Information Sheet on Ramsar Wetlands

Official translation by Charles Akin
Siteref: ***6CL002***

1. **Date this sheet was completed/updated:** 29 November 1996

2. Country: CHILE

3. Name of wetland: Salar de Surire

4. Geographical coordinates:
18°46 - 18°55'S; 68°58 - 69°56'W

5. Altitude: an average of 4,200 metres

6. Area: 15,858 hectares (total protected area)

7. Overview:

The Surire salt marsh is part of the High Andean altiplano steppe (Gajardo, 1994). This landform extends between 4,000 and 5,000 metres in altitude forming a large flat area dominated by isolated mountains and inflowing and outflowing river basins. The basic vegetation is determined primarily by relief and the presence of bodies of water. The salt marsh is surrounded by vegetative communities dominated by *bofedales de la tundra altiplánica* (Quintanilla, 1988).

A large number of non-metallic minerals (calcium and boric salts) are found here. At one corner of the salt marsh, there is a stream that begins in a large artesian hot spring (Salas, 1975). The fauna associated with this environment is very important, and the area is one of the four most important places for the reproduction of flamingos in Chile (Ormazábal, 1988).

8. Wetland type:

dry salt marsh and saline lakes with seasonal fluctuations

9. **Ramsar criteria**: 1b,2a,2b,2c,3b

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

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

Victor Valverde Soto, Jefe Sección Fauna Silvestre
U.G. Nacional Património Silvestre
Corporación Nacional Forestal
Av. Bulnes 259, Of. 604, Santiago de Chile

12. Justification of the criteria selected under point 9, on previous page: ~no information

available~

13. General location:

The salt marsh is 266 kilometres from Arica and 126 kilometres from Putre in the region of Tarapacá, Province of Parinacota.

14. Physical features:

Several streams draining the higher areas of the basin flow into the salt marsh. In the northern sector of the salt marsh, there are piedmonts of volcanic deposits of pyroclastic andesite. These are low-grade accumulations of clastic, disparate, unsorted rocks produced by the interpenetration of erupted volcanic structures. Along the eastern border of the salt marsh, there are a broad dejection fan and smaller fans on which volcanic structures have formed.

In the south, there are slopes of interspersed volcanic structures and dejection fans. A wide variety of salts, chlorides and sulphates are found in the salt deposits of the Surire salt marsh.

15. Hydrological values:

The Salar de Surire is the sedimentary basin of the endorheic drainage system with the same name. Small seasonal streams flow into several lakes within the salt marsh or enter the ground in dry stream beds or in the salt marsh. The main source of water is the Rio Surire (also called the Casisaye) which begins in the south-western Chiguane, Mulluri and Surire hills. Its flow increases considerably during the summer allowing it to flow to ponds well within the salt marsh.
Within the Salar, there are a large number of small lakes of which some are seasonal. The most important lake is Lake Chancacollo to the north of the wetland covering an area of 1.5 square kilometres. In the central part, there is another lake from which the Río Blanco flows. This river flows toward the centre of the salt marsh and then disappears in the ground. To the east, there is a series of small lakes, the most important of which are known as the Baños de Polloquere.

Parameters (mg/l)	Chilcaya	Guarmire	Chiguana
pH	8.0	7.9	7.9
Electrical conductivity mmho/cm	21.5	17.6	18.9
Sodium	6600.8	5793.0	9857.7
Borom	210.2	150.2	109.5
Chloride	4798.5	1021.0	7980.5
Bicarbonate	1054.0	182.7	-
Lithium	157.6	12.3	219.5
Arsenic	-	1.5	-
Total solids	-	15468.0	-

Replenishment of the aquifer depends on precipitation in the area and its influence on stream

flow in the basin. There has been no attempt to construct hydrological works in the salt marsh.

16. Ecological features:

A large part of the Salar de Surire is formed by the main salt marsh where soils do not permit the development of vegetation. In the surrounding areas, there are formations of steppe vegetation of kamephytes and nanophanerophytes. This herbaceous-shrub association includes other types of vegetation characteristic of the High Andean altiplano steppe (CONAF, 1985; Gajardo, 1994).

17. Noteworthy flora:

The main vegetative associations in the area of the Salar de Surire are the following.

a) association *Festuca ortophylla/Parastrephia quadrangularis*

This association grows as scrub bush with the *Parastrephia* reaching roughly 1 metre in height. Other species found in this association are:

Picnophyllum molle
Astragalus bolivianus
Senecio graveolens
Deyeuxia breviaristata

This association covers a limited area between the association of *bofedal* (*Oxicloe andina*) and the grasslands of Paja Brava.

b) association *Festuca ortophylla/Parastrephia lepidophylla*

This association forms a bush area dominated by the shrub *Parastrephia lepidophylla* that can reach 0.70 metres in height and that has evergreen, resinous leaves of little value to grazing animals. Other species found in this association are:

Festuca ortophylla
Picnophyllum molle
Deyeuxia breviaristata

c) association *Azorella compacta/Parastrephia quadrangularis*

The main species in this association is *llareta* (*Azorella compacta*) which grows sparsely in compact clumps reaching a diameter of 2 metres and 1 metre in height. It is usually found on rocky hillsides. Other species found in this association are:

Parastrephia quadrangularis
Picnophyllum molle
Senecio graveolens

This association is not well represented in the Surire basin because it grows in marginal areas located on rocky hillsides.

d) association *Polylepis tarapacana/Festuca* spp.

This association is well represented within the Surire basin and covers large areas of the hillsides defining the basin. *Queñoa* (*Polylepis tarapacana*) is the main species and can reach up to 2 metres in height producing many branches. It favours rocky surfaces where it forms scrub forests. Other species in the association are:

Azorella compacta
Parastrephia lepidophylla
Picnophyllum molle

The scrub forests of *Polylepis tarapacana* found in the Surire basin are well established and in a satisfactory state of conservation making this area of great importance for phytosociological studies.

The surrounding vegetation includes that which grows in places where conditions in the salt marsh permit the survival of evergreen species defined as the *Oxychloe andina* association, commonly known as the *bofedal*.

The species in this association range from aquatic plants to plants growing in dry soils. The following aquatic plants are found: *Azolla foliculoides*, *Callitriche stagnalis* and *Elodea potamogeton*. Among bushy plants is the genus *Deyeuxia* spp.
Species found as grassy clumps are: *Oxychloe andina*, *Patosia clandestina*, *Gestiana prostata*, *Wermeria pygmaea*, *Hypsella oligophylla* and *Eudema friesii*. In dry soils or on soils in the process of drying, *Festuca* spp. and *Deyeuxia* spp. grow. Along the edges, *Parastrephia quadrangularis* and *Parastrephia lepidophylla* are found.

The vegetation bordering the salt marsh can be divided into eighteen taxonomic orders: Azollaceae, Cactaceae, Caryophyllaceae, Compositae, Ephedraceae, Fabaceae, Frankeniaceae, Gramineae, Hydrophyllaceae, Loasaceae, Lobeliaceae, Malvaceae, Papilonaceae, Plantaginaceae, Polypodiaceae, Rosaceae, Scrophulariaceae and Umbelliferae. The most representative families are:

Compositae with fifteen species
Gramineae with five species
Caryophyllaceae with three species

The other families are represented by only one species.

Among the species present, *Deyeuxia nardifolia*, *Festuca nardifolia*, *Plantago tubulosa*, *Sanecio candollii* and *Anthobryium triandrum* survive and grow on the salt crusts. *Deyeuxia nardifolia* is the most prevalent species and the species of greatest cover in the salt marsh. It is also an important ingredient in the diet of the vicuñas that live near the salt marsh.

Other minor species found in the salt crust are the *Festuca ortophylla*, *Parastrephia lucida* and *Parastrephia lepidophylla*.

There is no species classified as **rare** from the point of view of conservation in the conclusions of the Symposium on the Status of Conservation of Tree and Shrub Flora in Chile (*Libro Rojo de la Flora Terrestre de Chile*, Benoit, Y. (ed.), 1989). The species *Azorella compacta* and *Polylepis tarapacana* were considered to be **vulnerable** species at the regional level by this symposium.

18. Noteworthy fauna:

The area surrounding the Salar de Surire is the habitat of a considerable number of species of wild mammals, the most important being the vicuña, the viscacha and the Culpeo fox.

Order	Scientific name	Common name	Code
Rodentia	*Lagidium viscacha cuvieri*	viscacha	VC
	Grenomys opinus opinus	tuco tuco	R
	Akodon andinus		C
	Akodon berlepschi		C
	Phyllotis boliviensis		R
	Galea musteloides		C
Carnivora	*Canis cuplaeus andinus*	culpeo fox	C
	Felis colocola	colocolo cat	R
	Felis concolor	puma	R
	Conepatus rex rex	chinque real	R
Artiodactyla	*Vicugna vicugna mensalis*	vicuña	VC
Edentata	*Euphractus nationi*	hairy armadillo	R

The following table gives the main species of mammals found in the Salar de Surire.

In the *Libro Rojo de los Vertebrados Terrestres de Chile* (Glade, A. (ed.), 1993) the puma, colocolo cat and hairy armadillo are listed as **endangered species** from the point of view of conservation status on both the national and the regional levels. On the other hand, the vicuña is listed as **vulnerable** on the national level, whereas on the regional level it is not endangered.

Surveys have identified small colonies of hairy armadillos in the Altos de Paquiza in the southern portion of the Surire basin. This species is only rarely found in the national parks and reserves.

Associated bird life in the wetlands - The lakes in the Salar are the habitat of several species of birds adapted to high altitude. The following three species of flamingos (*parinas*) of the six that exist in the world are found here year round:

Phoenicopterus chilensis (Chilean flamingo)
Phoenicoparrus andinus (Andean flamingo)
Phoenicoparrus jamesi (James's flamingo)

Along the edge of the salt water that forms these lakes in the southern portion of the Salar, there are hot springs which form a freshwater lake where several species of birds live.

Thirty-five species of birds have been identified belonging to the Charadriiformes, Ciconiiformes, Columbiformes, Cruiformes, Falconiformes, Passeriformes, Rheiformes, Strigiformes and Tinamiformes.

Figure 3 Birdlife in the Salar de Surire basin

ORDER	SCIENTIFIC NAME	COMMON NAME	CODE
RHEIFORMES	Pterocnemia pennata tarapacensis	Puna Rhea	VC
CICONIIFORMES	Phoenicopterus chilensis	Chilean Flamingo	VC
	Phoenicoparrus andinus	Andean Flamingo	VC
	Phoenicoparrus jamesi	James's Flamingo	VC
FALCONIFORMES	Buteo polyosoma	Red-backed Hawk	C
	Buteo poecilochorus	Puna Hawk	V
	Phalcoboenus megabterus	Mountain Caracara	C
	Falco femoralis pichinchae	Aplomado Falcon	C
	Falco peregrinus	Peregrine	C
	Vultur gryphus	Condor	R
STRIGIFORMES	Bubo virginianus	Great Horned Owl	R
CHARADRIIFORMES	Oreopholus ruficollis	Tawny-throated Dotterel	C
	Charadrius alticola	Puna Plover	C
	Recurvirostra andina	Andean Avocet	VC
	Larus serranus	Andean Gull	C
	Calidris bairdii	Baird's Sandpiper	C
	Phalaropus fulicaria	Grey Phalarope	C
	Attagis gayi gayi	Rufous-bellied Seedsnipe	VC
	Thinocorus orbygnyanus	Grey-breasted Seedsnipe	VC
TINAMIFORMES	Tinamotis pentlandii	Puna Tinamou	VC
COLUMBIFORMES	Metriopelia aymara	Golden-spotted Ground-Dove	VC
	Metriopelia melanoptera melanoptera	Black-winged Ground-Dove	C
	Metriopelia ceciliae gymnojas	Bare-faced Ground-Dove	C
PASSERIFORMES	Geositta cunicularia titicacea	Common Miner	VC
	Geositta punensis	Puna Miner	VC
	Upucerthia jelskii	Plain-breasted Earthcreeper	C
	Chloephaga melanoptera	Andean Goose	VC
	Lophonetta specularioides	Crested Duck	C
CRUIFORMES	Anas flavirostris	Speckled Teal	VC
	Carduelis astrata	Black Siskin	C
	Lessonia rufa oreas	Andean Negrito	R
	Agriornis montana	Black-billed Shrike-Tyrant	C
	Agriornis albicauda	White-tailed Shrike-Tyrant	V
	Fulica gigantea	Giant Coot	R

VC = very common
C = common
R = rare
V = vulnerable

Among the species of birds observed, *suri* (*Pterocnemia pennata tarapacensis* is listed at the regional and national level as a species **threatened with extinction** and the species *Attagis gayi* is listed as a **rare** species difficult to find frequently. The species *kiula* (*Tinamotis pentlandii*), condor (*Vultur gryphus*), *tagua gigante* (*Fulica gigantea*) and the three species of flamingos are listed as **vulnerable species** from the view point of the conservation status at both the national and the regional levels.

19. Social and cultural values:

The social value of the salt marsh is derived from minor grazing along the edges of the bodies of water and from vegetation outside the area of the nature reserve.

The only cultural vestige is a pre-Hispanic village about 100 metres south of the salt marsh near the encircling road. The other site of archaeological interest is a former settlement left from the Hispanic period during exploitation of the salt marsh.

20. Land tenure/ownership of:

(a) Site: private property

(b) Surrounding area: private property

21. Current land use:

At the present time, there is a mine for extracting non-metallic minerals (borax) in the northeastern part of the salt marsh that functions during the nine months of the year of the dry season on the altiplano. Shovels and wheelbarrows are used to extract minerals which are emptied onto drying fields to be transported later to another part of the region for final refining.

Visits by tourists to the salt marshes and the surrounding areas are another important activity. The following table gives statistics on visits between 1990 and 1995.

Visitors	1990	1991	1992	1993	1994	1995
Chileans	121	115	104	253	55	299
Foreign visitors	38	53	68	183	110	433
Total	159	168	172	436	165	732

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

An environmental impact study is being prepared on the extraction of borax by the mining company working in the area.

23. Conservation measures taken:

In 1970, the Parque Nacional Lauca was created covering approximately 520,000 hectares including the Salar de Surire. In 1983, the limits of the national park were re-defined, and three administrative bodies for protected nature areas were created: the present Parque Nacional Lauca, the national nature reserve Las Vicuñas and the Salar de Surire nature reserve including part of the salt marsh of 11,298 hectares.

A new management scheme is in effect for the nature reserve and will be replaced by a new management plan.

24. Conservation measures proposed, but not yet implemented:

The management plan for the nature reserve will be put into effect shortly.

25. Current scientific research and facilities:

An environmental impact study is being made on the extraction of borax by the mining company working in the salt marsh. This study will provide baseline data on the fauna and flora in the region. In addition, the Corporación Nacional Forestal (CONAF) carries out surveys of the vicuñas in the areas near the salt marshes.

There is infrastructure built by CONAF near the marshes in the form of a guard post (two houses) and a mining camp with facilities for workers and storage areas.

26. Current conservation education:

A descriptive pamphlet about the salt marsh is being prepared.

27. Current recreation and tourism:

A road allowing tourists to explore the salt marsh exists in the part of the salt marsh included in the nature reserve.

28. Jurisdiction:

I Región de Tarapacá
Ministerio de Agricultura
Secretaría Regional Ministerial de Agricultura
CONAF I Región

29. Management authority:

U.G. Patrimonio Silvestre
CONAF I Region
Arica

30. Bibliographical references:

CONAF. 1985. Guía de Manejo del Monumento Natural de Surire. CONAF I Región, Arica, Chile.

CONAF. 1995. Censo de avifauna del Salar de Surire. Regostro de censos periódicos. CONAF I Región, Arica, Chile.

Ormabázal, C. 1988. Determinación de os lugares de importancia para la conservación del flamenco en Chile. en Taller Internacional de especiales Flamencos Sudamericanos. CONAF/NYSZ. Antofagasta, Chile.

Quintamilla, V. 1988. Carta vegetacional de las zonas andinas y semiáridas de Chile septentrional. Universidad de Santiago de Chile. Santiago, Chile.

Salas, R. 1975. Estudio geológico del salar de Surire, Provinia de Arica, Chile. Instituto de Investigaciones geológicas. Comisión Arica, Arica, Chile.