irregularity of average annual contributions that are 80 per cent fluvial ( $2.6 \times 10^9$  cubic metres) and the remaining 20 per cent ( $0.6 \times 10^9$  cubic metres) from rainfall. The losses are 98 per cent ( $3.1 \times 10^9$  cubic metres) by evaporation and the rest by infiltration.

The northern part of Lake Poopó is connected to Río Desaguadero, an effluent of Lake Titicaca. This provides more than 80 per cent of the volume of inflow. In the south, the most important tributary is Río Márquez. To the east, there are the Juchusuma and Tacagua rivers, which join before reaching Lake Poopó. The only river draining water from the lake is Río Laca Jahura, which usually disappears during periods of low water. Variation because of the exchange of water cause significant modifications in its volume, making this lake a very unstable environment.

#### 16. Ecological features:

The vegetation growing in the Lake Poopó basin is xerophytic, typical of arid areas of the puna. Soil conditions are especially deficient because of their salinity. Plants have formed various plant associations, adopting strategies that allow them to adapt to environmental conditions according to the nature of the soil, the availability of water, exposure and other factors described in the following paragraphs.

The following plant formations, according to physiognomic criteria and according to growth forms:

*Tolillares* growing on rocky hill slopes: On the rocky hill slopes in the basin, in the soil gathered among the rocks, isolated shrubs in the *Baccharis* and *Parastrphia* genera are frequently found. *Fabiana densa* is also common and in some cases dominates. In certain more-exposed areas, scattered groups or small groups of

*Trichocereus* and *Opuntia armata*, *O. boliviana*, *O. orurensis* and *O. soerhensii*, which grow in clumps.

Matorral (*tholar*): In the flat areas or areas with little slope, there are matorrales of resinous and evergreen shrubs (*tholares*). The soil is sandy, clay and more or less dry. The representative species of this plant unit in the basin are *Baccharis boliviensis* and *B. incarum*, *Parastrephia lepidophylla* and *P. quadrangularis*. In Lake Uru Uru, there is a common association of *Distichlietum humilis* and *Muhlenbergia fastigiatae* (Navarro, 1993). A smaller number of groups of Gramineae of primarily *Festuca orthophylla* and *Stipa ichu* also appear.

High grasses (*pajonal alto*) are distributed on the hillsides and plains on primarily sandy and dry soils. They are communities dominated by shrub layers of Gramineae. Variations in floristic composition and cover are related to climatic and soil factors. The species that form this plant unit are mainly *Festuca orthophylla* and *Stipa ichu*. Others encountered with less frequency are species in the *Deyeuxia*, *Muhlenbergia* and *Poa* genera. There are also sparse associations with *Lampaya castellani* (Verbenaceae) in the form of clumps and with species of *Baccharis* (Compositae) that form low bush.

Communities of saline soils: On the lakeshore, there is a wide belt of white sand without vegetation because of concentrations of solidified salt. This progressively creates transitional saline soils with sandy areas, which allow the development of certain very specialized halophytic species, such as *Sarcocornia pulvinata* and species in the genus *Atriplex*.

Aquatic plants: Salinity is the main limiting factor of the lake for macrophytes. The area with vegetation is only 68 per cent; a low amount because of the depth of the lake (Collot, 1982). The most widely distributed are species in the *Ruppia* and *Chara* genera, which appear in association with *Ruppia* and *Schoenoplectus californicus* (bulrush). To a lesser degree, there are species such as *Elodea potamogeton*, *Myriophyllum* sp. and *Potamogeton* sp. In Lake Poopó, there are no floating species, but large areas of Lake Uru Uru are covered with species in the genus *Lemna*, for example *L. gibba*, *L. valdiviana* and associations of *Lemna minusculae* and *Lemnetum gibbae*, which are characteristic of eutrophic water (Lieberman et al., 1991). Among the *pleuston*, there is often *Azolla filicuoides*.

#### 17. Noteworthy flora:

The flora of the Lake Poopó basin is represented by 129 species of which 109 are terrestrial in 27 families. The remaining 20 species are macrophytes. Of these, three belong to the group of phycophyta (microscopic algae).

In the Lake Poopó basin, endemic high-Andean species in the *Chersodoma*, *Lampaya* and *Parastrephia* genera have adapted. Extreme aridity in the area has created endemic species, such as *Chersodoma candida* and *C. jodopappa*. Several endemic species in the genus *Senecio* are considered vulnerable or endangered by changes to the habitat (Cabrera and Willink, 1993). The Cactaceae family is listed in Appendix I of CITES.

The conditions of high soil aridity, saline concentrations and the associated difficulty of extracting water determine a type of plant cover resistant to saline soils, such as *Distichlis humilis* and *Muhlenbergia fastigiata*. Other areas have very specialized halophytic species such as *Sarcocornia pulvinata*, *Suaeda foliosa*, species in the genus *Atriplex* and the Compositae of *Hymenoxys robusta*, *Senecio humiilinus* and *S. viridis*.

The plant communities best distributed geographically in the basin are *Baccharis incarum*, *B. obtusifolia* and *Parastrephia quadrangularis*, which are considered an endangered species. In the grasslands, the most abundant bunched Gramineae are *Stipa ichu* and species of *Festuca*. On the hillsides, there are abundant groups of *Opuntia* and *Trichocereus* that grow in clumps. Among the aquatic species, the most important are *Ruppia*, a genus characterized by its growth in saline water and *Chara* and *Schoenoplectus* that traditionally are used for the construction of boats, but have been replaced by other wood.

#### 18. Outstanding fauna

The large mammal found here is mainly the northern geographical subspecies of the vicuña (*Vicugna vicugna mensalis*). It is a species typical of arid grasslands of the puna and semiarid plateaux. Among the most common species in this area are the Andean wolf (*zorro andino*) (*Pseudalopex culpaeus*). Associated with rock piles, is the vizcacha (*Lagidium viscaccia*). A less conspicuous species is the skunk (*sorrino* or *anatuya*) (*Conepatus chinga*). Several felines such as the puma (*Puma concolor*), the Andean cat (*titi*) and the *gato pajero* (*Oreailurus jacobita*) and *O. pajeros* are probably found here. There is still incomplete knowledge about the smaller mammals in the area.

The fish fauna in the lacustrine system is represented by the native genera *Orestias* (14 species) and *Trichomycterus* (5 species) as well as two introduced species, *Salmo gairdneri* (trout) and *Basilichtys bonariensis* (the *pejerrey*), which are all used in the diet of the local inhabitants.

The Anura (toads and frogs) that live in certain parts of the lake belong to the genera *Bufo*, *Gastrotheca*, *Pleurodema* and *Telmatobius*. Among the lizards present are several species in the genus *Liolaemus* and the only snake on the puna *Tachymenis peruviana*.

As for the aquatic bird life, lakes Poopó and Uru Uru represent a place of great importance for the Andean species as well as for the shorebirds of the Neartic of which there are close to 30 species. Among the most common resident birds are the *Anas cyanoptera*, *A. flavirostris*, *A. georgica*, *A. puna*, *Charadrius alticola*, *Chloephaga melanoptera*, *Gallinula chloropus*, *Himantopus mexicanus*, *Larus serranus*, *Oxyura jamaicensis*, *Phoenicopterus andinus*, *P. chilensis* and *P. jamesi*. Among the waders from the Neartic, the most abundant are the *Calidris bairdii*, *Phalaropus tricolor*, sighted in large flocks during its migration, *Tringa flavipes* and *T. melanoleuca*. Among the endangered birds are the *gallareta cornuda* (*Fulica cornuta*), the *zambullidor* (*Rollandia mycroptera*), the Andean flamingos (*Phoenicopterus andinus*, *P. chilensis* and *P. jamesi*), the *surie* (*Pterocnemia pennata*) and the Andean condor (*Vultur gryphus*).



## 19. Social and cultural values:

Like other parts of the altiplano, Lake Poopó and the surrounding area is one of the poorest parts of Bolivia, where an estimated 67 per cent of the rural population lives in poverty and 33 per cent lives in misery. The neighbouring communities around Lake Poopó are composed of Aymara communities and the Uru ethnic group, which is one of the oldest groups on the American continent. It is estimated to have existed since 1500 to 2000 years BC (Delgadillo, 1998) and is formed by Muratos, located closer to Lake Poopó, Chipayas and Iru Itus. The social organization of the Uru Muratos is based on the nuclear family formed by father, mother and children. The community is formed on the basis of this socio-political organizational unit and is divided into two agnatic links among its members on two levels: on the one hand the members forming a community with agnate ties among its members in patriarchal local groups and the other level of the overall community which forms the Uru Murato tribe. Their political organization is based mainly on the top mayor and the lower or communal mayor as basic authority and the school mayor whose competence is directly related to the educational unit. In 1996, the office of OTB president was created, who works directly with municipios and manages projects.

The Uru world of myths is characterized by zoomorphic structures with representations of snakes and frogs. It is possible that the cult of the snake among the communities along the river was later assimilated by the Aymaras. The Uru had the ray, fertility, water, rain, fire and cold as secular gods. For this reason, the Uru have maintained Lake Poopó, its islands and the surrounding ecosystem as sacred sites. They worship the Jalsuris, which are whirlpools in Lake Poopó. Before entering the lake, they carry out certain rituals that allow them to use the resources in the lake and perpetuate the group's identity. They have rituals for hunting and fishing, which are the main activities for their survival, given the scarce agriculture and livestock raising that their neighbours, the Aymara, allow them to develop. The places considered most important for the history and culture of the Muratos are Vila Ñeke, Jututilla and near the thermal waters of Pazña, Urmiri and Challapata. There are rituals that they still carry out.

The territorial origin of the Uru (Capillus, Chipayas and Muratos) is located on the central altiplano in the department of Oruro and extended to the Pacific Ocean. On the north, it reached up to the northern shore of Lake Titicaca and the valley of Arequipa and on the south to the upper part of Río Loa up to Lípez and Chichas. On the east, it reached to Río Cotagaita. This wide distribution has been reduced to three large settlements: Llapallapani on the extreme southeastern edge of Lake Poopó, the community of Vila Ñeque to the north and the community of Puñaka Tinta María in the northwest.

## 20. Land tenure/ownership of:

At the time of the arrival of the Spanish, the Bolivian altiplano was populated by three main groups: the Aymaras, Quechuas and the Uru-Chipayas. The first two groups were herders and farmers and, therefore, owners of the land, while the Uru-Chipayas lived on the shore of the lakes and salt flats. This distribution of the land has been maintained and remnant populations still exist around Lake Titicaca and

along the Río Desaguadero (the Urus), Lake Poopó (the Muratos) and the salt flat of Coipasa (the Chipayas).

Mining concessions occupy most of the land in this area east of the Lake Poopó basin. According to the Technical Service for Mines (SETMIN), there are now 437 concessions registered with the Mining Survey (data from May 2000) located around Lake Poopó. Concessions before 1997 had 54 different owners. After 1997, there were 63 concessions of which only five were companies and the rest private persons. The rest of the land is private property of local inhabitants or is communal land and partly public land.

#### 21. Current land use:

Conditions in the area allow only subsistence agriculture, although the Urus make use of knowledge of ancient techniques using water to wash salt from the soil and prepare the ground for farming. Herding is also limited. The species used are mainly local species and occasionally sheep and goats. Commercial forest production is insignificant, and shrubs are widely used as firewood. The Uru culture was traditionally dedicated to hunting, fishing and the gathering of wild flamingo eggs during January and February and to a lesser degree aquatic and terrestrial plants.

Mining is carried out in the area surrounding Lake Poopó for extraction of silver, lead, zinc, copper limestone, antimony, iron and a small amount of gold and often tin together with the other minerals. There is also uranium in four mines, which were exploited experimentally during the 1980s by the Bolivian Nuclear Energy Commission.

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

Degradation of water resources in this area is caused mainly by chemical pollution produced by the mining and metallurgical industries and recently by pollution caused by petroleum spills. Lakes Poopó and Uru Uru and the lower Río Desaguadero have high concentrations of heavy metals above the limits permitted for human consumption (Apaza et al. 1996; Van Ryckeghem 1997; OAS/UNEP and ALT 1999). These high levels were also found in fish (Beveridge et al., 1985). From the time of its formation in 1995, Lake Uru Uru has received polluted water from Río Sora Sora, originating in Río Huanuni, which is affected by mining at Mina Huanuni, the most important deposit of tin in Bolivia. There is organic and bacteriological pollution from wastewater and urban waste from the city of Oruro on Lake Uru Uru (Lieberman et al., 1991; OAS/UNEP and ALT, 1999) and from the three neighbouring towns of Challapata, Huari and Poopó, whose sewage empties into Lake Poopó. Other adverse ecological effects on the wetland are indiscriminate hunting of vicuñas, flamingos and other aquatic birds as well as the cutting of *tholares* in excessive numbers for use as fuel.

Two sources of pollution have been studied in the area near the wetland (SERGEOMIN, 1999): those of natural origin and those related to anthropogenic activity. The first, is found mainly in the western part of the area of the department

of Oruro where it meets the Western Cordillera, which is the result of intense magmata activity from the Miocene, resulting in widespread pyroclastic and volcanic strata that formed the landscape of plateaux and conic elevations. This type of pollution is the result of the post-magma activity especially sulphur production, fumaroles and geothermal resources, which has produced an area polluted with minerals and volatile elements such as sulphur, boron and arsenic (SERGEOMIN, 1999). Anthropogenic activity has affected the department of Oruro since the colonial period through mining, which has left many deposits of solid waste.

### 23. Conservation measures taken:

The proposed Ramsar site borders on one of the nine conservation units for vicuña, the Desaguadero-Poopó reserve, which covers eight protection areas: Andamarca, Huancaroma, Llanquera, Pampa Aullagas, Salinas de García Mendoza, Silluta, Toledo and Untavi wildlife reserves. The last two were recently incorporated (Velasco, 2002, personal communication).

This wetland is not included in the national system of protected areas (SERNAP) and, therefore, still does not have environmental measures for sustainable maintenance and is considered to be in a critical conservation status among the wetlands of Latin America and the Caribbean (Olson et al., 1998).

However, in order to reduce the harmful effects of mining on Lake Poopó, the Oruro pilot project was implemented for three years that led to implementation of environmental policies by the Bolivian government. This was the result of the World Environment Summit in Rio de Janeiro in 1992. It provided for sectorial environmental analysis (SEA) financed by the World Bank, whose conclusions stressed carrying out an environmental management project in the Lake Poopó basin given the evident environmental degradation caused mainly by mining (SERGEOMIN, 1999). The implementing agencies were SERGEOMIN through its department for mining and the environment and the Swedish Geological Service (SGAB).

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

Law No. 2097 of 8 June 2000 declared Lake Poopó, Oruro, a national heritage and ecological reserve. However, until now nothing has been done for its conservation. There are projects to be carried out with the local communities, primarily with the Uru Muratos in environmental education and the use of resources. Public bids were recently called for carrying out a study of the Andamarca area neighbouring Lake Poopó in order to provide this area with the status of a departmental protected area.

### 25. Current scientific research and facilities:

The General Office for Biodiversity (Dirección General de Biodiversidad) an agency of the Ministry for Sustainable Development and Planning, with the support of the Wildlife Conservation Society (WCS/Bolivia) carried out a study of the natural resources of Lake Poopó and Uru Uru for nomination as a Ramsar site. The study included surveys of the fauna, flora, limnology and anthropology of these wetlands and the surrounding area, whose conclusions are attached to this information sheet.

As for infrastructure, in the eastern part of Lake Poopó the settlements of Challapata, Huari and Pazña offer accommodations and food. In the western part, the settlements are smaller, but can provide bare accommodations. Lake Uru Uru is very close to the city of Oruro where all types of service can be found.

26. Current conservation education:

A programme is being carried out for environmental education using the method of teaching of ecology in the school patio (EEPE), which has proven effective in several towns in Bolivia and also at the continental level. At the same time, there is an itinerary exhibit on the conservation of high-Andean flamingos and wetlands in Bolivia with the support of WCS/Bolivia and the Audubon Society.

27. Current recreation and tourism:

There are varied elements with tourist potential in the Lake Poopó basin, such as nature, culture, archaeology, thermal water, colonial churches, and ethnic groups among other aspects. However, this resource is not yet adequately exploited for tourism. The department of Oruro limits its tourist activity to the Festividad del Carnaval, which benefits only the capital city. The basin does not attract tourists because of the distance and isolation, difficult access, non-existent promotion and tourist information, state of conservation of several attractions and the lack of services (accommodations, food, transportation and information). Because of the characteristics of the area, sustainable and responsible tourism would be beneficial not only for the local inhabitants that live near the lake but also for the environment itself because the affluence of tourists would create additional incentive for maintaining a sound ecosystem.

28. Jurisdiction:

The hierarchy at the site is the following:

- Bolivian national government
- Prefecture of the department of Oruro
- Sub prefectures of the provinces of Avaroa, Cercado, Ladislao Cabrera, Poopó,  
Saucari, Sebastiaán Pagador and Sur Carangas
- The municipal governments

29. Management authority:

The institution responsible for Lakes Poopó and Uru Uru is the prefecture of the department of Oruro in coordination with the Dirección General de Biodiversidad of the Ministry for Sustainable Development and Planning:

- Ministerio de Desarrollo Sostenible y Planificación
- Viceministerio de Medio Ambiente, Recursos Naturales y Desarrollo Forestal
- Dirección General de Biodiversidad

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30. References: