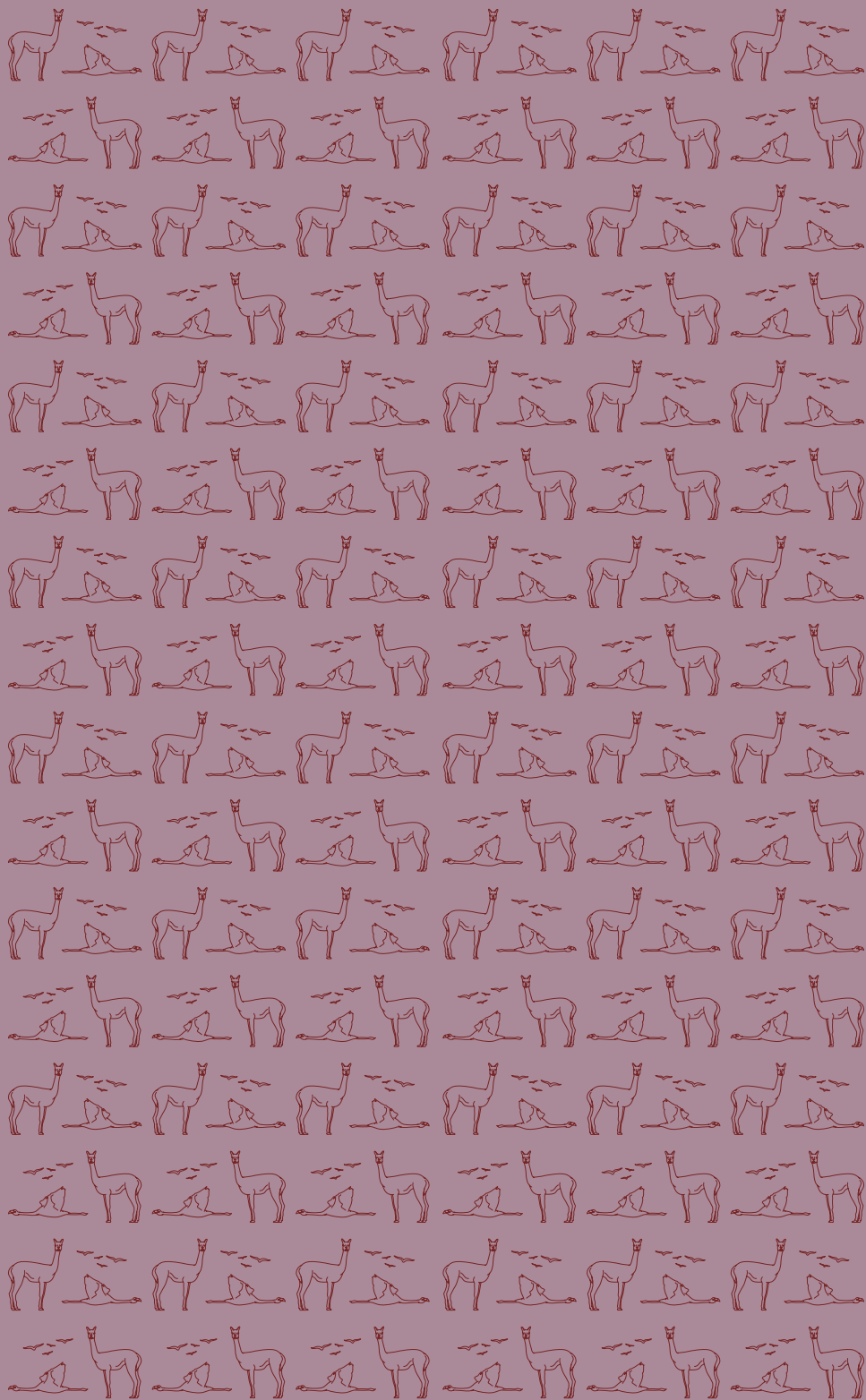


A swan on the left and a guanaco on the right, both looking towards the center, set against a background of a salt flat with a grid-like pattern.

Salt Flats are Wetlands





In honor of the High
Andean Wetlands, which
sustain the balance of life.

In honor of those who
fight every day for their
conservation.

In honor of you, the reader,
who seeks to understand
the importance of
protecting these wetlands.

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Argentina, July 2024.

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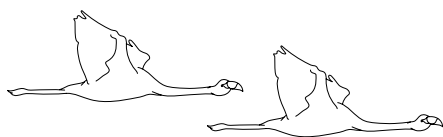
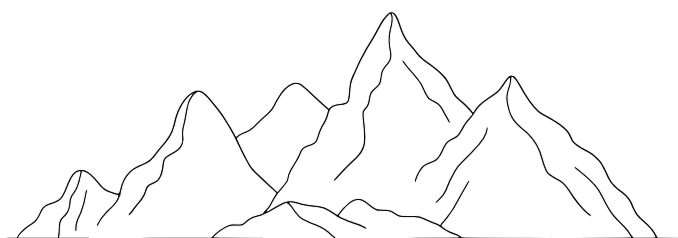
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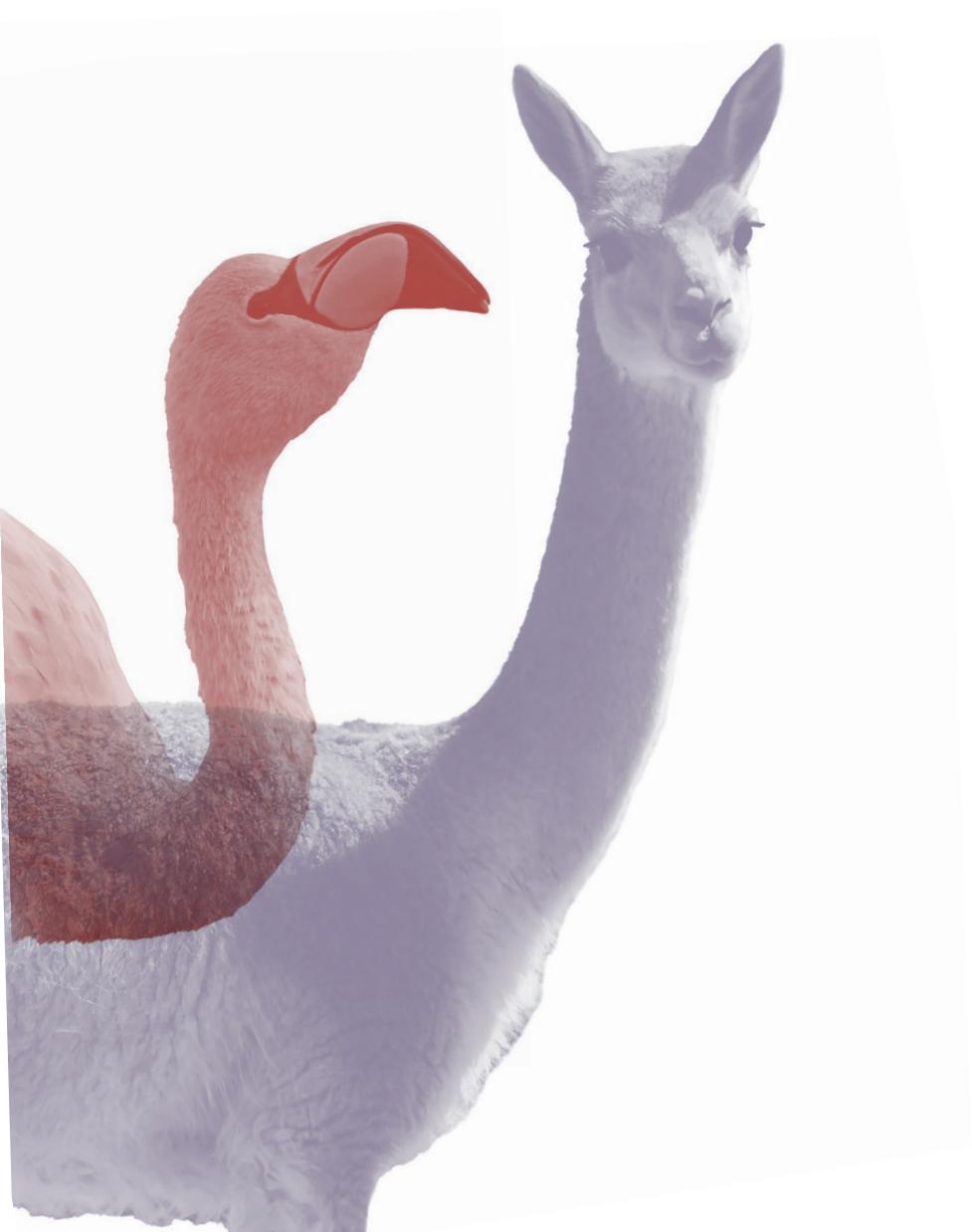
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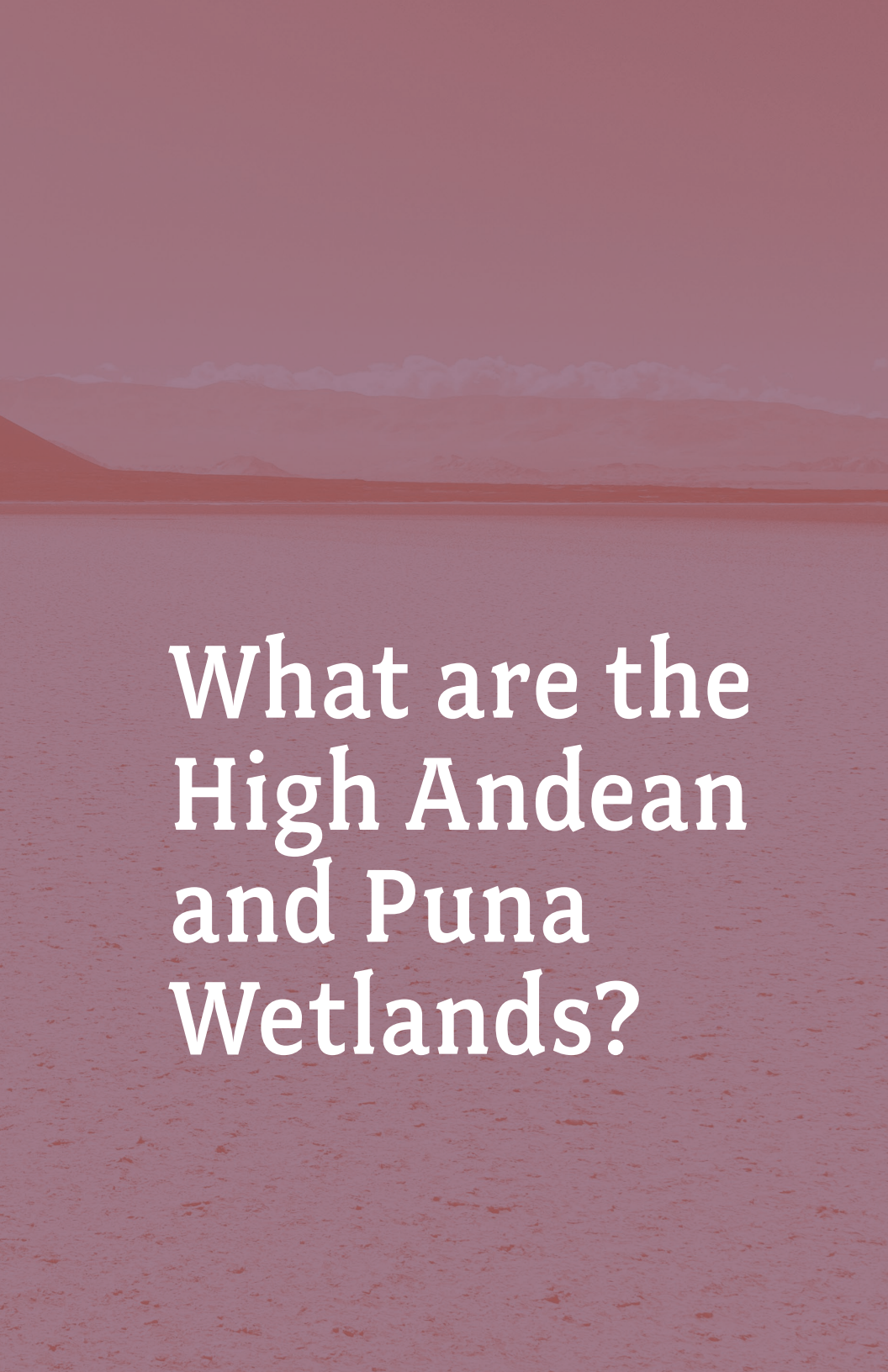
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What are the
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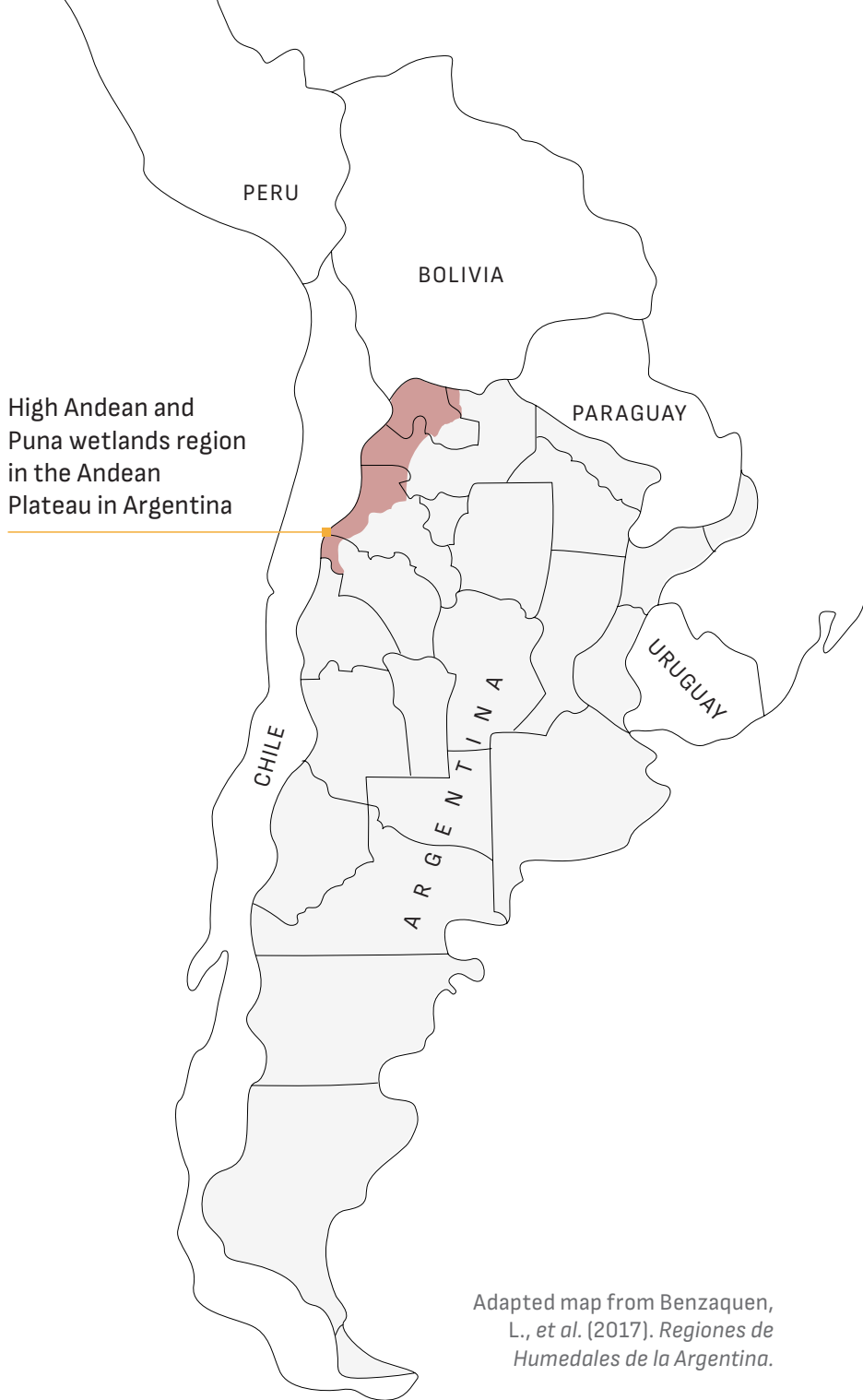
The High Andean Wetlands

The High Andean and Puna Wetlands in Argentina are located in the high mountains of the Andes region, at over 3,000 meters above sea level. These ecosystems are crucial for the region's ecological balance, as they provide essential habitats with a variety of plants and animal species. Many of them are endemic to this area and have adapted to the unique conditions found in such high-altitudes.

These wetlands play a key role in hydrological regulation, acting as natural water reservoirs and helping to maintain the flow of rivers that originate in the mountains. In addition, they're vital to local communities, offering ecosystem services, including freshwater supply, climate regulation, and habitats that support unique biological diversity.

Notable wetlands in the Andean Plateau region include high-altitude lakes, vegas and peatlands, and salt flats.

High Andean and
Puna wetlands region
in the Andean
Plateau in Argentina



Adapted map from Benzaquen,
L., et al. (2017). *Regiones de
Humedales de la Argentina.*

High-altitude Lakes

These lakes are generally very shallow, often less than 10 cm deep, but can extend over several dozen hectares. They are primarily fed by the surrounding peatlands and vegas, although sometimes they are supplied by surface runoff or occasional rainfall.

Laguna Colorada. High Andean lagoon located at the Salinas Grandes basin, in the town El Moreno, in the province of Jujuy, Argentina. Photo: Heber Sosa.



Vegas and Peatlands

Vegas are low, flat, and fertile lands, usually supplied by rivers or watercourses. Peatlands, on the other hand, are permanently humid lands with abundant vegetation and a highly uneven micro-relief, located in high, arid areas. Both are azonal ecosystems, meaning the vegetation that grows there is unique to these wetlands and differs from the typical vegetation in the surrounding area. Their microclimate contrasts with the desert environment and their vegetation grows all year round. In the following section, we will explore another kind of wetland: salt flats.

Vega. Located in the town of Lagunilla, to the west of Laguna de los Pozuelos, in the province of Jujuy, Argentina. Photo: Heber Sosa.





The Laguna Negra High Andean Wetland.
Laguna Verde Basin. Lagunas Altoandinas
y Puneñas de Catamarca Ramsar Site.
Photo: Lis Sablé.





A wide, flat landscape of salt flats under a dark sky, with distant mountains visible on the horizon. The foreground shows a textured, cracked surface of salt flats, leading towards a flat horizon line. In the background, a range of dark, rolling mountains is visible against a deep blue, overcast sky. The overall tone is monochromatic and somber.

Salt Flats are
Wetlands Too

High Andean Salt Flats

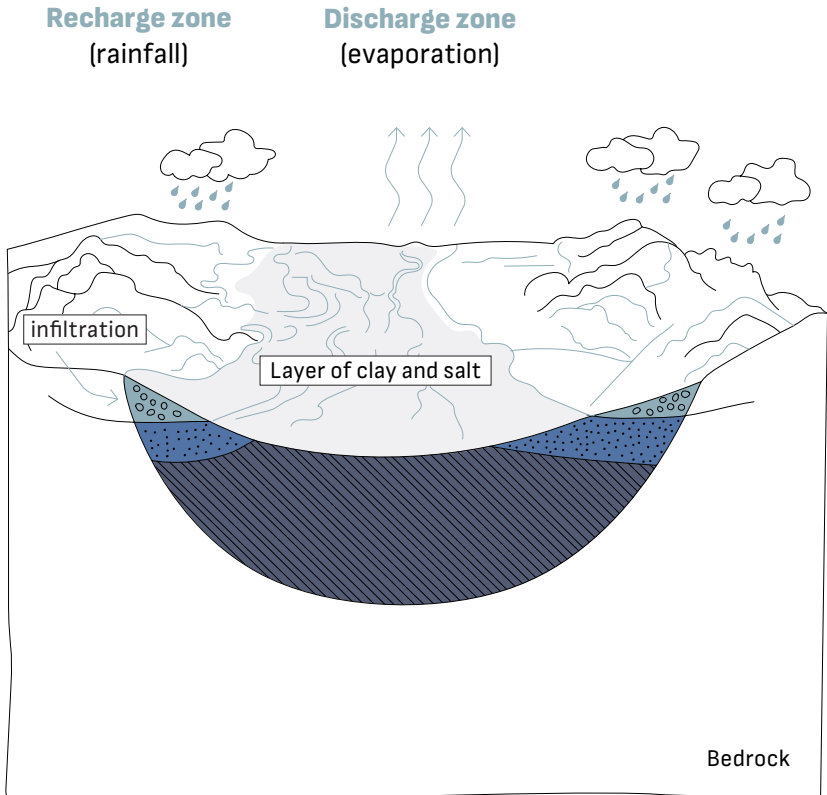
Salt flats are a type of wetland that forms at the bottom of endorheic basins –closed basins with no outflow to the ocean. Instead, water is trapped in depressions between the mountains. Usually, salt flats are bowl-shaped.

The salts, resulting from the erosion of rocks and volcanic activity, accumulate and concentrate through evaporation, in a process that takes millions of years.

Eventually, this process gives rise to a mature salt flat, with a brine, which is formed by groundwater, and that is rich in boron, lithium, sodium and magnesium salts, among other minerals. This brine is often separated by a layer of clay, which typically contains sodium-rich salts on its surface.

What follows is a description of two of the many salt flats in Argentina. Most of them are located in the Puna regions, in the provinces of Jujuy, Salta, and Catamarca, and to a lesser extent, La Rioja. Although there is no exact or official count, it is estimated that there are dozens of salt flats in Argentina, each with its own specific characteristics.

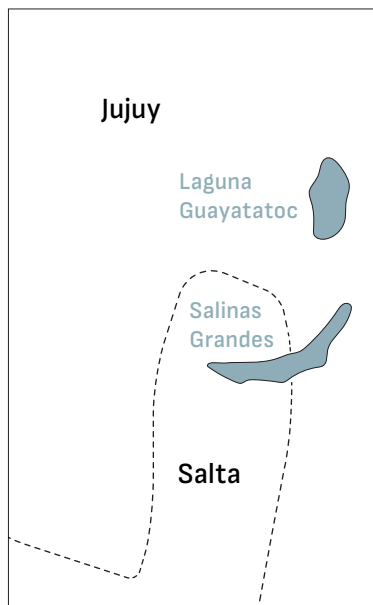
Salt flat basin



Salinas Grandes y Laguna de Guayatayoc

LOCATION AND LAND

This salt flat is located in the northwest of Argentina, in the Andean Plateau region known as Puna, and forms an extensive closed basin that bears the same name. Although it functions as a single unit in environmental and cultural terms—meaning it is considered as one cohesive territory—its political administration is divided between the provinces of Jujuy (in the Cochinoca and Tumbaya departments) and Salta (in the La Poma and Los Andes departments). The total surface area of the basin is 17,552 km².



INDIGENOUS PEOPLE

This region is inhabited by the Kolla people and the Atacama people. Most of the population works with sheep and llama grazing, along with small-scale agriculture. Artisanal salt extraction serves an essential complementary activity for these communities. In addition, many people work or have worked in this salt flat which has been a source of livelihood for generations, and is part of their history and identity.

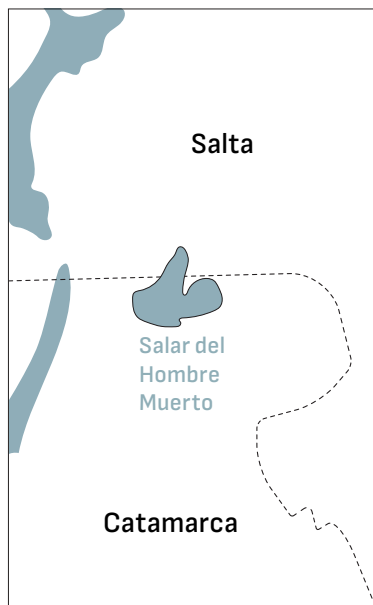


Cerro Chañi. Salinas Grandes, Argentina.
Photo: Manuel González del Solar / Unsplash.

Salar del Hombre Muerto

LOCATION AND LAND

This salt flat is located in the Antofagasta de la Sierra department, on the northwestern border between Catamarca and Salta. This is a typical high-altitude depression, covering a surface area of 588 km² at 4,000 meters above sea level, where a salt flat, several saline lakes and extraordinary vegas, especially near river mouths, are found. Beneath the salt flat, the groundwater consists of brine saturated with various minerals, including high concentrations of lithium.



INDIGENOUS PEOPLE

The Kolla-Atacama people who inhabit the salt flat are integrated by the Atacameños del Altiplano and Atacameños de Andiofaco communities. Their main activities revolve around grazing, livestock farming— including sheep and llamas—, wool and textile production, and small-scale agriculture.

In recent years, community-based tourism has emerged as a significant source of income for these communities. This involves offering visitors historic and ancestral tours of the salt flat, as well as traditional cuisine and accommodations.



Salar del Hombre Muerto.
Catamarca, Argentina.
Photo: Ignacio Nicolás Lovell.



A large flock of flamingos is gathered in a wetland landscape. In the foreground, several flamingos are standing in shallow water, some facing the viewer and others with their backs to it. In the middle ground, a larger group of flamingos is scattered across a flat, wet area. The background features a range of mountains under a clear sky. The entire image has a greenish tint.

Why Protect the High Andean Wetlands?

There are many reasons to protect the High Andean Wetlands. Here, we will explore the wetlands' contribution to water provision and biodiversity, their significant role in mitigating the impacts of climate change and their social and cultural importance.

Water

High-altitude wetlands are interconnected through complex hydrological and ecological processes. They're the main hydrological regulators of the region, particularly through vegas and peatlands, and they play a crucial role in providing water for both people and biodiversity.

These wetlands are either temporarily or permanently flooded and can either be surface-flow wetlands or subsurface-flow wetlands. They contain fresh, salty or brackish water, with different proportions of modern (less than 60 years old) and pre-modern or "fossil" waters (between 60 and 10,000 years old).

Fossil water has been stored underground for hundreds or thousands of years and it is a non-renewable resource.

Due to the effects of the sun and the wind in the areas where the High Andean Wetlands are located, the amount of water that evaporates is seven to twenty times greater than that which precipitates as snow or rain. This means that there is a permanent water deficit and scarce water availability, even without human intervention.

Biodiversity

These wetlands are true oases; teeming with life and biodiversity. They are home to iconic species from the Andean Plateau, such as the High Andean flamingos, which feed and breed here during summer. Ducks, coots, vicuñas, vizcachas, fish, and amphibians also inhabit these wetlands, in addition to endangered species like the Andean mountain cat and chinchillas.

The High Andean Wetlands are also home to different microbial communities that have adapted to these extreme environments. This includes stromatolites (microorganisms that date back 3.5 billion years and represent the oldest living lifeforms on Earth, and capture carbon dioxide and release oxygen).

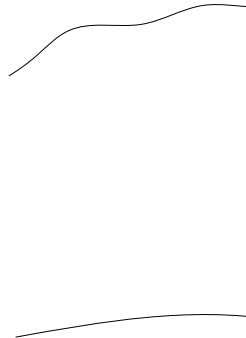


Climate Change

As carbon sinks, hydrological regulators, and biodiversity havens, High Andean Wetlands are especially important in the face of escalating climate and ecological crises which exacerbate the pressures that naturally characterize them (their extreme aridity, permanent water deficit, and scarce water availability).

Due to their characteristics, these wetlands are sensitive to variations in rainfall and to other extreme weather phenomena, such as temperature rises or glacial retreats.

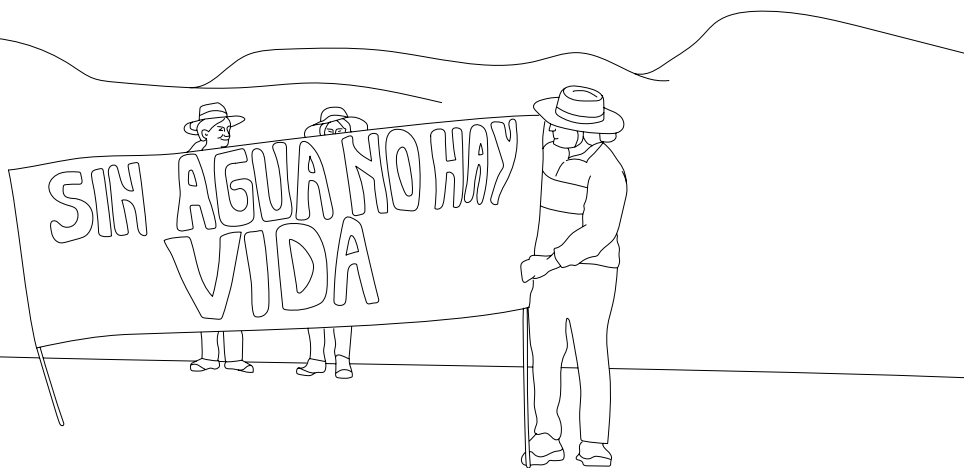
The High Andean Wetlands help mitigate the effects of climate change by capturing and storing carbon through their vegetation (grasses and mosses) and their microorganisms (bacteria and algae). These wetlands play a crucial role in adapting to climate change due to their function as hydrological regulators by storing water, promoting underground aquifer recharge, and reducing the risk of flooding.

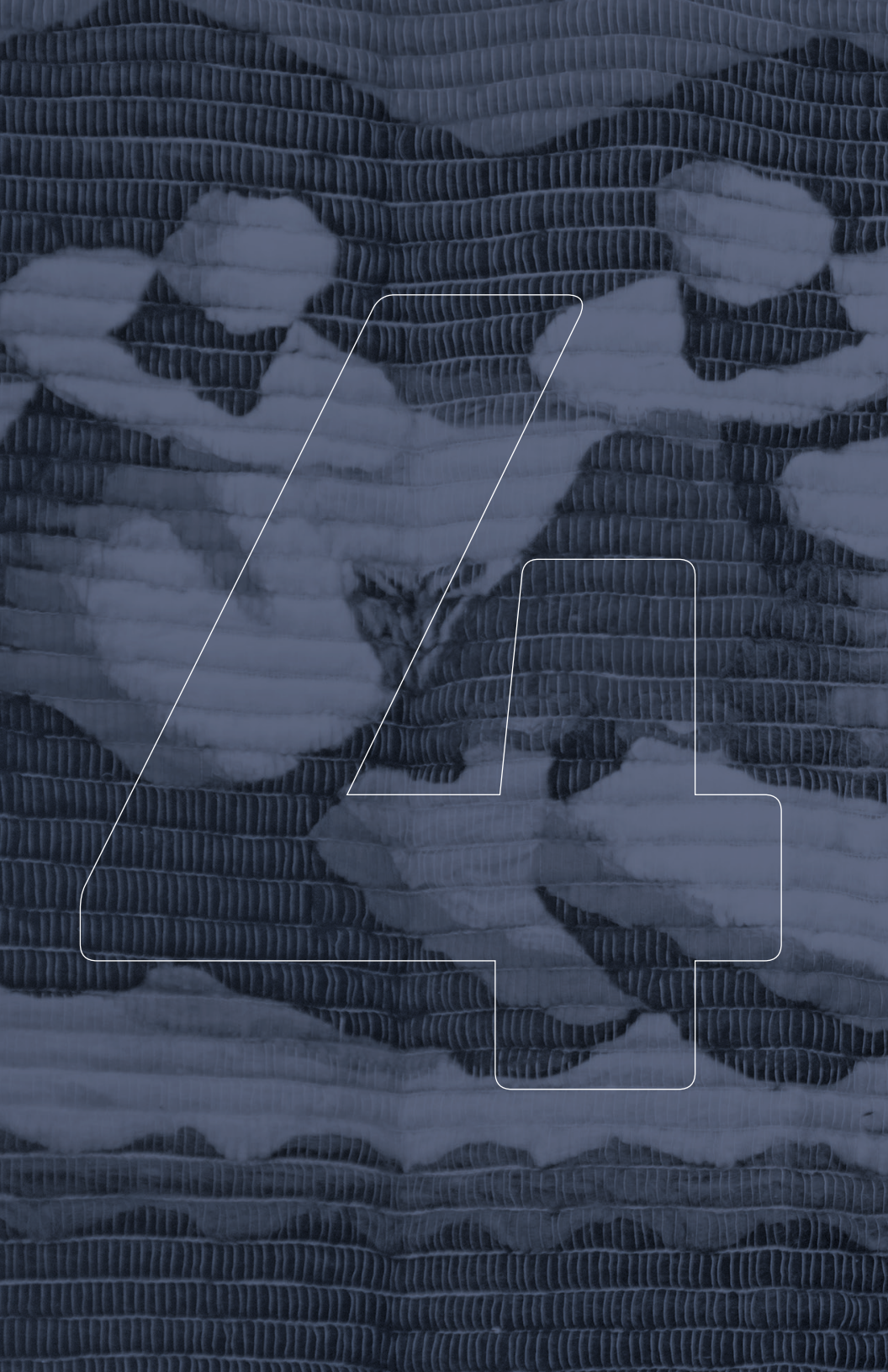


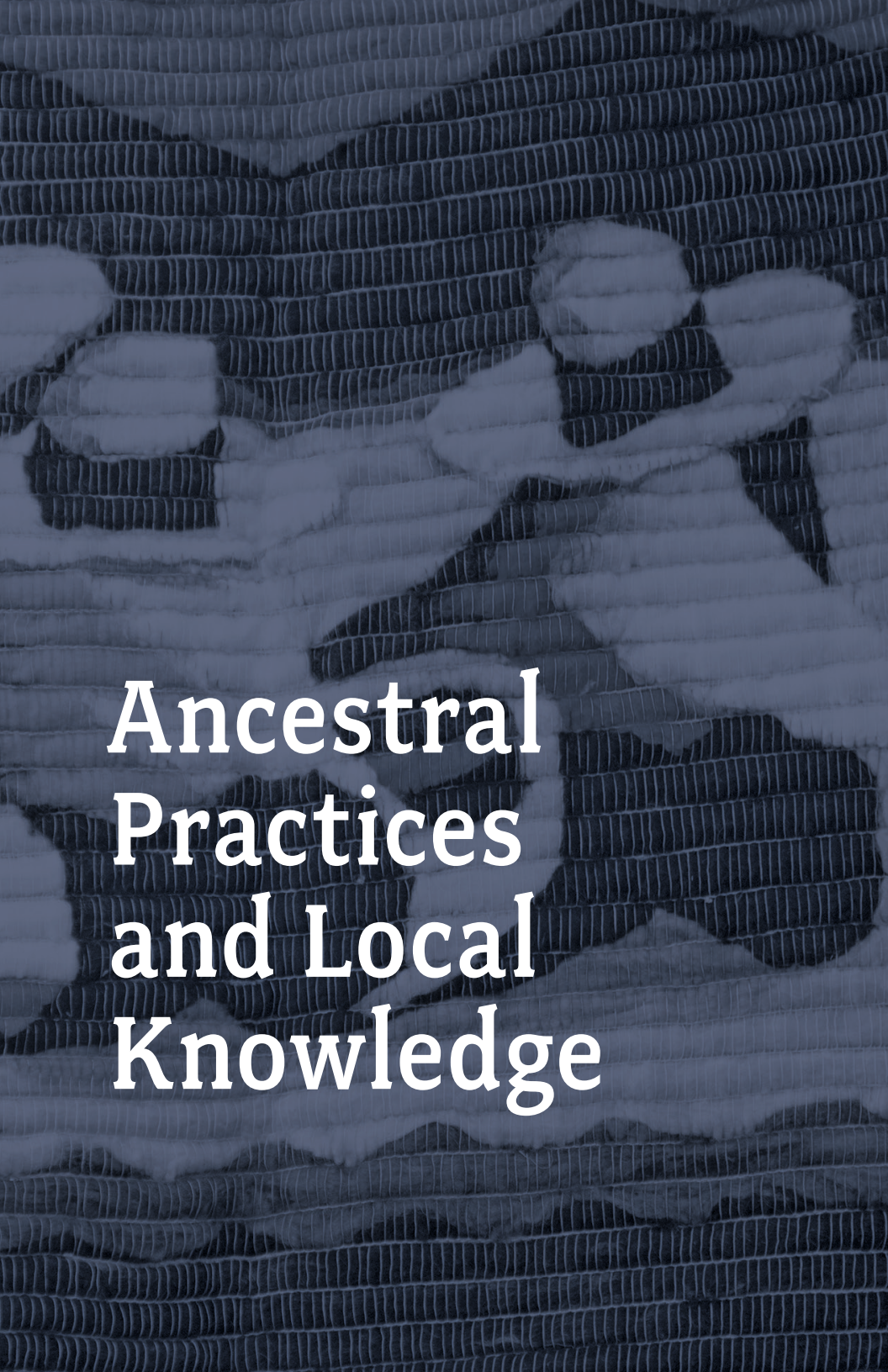
Social and Cultural Importance

This region has a low population density. The population is focused in small rural communities located near sources of freshwater. The Kolla, Atacama, and Diaguita Indigenous communities, along with local Creole communities, have a historic, cultural, and economic connection with this land, which sustains their livelihood. Their primary economic activities depend on the wetlands and their environmental contributions.

These communities have developed ways of life based on a world view called “Buen Vivir” (Good Living). They play a vital role as biodiversity guardians, actively contributing to its restoration, conservation, and sustainable use.







Ancestral Practices and Local Knowledge

Textile Art

Textile art in Indigenous and rural communities is an accurate reflection of ancestral practices and local knowledge. It incorporates unique techniques, materials, and cultural significance. Textiles are more than aesthetic or functional objects; they also carry stories and symbols that reinforce the communities' cultural identity and continuity.

Ancestral practices and local knowledge are essential in the creation of these textiles, which often include techniques –such as two-needle knitting or weaving on looms– and designs that were passed down for generations.

Most of these fabrics are made with wool from the animals the community raises, such as llamas and sheep. Often, the artisans are also the ones who shear, spin, and dye the wool using natural dyes extracted from wild plants in their environment.



Textile art made by artisans from the San Francisco de Alfarcito Indigenous community. Salinas Grandes and Laguna de Guayatayoc basin, province of Jujuy. Photo: Pía Marchegiani.

Small-scale Agriculture and Livestock Farming

Agriculture and livestock farming are common traditional activities in many of the Indigenous and rural communities that live in the High Andean and Puna Wetlands. For generations, these activities have been a source of food and opportunities for sustenance, making products such as charqui, cheese, and hand-woven textiles.

Many families practice transhumance, a pastoral tradition involving the seasonal migration of livestock and people. This practice draws upon generations of knowledge gained from the places traversed. Cattle, sheep, llamas and goats are common livestock.

Agriculture takes place on small, warm, and fertile plots of land used for Andean crops or in greenhouses used to produce vegetables in smaller quantities. Broad beans, oca potatoes, corn, peas, onions, and other vegetables are also grown there. Water, sourced from mountain slopes flowing into rivers or lakes, is essential for irrigation as well as human and animal consumption.

These practices are vital for the people's livelihoods and the local economy. They also represent the deep ecological and cultural knowledge accumulated over generations. Ancestral techniques and local knowledge are crucial for the sustainability and resilience of these ecosystems.



Llamas. Fiambalá, Catamarca, Argentina.
Photo: Ryan Ancill / Unsplash.

Tourism

The High Andean and Puna Wetlands offer a unique opportunity to experience the cultural and natural diversity of the region, promoting the conservation of these ecosystems and the sustainability of local communities. These areas are rich in natural and cultural heritage, including archaeological sites, rock art, as well as a variety of landscapes, such as salt flats, lakes, rivers, volcanoes, and habitats for native fauna, some of them iconic species like flamingos.

Some Indigenous communities promote sustainable tourism, actively participating in its management. This approach strengthens social cohesion and local control over resources while fostering the preservation of cultural and natural heritage. By respecting and preserving traditional lifestyles, these communities reinforce their identity, and encourage cultural exchange and intercultural dialogue between visitors and locals.



Pumice stone field. Antofagasta de la
Sierra, Catamarca, Argentina.
Photo: Carlos Aprea / Unsplash

Artisanal Salt Production

Salt extraction from natural sources like salt flats is a time-honored tradition in this region. Indigenous communities living in the High Andean Wetlands, especially those closest to the salt flat, have developed techniques and ancestral knowledge to harvest and manage salt sustainably, respecting nature's cycles. This approach has allowed them to engage in this activity for decades, providing a source of income for both the community and families.

In Salinas Grandes and Laguna de Guayatayoc basin, many families have formed cooperatives or small family businesses to harvest, manage, and sell salt. Locals emphasize that these cooperatives are not only economically significant but also serve as spaces that create a sense of belonging and shared cultural identity.

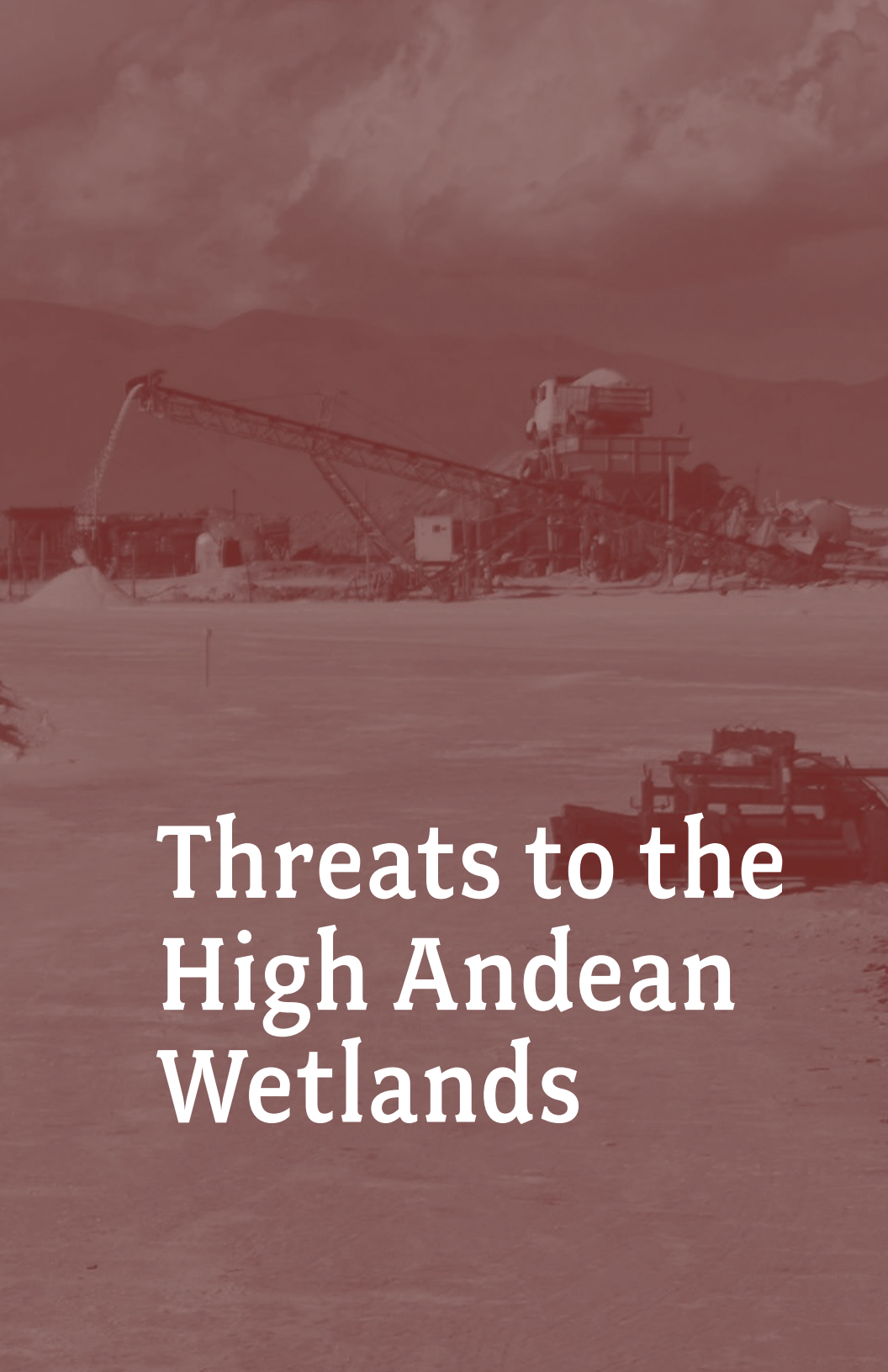
Beyond its economic value, traditional salt extraction also holds cultural and ceremonial meanings. Salt often plays an important role in rituals and commercial exchanges, and it is also a symbol of connection with the land and with nature.

Knowledge and techniques are passed down through generations, which contributes to preserving these communities' culture and heritage, while providing a source of income and economic independence.



Crafts made with salt
extracted from Salinas
Grandes. Photo: Emilia Delfino

5



Threats to the High Andean Wetlands

The High Andean Wetlands are at Risk

The impacts of the climate and ecological crises are already evident at these high-altitude wetlands. In the last decades, significant temperature rises, long periods of drought, and altered rainfall patterns have been reported in these regions.

This has already brought negative consequences on the lives of local communities. Some activities, such as agriculture and livestock farming, are seriously harmed by the lack of water supply for irrigation, which has a negative impact on growth and quality of pastures.



In addition to the severe effects caused by climate change, in a region already grappling with a negative natural water balance, any additional activity that requires substantial water resources poses a threat to these ecosystems. Lithium mining in the High Andean Wetlands falls squarely into this category.

The significant water requirements and negative consequences associated with lithium mining further strain these ecosystems, jeopardizing both their integrity and biodiversity. Moreover, this activity also violates the human rights of Indigenous people who have inhabited these territories for generations. The promotion of lithium mining without adequate information, participation processes, and the free, prior, and informed consultation mandated for Indigenous communities in the High Andean and Puna Wetlands represents a violation of their rights.



Environmental Impacts of Lithium Mining

WATER POLLUTION AND SOIL DEGRADATION.

Improper disposal and management of hazardous wastes, such as leftover salts from brine, by products, or other chemical compounds used during the lithium mining process may affect the quality of freshwater in aquifers and the soil in the basin.

FRESHWATER SALINIZATION.

The extraction of brines for lithium mining may cause an imbalance in the hydrology of the salt flat, leading to the salinization of freshwater reserves and affecting both the availability and the amount of water for ecosystems and human populations. Once water is removed from its natural cycle, salinized or polluted, it cannot be recovered with the same conditions and characteristics.

Environmental damage.

**Vega Trapiche dried up
by lithium mining:**

Salar
del Hombre Muerto,
Antofagasta de la Sierra,
Catamarca, Argentina.

Photo: Julio Carrizo.



WATER QUALITY AND AVAILABILITY.

Overexploitation of lithium-rich and potassium-rich brine reduces the water levels in aquifers, potentially causing surface water bodies and vegas (wetlands) to dry up.

BIODIVERSITY LOSS.

The destruction of natural habitats and the alteration in hydrological cycles affect the native flora and fauna, especially endemic species and migratory birds that depend on wetlands. The salinization and degradation of pastures and water sources caused by lithium mining result in the displacement of much of the native fauna.

LANDSCAPE TRANSFORMATION.

Mining infrastructure—such as roads, evaporation ponds, processing plants, and mining camps—significantly transforms the natural landscape, impacting both its beauty and the integrity of the ecosystem.



Sociocultural Impacts of Lithium Mining

COMMUNITIES DISPLACEMENT.

The expansion of mining projects may require the displacement of Indigenous and rural communities, forcing them to abandon their traditional territories and their lifestyles.

LAW SUITS AND SOCIAL CONFLICTS.

Extractivist projects currently proceed without guaranteeing basic rights, such as the right to information and environmental participation. This infringes upon the rights of Indigenous communities to free, prior, and informed consultation, access to land, and self-determination, as stipulated by national and international standards.



Photo: Calma Cine.

ALTERATIONS IN ANCESTRAL PRACTICES AND KNOWLEDGE.

Extractivist activities entail a risk to the continuity of practices that Indigenous communities follow in these territories and that they depend on to survive. The potential loss of these traditional activities poses a risk to the preservation of ancestral lifestyles and to the transmission of traditional knowledge.

LOSS OF CULTURAL HERITAGE.

Mining activities often lead to the destruction of archaeological sites, sacred places, intangible heritage, and other locations that are culturally and spiritually significant to local communities and humanity as a whole.





Cerro Galán, Catamarca, Argentina.
Photo: Máuricio Arias / Unsplash.



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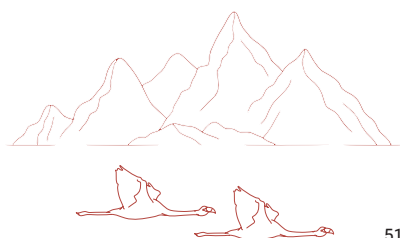
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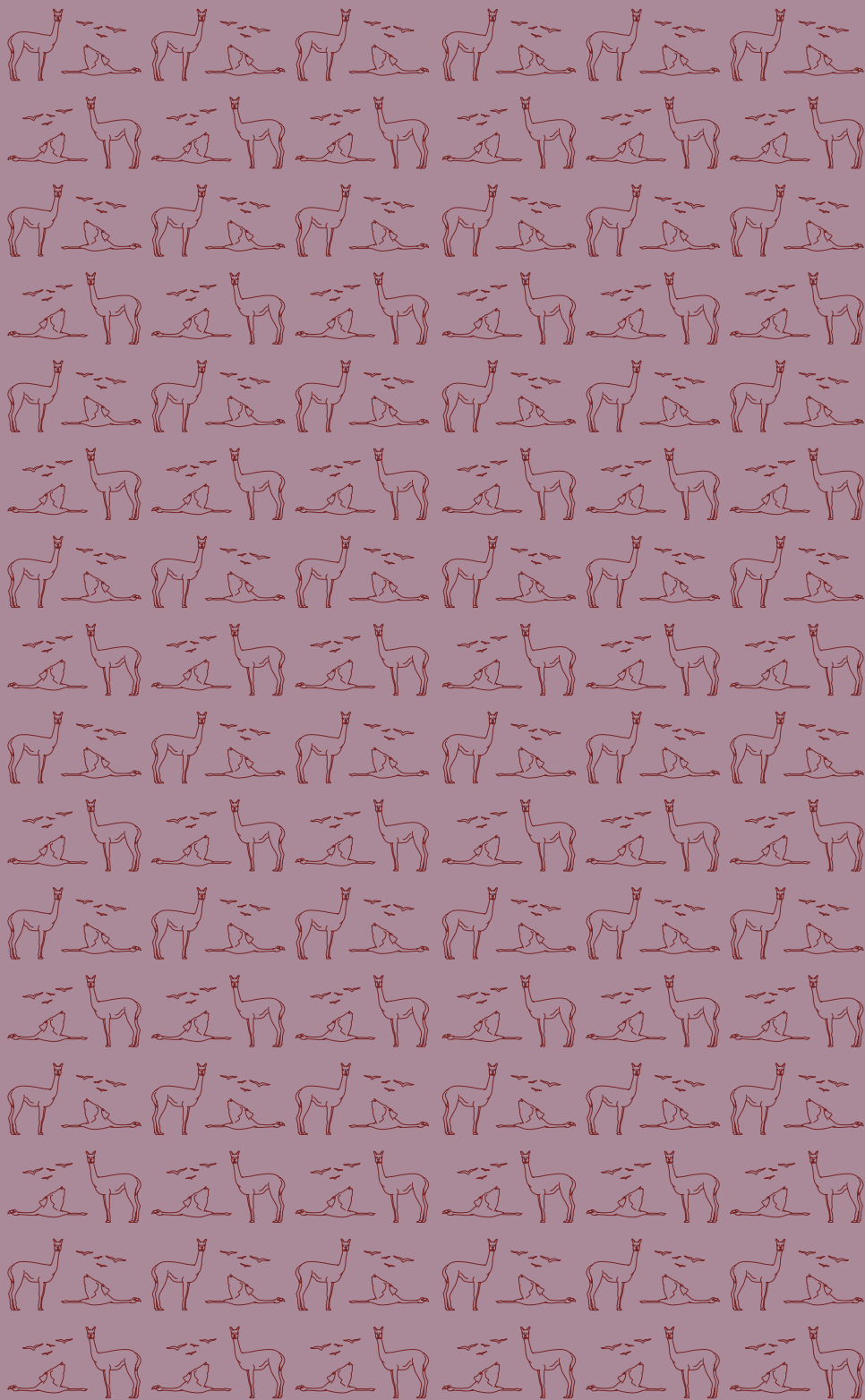
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Fundación YUCHAN

Fundación YUCHAN is a nonprofit civil society organization founded in 2001 for the public benefit. Its mission is to promote any technical, scientific, cultural or managerial activity that contributes to the conservation and the sustainable use of the natural environment and cultural heritage of the High Andes, the Montane Rainforests, and Chaco, in northern Argentina and in the neighboring countries that share these ecoregions.

Asamblea Pucará – Pueblos Catamarqueños en Resistencia y Autodeterminación

Asamblea Pucará was established in 2017 to unite various assemblies in the province of Catamarca in a common movement for the defense of water. Its members include people from communities and neighbors affected by mining activities in different territories across the province. The Asamblea Pucará serves as an organizational space that collectively plans and carries out collaborative actions to strengthen bonds among the territories of Catamarca.



Salt Flats are Wetlands

Let's explore the rich diversity and the utmost importance of the High Andean and Puna Wetlands. These unique ecosystems are not only home to extraordinary biodiversity and vital for water regulation, but they also play a crucial role in climate change adaptation. The social and cultural significance of these environments is profound, as they support the development of ancestral practices and sustain local economies.

This booklet is a call to action to protect these ecosystems and preserve the knowledge and traditions that have allowed the development of diverse ways of life for generations.

