



## Park Profile - Peru

### Nor Yauyos – Cochas Landscape Preserve

**Date of most recent on-site evaluation:** January 20, 2003

**Date of publication:** March, 2003

**Location:** Province of Yauyos, department of Lima and Province of Jauja, department of Junín

**Year created:** 2001

**Area:** 221,268.48 ha

**Ecoregion:** Peruvian Andean foothills

**Habitats:** Tropical highland steppes, humid forest-tropical highland jungle, very humid tropical sub alpine plains, rainy tundra-tropical alpine, tropical Nival



#### Summary

##### Description

The Nor Yauyos–Cochas Landscape Reserve lies in the Andean region of the departments of Lima and Junín. The reserve is home to breathtaking highland landscapes, lakes, and archaeological sites, all of which offer major potential for tourism and recreation. Several communities based on subsistence agriculture and grazing lie within the reserve boundaries.

##### Biodiversity

Biological diversity in the reserve is typical of high Andean areas, with a number of Andean and regionally endemic species, but relatively low species richness. The area is home to plant species such as the quinual (*Polypepis racemosa*), quishuar (*Buddleia incana*) and colle (*Buddleia coriacea*). Fauna include the white-cheeked pintail (*Anas bahamensis*), great egret (*Casmerodius albus*), Andean goose (*Chloephaga melanoptera*), cinereous harrier (*Circus cinereus*), peregrine falcon (*Falco peregrinus*), condor (*Vultur Gryphus*), opossum (*Didelphys marsupialis*), Andean fox (*Dusicyon culpaeus*), puma (*Felis concolor*), Pampas cat (*Felis colocolo*), Andean cat (*Felis jacobita*), alpaca (*Lama glama pacos*), llama (*Lama glama*), vizcacha (*Lagidium peruvianum*), mouse opossum (*Marmosa elegans*), white-tailed deer (*Odocoileus virginianus*) and vicuña (*Vicugna vicugna*).

##### Threats

Though officially protected, the Nor Yauyos–Cochas Landscape Reserve remains vulnerable. Major threats to the area include mining, disorganized tourism, litter, and pollution. Other problems stem from slash-and-burn agriculture, fishing and sport

hunting, the destruction of archaeological sites and terraces, and the loss of forest resources. The reserve currently lacks organized administration and management.



*A View of the Nor Yauyos- Cochas Landscape Reserve*

## Description

### *Physical Description*

The reserve covers two watersheds, the Alto Cañete and the Cochas-Pachacayo. The Alto Cañete River, in the upper basin of the Cañete River in the northern part of the province of Yauyos, flows 215 km down from the Pichcahuaria Range and the foot of Mount Ticlla to the Pacific Ocean<sup>1</sup>. The Cochas-Pachacayo River, in the southwestern part of the province of Jauja in the department of Junín, flows into the Mantaro River.

According to Udvardy's classification system of biogeographical provinces<sup>2</sup> as adapted by CDC-UNALM<sup>3</sup>, the reserve is located in the Middle Andes (1,000–3,800 m) and the tropical highland plain (above 3,800 m) biogeographical provinces.

Five Holdridge<sup>4</sup> life zones (classified by varying characteristics such as rainfall, temperatures and dominant vegetation) are found within the reserve: Tropical Highland Jungle Steppes, Humid Forest-Tropical Highland Jungle, Very Humid Plains-Tropical Subalpine, pluvial tundra and Tropical Nival. The Humid Forest-Tropical Highland Jungle and Tropical Nival are underrepresented in the Peruvian National Park system.

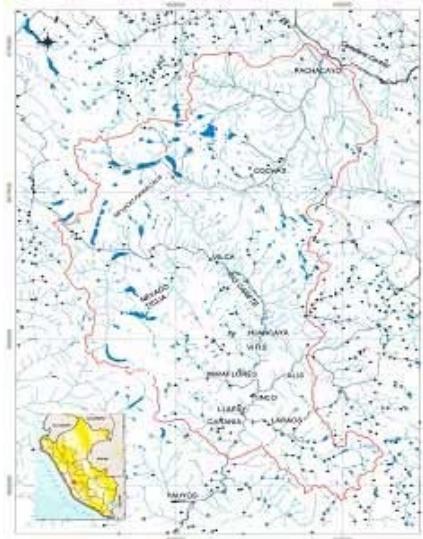
Most of the territory lies within the Cordillera Occidental mountain range, and one sector, mainly in Junín, forms part of the inter-mountain highland plain. The area features the Llongote, Pishcahuajra and Pariacaca ranges. The main geomorphologic features of the reserve are glaciers, rocky areas which have recently emerged from melting glaciers, steep mountain cliffs, hills and mountain slopes, dry and rolling alpine areas, severely steep mountainsides, moderately steep mountainsides, and level plains<sup>5</sup>.



## *A spring-fed pool in the Landscape Reserve*

There are several lakes in the upper Cañete River Basin which, depending on their hydrology, feature a variety of ecosystems. All the lakes in the area are of glacial origin. The region also has small spring-fed pools. Rainfall is markedly seasonal, with February and March seeing the heaviest rainfall and from July and August considered a dry season. Rainfall varies depending on the altitude.

Access



Access to the reserve is via two main routes, the South Pan-American Highway (Lima-San Vicente de Cañete, exit at km 145) and the Central Highway (Lima-La Oroya, exit at km 175). Both roads are paved and are of major importance to the country. Byways connect the two main highways, linking the district capitals and other villages. These smaller roads are minor routes and are not paved.

## Biodiversity

### Flora

Aquatic vegetation includes six rooted species and 11 floating species, as well as eight species of microphytes. Terrestrial vegetation includes a dozen identified species in the Tropical Highland Jungle-steppes zone, 16 species in the Tropical Highland Forest-Humid Forest; nine species in the very humid plain-Tropical subalpine; and some haemocryptophytic species mixed in with steppe grasses on the pluvial tundra-Tropical Alpine<sup>6</sup>.

Some major species include: alder (*Alnus jorullensis*), anjojisha (*Opuntia subulata*), taya (*Parastrepbia lepidophylla*), chachas (*Escallonia pendula*), tarwi (*Lupinus mutabilis*), quinual (*Polylepis racemosa*), quishuar (*Buddleia incana*), colle (*Buddleia coriacea*), yanacara (*Gynoxis* sp.), karkac (*Escallonia corymbosa*), huamanpinta (*Chuquiraga espinosa*), roque (*Colletia spinosissima*), sauco (*Sambucus peruviana*), mutuy (*Cassia* sp.). Upper reaches feature *Calamagrostis vicunarum*, *Festuca dolichophylla*, *Calamagrostis rigescens*, *Hypochoeris taraxacoides*, *Calamagrostis intermedia*, *Distichia muscoides*, *Alchemilla pinnata*, *Plantago tubulosa*, *Azorella* spp., *Urtica* spp.<sup>7</sup>



A view of vegetation in the Nor Yauyos-Cochas Landscape Reserve

### Fauna

Fauna include 14 species of zooplankton and meiobents in the lakes of Paucarcocha and Piquicocha, two species of benthics, and three amphibian species<sup>8</sup>. The area is also home to 17 species of mammals<sup>9</sup>.

The reserve serves as an important permanent and seasonal habitat for 46 species of birds, including 26 species of wading and shorebirds. Flocks of ducks, grebes and egrets abound.

Terrestrial birds include a large number of species commonly found in the Peruvian highlands, especially hummingbirds (*Aglaeactis cupripennis*, *Myritis fanny*, *Patagona gigas*, *Phalcobaenus albogularis*, *Polyonymus caroli*), cotinga (*Ampelio rubrocristatus*), conure (*Aratinga Wagleri*), burrowing owl (*Athene culnicularia*), mountain parakeet (*Bolborhynchus obrygnesius*), great horned owl (*Bubo virginianus*), and red-backed hawk (*Buteo polyosoma*) among others.

Main mammal species include the rodents *Akodon boliviensis*, *Orizomys* sp., *Phyllotis pictus*, *Phyllotis* spp., Andean Guinea pig (*Cavia tschudii*), Andes skunk (*Conepatus rex*), opposums

(*Didelphis marsupialis*), Andean fox (*Dusicyon culpaeus*), puma (*Felis concolor*), Pampas cat (*Felis colocolo*), Andean cat (*Felis jacobita*), alpaca (*Lama glama pacos*), llama (*Lama glama*), vizcacha (*Lagidium peruvianum*), mouse opossum (*Marmosa elegans*), white-tailed deer (*Odocoileus virginianus*), and vicuña (*Vicugna vicugna*)<sup>10</sup>.

#### *Vulnerable, Threatened, and/or Protected Species*

##### Terrestrial Environments

The current official list of wildlife species classified as vulnerable includes the vicuña (*Vicugna vicugna*), puma (*Felis concolor*), and wildcat (*Felis colocolo*). The Andean wildcat (*Felis jacobita*) is listed as rare<sup>11</sup>.

##### Aquatic environments

The torrent duck (*Merganetta armata*), common bandurria (*Theristicus melanopis*), and a frog species (*Telmatobius rimac*) are considered vulnerable.

##### Regulated Species

Trout fishing is prohibited from May to September. In season, the minimum size requirement is 25 cm<sup>12</sup>.

#### *Management*

##### *Administration*

The Nor Yauyos–Cochas Landscape Reserve currently lacks an on-site management entity. There are no administrators, rangers, game wardens, or guards.

Development agencies that work in the area are submitting funding proposals for a master plan for the protected area. This requires that the National Institute of National Resources (INRENA) assemble a management committee to head the development of the master plan<sup>13</sup>. The plan will define the zoning and organization of the landscape reserve and establish guidelines for certain activities within the park boundaries, including industry (mining) and recreation (tourism). The establishment of the landscape reserve will not impose limitations on existing private property<sup>14</sup>.

To date, no organized municipalities or peasant farming communities have come up with proposals or working plans to manage the landscape reserve. Due to the low population in the area, conditions are ideal for developing management and territorial ordering strategies.

INRENA aims to promote an administrative contract for the area to involve stakeholders such as the Nor Yauyos Development Corporation (CODENY) and the Agrarian Society of Social Interest (SAIS Túpac Amaru) cooperative. There is currently little or no coordination between these entities.

#### *Background*

The establishment of Nor Yauyos–Cochas Landscape Reserve began through the legal and political initiative of local interest groups. Essential in this process were SAIS Túpac Amaru, a production cooperative and umbrella group for local communities, and CODENY, a conglomeration of local entities such as ProYauyos, ProRural, the Valle Grande Rural Institute,

and local communities in the department of Lima. Both groups have a common interest in promoting tourism in their respective regions. Eventually, the groups created a joint planning committee, conducted feasibility studies, and presented a formal proposal before the ministerial cabinet for specific protection status of the proposed area.

Ministerial Ruling No. 123-96-ITINCI/DM on September 8, 1996, granted by the Ministry of Industry, Tourism, Integration and International Commercial Negotiations, recognized a National Tourist Reserved Zone in the upper watershed of the Cañete River, covering the area from its headwaters to the confluence with the Alis River near the town of Tinco Alis. Supreme Decree No.001-99-AG on January 7, 1999 established the area and the surface terrain between the upper basins of the Cañete and Cochas-Pachacayo Rivers as a reserved zone and placed it under the jurisdiction of INRENA. Finally, Supreme Decree No. 033-2001-AG on June 3, 2001 declared Nor Yauyos-Cochas as a landscape reserve, creating Peru's first (and to date, only) landscape reserve. INRENA's Ruling No. 321-2001-INRENA established the buffer zone of the Nor Yauyos–Cochas Landscape Reserve.

Originally, the reserved zone covered 170,000 ha. Another 50,000 ha were added with the declaration of a landscape reserve, including protected areas within the communities of Laraos, Miraflores, Alis, Carania, and Tomas that had been initially proposed by the technical studies. The end result established a landscape reserve covering 221,268.48 ha.

### *Budget*

To date, the area has not been allocated a budget, nor does INRENA have the financial capacity to assign one. ProRural and ProYauyos are currently looking for financing for social development and tourism projects by presenting proposals to international cooperation entities. These proposals include funding requests for an administrative system run by INRENA.

### *Borders*

The reserve is bordered to the north by the mountains of Antacharre, Tunsho, Acococha, the summits of Shururo, Chuycho, Pampamarca, Ventanilla, Andas and Patacancha, and portions of the Pachacayo River. To the east, the reserve is bordered by the mountains of Yanacorral, Altarniuco, Acotanta, Mayocancha, Huirococha, Chaquique, Tucohuanajan, Bronce, Portachuelo, Huaca Urco, Huayunca Punta, Cochapata, Muquimina, Tunshupallpa, Jatunpampa, Callapa, Atunchachi, Yana Orco, Quillcasca, Yanapunco, Uchcapri, Leonpitacana, Caurnisho and the summit of Mount Tanraniyoc. To the south, the area is hemmed in by the summits of Toroyoc, Huampuna, Patille, Huarmijarula, Cormipampa, Chile Punta, Huayumarca, Eslabón and Sinchi Marca Punta, passes through the mouth of the Maizal gully and the Cañete River, continues along the tops of the Cochape, Matamata, Chucapunta and Huambiñe mountains to Mount Llongote, Mount Ancash Punta, Mount Ticlla, and Mount Huaynacutuni, and reaches the heights of the Cordillera Tapo range. To the west, the reserve is bordered by the Runcho, Llipllina, Pomacocha, Huashuapunta, Oesha, Mina, Pario, Suyoc, Chuspi, Collquepucro Chico, and Corihuas mountains, as far as the peaks of the Manon Uno, Suiricocha, Norma, Tatajaico and Panchacoto mountains, and towards the summit of Mount Antacharre.



*Photo courtesy of SAIS Túpac Amaru*

### ***Human Influence***

The Nor Yauyos–Cochas landscape reserve features the following districts: Tanta, Miraflores, Carania, Vitis, Huancaya, Alis, Laraos and Tomas in the province of Yauyos and Canchayllo in the province of Jauja in Junín. Around 30% of the territory of the protected area lies within the department of Junín, while the other 70% lies within the department of Lima. Within the protected area of Yauyos, there is a total estimated population of 3,450 inhabitants. Around 2,100 inhabitants live inside the protected area of Jauja.

Agriculture and livestock herding are the main economic activities in the area, with some service industries, commerce, and mining. Lack of development opportunities has kept farming and animal husbandry as the primary sources of income for peasant farming families in the area. The communities of Laraos, Carania, Miraflores, and Vitis are based on farming. The communities of Tanta, Vilca and Huancaya, all located over altitudes of 3,600 meters, focus on herding<sup>15</sup>.

Peasant farming communities currently own and cultivate a large amount of land. Plots tend to be small, used primarily for individual plantings of staple food crops. Agriculture is a limited-development, high-risk activity owing to the varied climactic conditions of the region. Farming is done largely on moderately sloped hillsides, terraces, and some flat terrain. Very little irrigation infrastructure exists in the region and crops are dependent on rainfall. The main crops, in order of importance are: corn, potatoes, beans, oca, olluco, wheat, barley, quinoa, mashua and other minor food staples. Alfalfa and other grasses are planted for livestock<sup>16</sup>.

Most of the communal grazing land is hillside and open plain, with natural grasses. Regional livestock products (meat, wool, milk, etc.) are sold to local and regional markets. In the Yauyos protected area there are 5,750 head of cattle, 27,100 sheep, 7,950 alpacas, and 3,706 llamas<sup>17</sup>. In the Junín protected area there are 35,000 sheep, 1,000 head of cattle, 5,000 alpacas, and 200 vicuñas<sup>18</sup>.



*Comunidad de Laraos*

### ***Conservation and Research***

Valle Grande, the Opus Dei agrarian research institute, has worked in the Yauyos region for over 35 years, providing training and promoting agriculture and grazing. The institute also produces a series of working papers and technical studies on the Yauyos region. Similarly, the SAIS Túpac Amaru cooperative produces a series of documents covering the province of Jauja. Resources are listed in the appendix of this document.

### **Threats**

Threats to the Nor Yauyos–Cochas Landscape Reserve include:

- Mining
- Unregulated tourism
- Waste and pollution
- Farming, livestock herding and slash-and-burn agriculture
- Sports fishing and hunting
- Destruction of terracing and archaeological sites
- Loss of forest resources

### ***Mining***

Mining is a key large-scale industrial activity in the region, both within and outside the protected area. Mining has boosted the exchange of goods and services in the area and has created a large number of jobs. The Yauyos sector adjacent to the park features the mines of Yauricocha, Pacocha, Caramachay, and La Calera and the protected area around the Cochas River watershed in Junín is home to around 10 small- and medium-scale mining operations. The Yauricocha mine, formerly run by the state mining company Centromín Peru and now under the administration of the Sociedad Minera Corona, is located in the district of Alis and has been mining zinc, copper, silver, and lead in the area for over a century. Production has dwindled in recent years, but the new administration hopes to boost output. Despite the fact this large mine does not lie inside the protected area, it has a marked influence on the local environment and economy<sup>19</sup>. Mining operations at Yauricocha dump tailings into the Alis River upstream of the reserve. One local inhabitant claimed every mining operation dumps tailings during the rainy season - when rivers are swollen, the water is darker and it is difficult to detect dumping. During a visit to the area, the waters of the Alis River were seen to be darker than other rivers in the region. Farmers interviewed for this report claim that at one time trout (*Oncorhynchus mykiss*)

disappeared from the river altogether. Today, they inhabit the lower part of the river, leading local inhabitants to wonder whether the fish adapted to the polluted conditions.

Compañía Minera San Valentín, owned by the Arias Group, operates the Pacocha mine within the protected area. The operation dumps tailings into Lake Pacocha, potentially affecting the Laraos River. The peasant farming community of Laraos is waging an ongoing legal battle with the mine and has filed several lawsuits to stop the dumping. Under current legislation, IRENA offers a technical opinion on the implementation of activities in natural areas or rural zones. When interviewed, INRENA officials said they opposed the project.

The legacy of mining is visible elsewhere in the preserve. Old coal mines line the roads through the region and spoil piles tower over water sources and agricultural land. In the district of Alis, in the village of Tinco de Alis, there is an increasingly active calcium carbonate (lime) quarry located alongside the access road into the tourist area, which deteriorates the scenic quality of the entrance and is a constant source of particulate emissions. This dust affects the river, the surrounding plant life, and the inhabitants of the village of Tinco de Alis. Tailings are piled alongside the Cañete River. Within the protected area in the province of Jauja, small- and medium-scale mining operations extract silicate, marble, carbonate, gypsum, lime, and travertine. These operations and their industrial furnaces are a source of both air and water pollution.



*Visual impacts of a lime mine*



*Mining supplies near the Río Cañete*

The mines have social impacts, as well. Many of the children of SAIS Túpac Amaru cooperative workers find work in the mines. While the cooperative tries to control these operations, many of these mines operate in a clandestine fashion. Miners were traditionally exploited, abused, and forced to work excessive hours, particularly in informal mining operations, where they were not paid a fair wage or properly fed. These conditions lead some miners to hunt vicuña, deer, and duck and use dynamite while fishing<sup>20</sup>.



*The impacts of mining around Junín.*

### *Unorganized Tourism*

The Nor Yauyos–Cochas Landscape Reserve has the potential to be a major tourist destination, but without formal planning and promotion, there is little actual tourism in the sector. The natural conditions of the landscape, the abundance of archaeological sites, and the cultural and artistic heritage of the local communities all motivated the declaration of a protected area designed to attract recreation and tourism to the area<sup>21</sup>.

In recent years, the area has seen an increase in the number of visitors, mainly Peruvians from Lima and Huancayo, who have traveled to the area. The main attractions of the area include: lakes, rivers and waterfalls (the area features around 40 lakes located at varying altitudes), archaeological ruins, Inca terracing and cave paintings, flora and fauna, snow-capped peaks and geological formations, streams and hot springs, villages, agriculture, and grazing herds<sup>22</sup>.

Tourism is still a fledgling business. There are no routes, trails, or circuits properly prepared for tourism purposes. There are no trained guides, information sources, services, or basic infrastructure such as visitor centers, lodging, or restaurants. While the preserve covers a large area, tourism in the region focuses on the village of Huancaya, where visitors go camping and visit the lakes of Huallhua, Cuchupasca and Huarimanca. Some 250-300 visitors come here on average during holidays, making a total of 900-1,000 people a year.



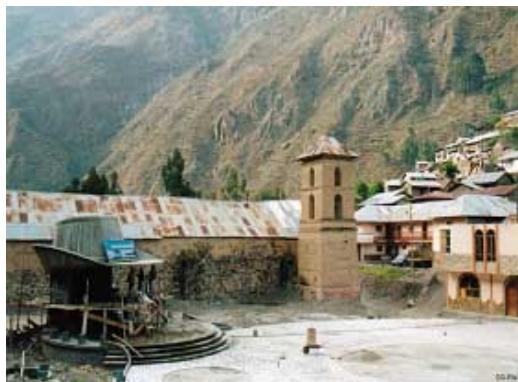
*Laguna de Huallhua,  
Huancaya*

Due to the lack of planning and local organization, the increase in tourism in the area has brought about the typical problems linked to the trade: an increase in litter and human waste as many of the less environmentally-aware tourists leave their trash behind at campsites. Others put their waste in plastic bags, but then leave the bags in the area so the local villagers can dispose of them, even though the local communities do not have adequate waste disposal systems. Tourism also brings an increase in noise and crowds of people, who listen to loud music, drink alcohol, and hold noisy parties. Many visitors chop down vegetation to light bonfires and make campsites in inappropriate spots, creating clearings and affecting the landscape. Some tourists come to fish and hunt, disrupting the local fauna.

The construction of new infrastructure, especially in villages, represents a potential risk to the visual integrity of the area's landscape. Many local mayors, in a bid to carry out civil engineering works and modernize their towns, build infrastructure with solid materials (iron rods, cement and bricks), changing the rural feel provided by the typical construction of highland towns.

The local population has great expectations for tourism that are reinforced with the arrival of every new tourist and the success of every business directed at tourism. The limited agricultural possibilities of the area lead the local communities to see tourism as an activity with major economic potential. However, local residents have yet to form a clear idea as to how to benefit from tourism and how to go about managing the trade. The lack of infrastructure and poor road conditions limit tourist access, and there are no regulations, control posts, or park wardens for the area. Nor is there waste disposal or any entrance fees for the reserve. Tourists have no guarantees, no protection, no services or facilities. There is no information on the various options or tourist products offered in the area. With all these factors, it is difficult to manage or promote organized tourism in the region.

Local residents fear that the declaration of the area as a landscape reserve will attract large-scale capitalists to the area and shut out the local population from the benefits of tourism. Therefore, local authorities and institutions are working to organize the area to take advantage of the growing influx of tourism. Local governments are promoting the creation of tourism companies run by the local population to ensure the residents manage and benefit from the tourism industry.



*The main square in Laraos*



*Erosion and trash near Vitis*

Around Jauja, within the SAIS Túpac Amaru cooperative, tourism is practically non-existent despite the fact that the area's communities, mountains, and highland lakes are easily accessible via the Central Highway and the town has a well-built hotel with a restaurant attended by personnel from the cooperative. The area features the Corivinchos ruins, the Helenapuquio, cave paintings, the Shutjo Canyon on the Piñascochas River, Puya Raimondi cacti in Canchayllo, and Inca terracing. The SAIS Túpac Amaru aims to promote its trout farming, cattle rodeos, sheep shearing, milking and preparation of dairy goods, arts and crafts, and Morochucos horse races as tourist attractions.



*The ruins at Corivinchos and the Cañón de Shutjo*



*Lake Ticllacocha*



*Puyas Raimondi in Canchayllo.*

### ***Trash, sewage, and pollution***

Domestic litter such as plastic bags, bottles, tins, packaging, etc., is a major problem in the area. Towns do not have proper garbage disposal systems and instead dump their waste on nearby land or directly into the river. Trash negatively impacts the environment in the landscape reserve, degrading the tourist experience.

Tourism also contributes its share of trash. Visitors bring in products from outside the area in plastic bags, boxes, tins and bottles, which, once used, are left behind in the area as litter. Large amounts of garbage are left behind by tourists, particularly on holidays or long weekends. Local communities have no way of disposing of the waste left behind by tourists, and merely pick up litter at the campsites and dump it straight into the river.



*Trash disposal in a stream*

The villagers have a similar problem dealing with domestic sewage water. Communities do not have sewage systems, and in some towns the local municipalities have built outhouses next to rivers so that human waste goes directly into the water.

Sewage systems by town:

TOWN	SYSTEM
ALIS	<i>Infrastructure exists but is not operational</i>
CARANIA	<i>No system, only latrines</i>
HUANCAYA	<i>No system, only latrines</i>
LARAOS	<i>Infrastructure exists but is not operational</i>
MIRAFLORES	<i>No system, only latrines</i>
PIÑOS	<i>No system, only latrines</i>
TANTA	<i>No system, only latrines</i>
VILCA	<i>No system, only latrines</i>
VITIS	<i>Infrastructure exists but is not operational</i>

Source: Diagnóstico CODENY, p. 40.

### **Farming and slash-and-burn agriculture**

Local communities use converted land for grazing pastures. Grazing from sheep and dairy cattle puts pressure on the soil's capacity for re-growth, eroding nutrients in the soil. Burning pastures on hillsides with the aim of renewing growth and producing tender shoots for cattle feed is a widespread local custom<sup>23</sup>. This practice causes erosion and soil loss, air pollution, threatens plant species, and negatively impacts the landscape.



*Burnt vegetation on a hillside*

## ***Fishing and hunting***

The landscape reserve is home to many camelids, including llamas and alpacas bred by local communities and large numbers of wild vicuñas. The area was once home to the second largest vicuña population in Peru, after Pampa Galeras in the southern Andes. In recent years, however, the number of vicuñas has dropped dramatically due to poaching. Poachers hunt the animals for their valuable and fine wool, which is in major demand on markets abroad. Poachers are believed to live in the area, but also come from towns such as Huancayo, Jauja and La Oroya, and smuggle out the fiber to sell it on the black market.

Fishing and hunting are currently small-scale operations, but due to the sensitive nature of the fauna, these activities have a major impact on the local wildlife. This can be seen on Lake Huallhua, near the community of Huancaya. One local resident interviewed claimed the area was once home to a large waterfowl population. Tourists came with firearms and scared the birds away, which have migrated further into the upper Andean reaches, near the community of Vilca, where there are practically no tourists or hunters. The local population hunts game on a smaller scale, mainly for their own food, and hunters primarily shoot foxes, deer and duck.

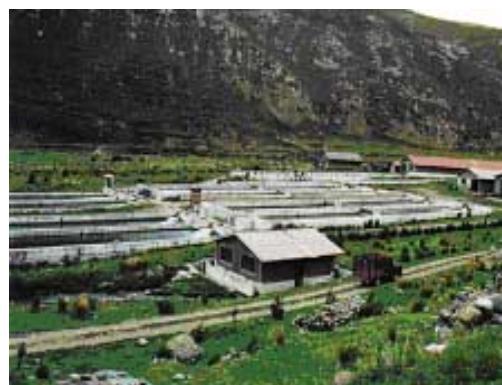
Fishing occurs directly in the river. The local population hauls in large quantities of trout to supplement their diet. Despite this dependence, there is no guidance or regulation to ensure the proper management of the fishery.

Some communities supplement their wild catch with trout farming. In the Yauyos section of the reserve, there are two fish farms in floating cages in Huancaya and three in pools near Alis. Local communities see fish farming as a major opportunity to reap returns. At the fish farm in the community of Huancaya on Lake Huallhua, for example, residents haul in trout catches two or three times a year, netting 3,000-4,000 kg per catch. Trout sells for S/.7/kg (US\$2), earning the community S/.21,000-28,000 (US\$6,000-8,000) per catch. This fish farm works with a floating system in the middle of Lake Huallhua, a major tourist destination in the area, affecting the local landscape.

In the Jauja section, the SAIS Túpac Amaru cooperative has six floating cages and farms that use compartmentalized pools. Trout production is highly technical. Advances enable the cooperative to produce 90-120 tons a year and catches are regularly brought in year-round. The peasant farming communities which are members of the cooperative, meanwhile, run seven private fish farms in pools and 10 floating cages.



*A floating fish farm in the laguna de Huallhua*



*SAIS Túpac Amaru fish farms*

### ***Destruction of terraces and archaeological sites***

The Incas developed a highly advanced form of agriculture that enabled them to farm on extremely steep slopes. Their stone terraces reshaped the natural landscape and represent striking examples of archaeological sites, particularly the terracing at Vitis, Miraflores, Laraos and Caranía. These terraces, Inca ruins, and other archaeological sites are important tourist attractions in the area. Today these terraces and other archaeological sites are gradually deteriorating due to grazing and poorly-managed farming techniques, which utilize the terraces as corrals for cattle herding and as extra land for planting alfalfa and other livestock feed<sup>24</sup>. Unmaintained terraces deteriorate as weeds, bush, and tree roots force themselves between stones, separating and crumbling walls. Rainfall and water from irrigation flow through these cracks, speeding up the cycle of deterioration.



*Inca terraces in Laraos*



*Active terraces*

### ***Loss of forest resources***

The forests within the area make up a small portion of the landscape. The main threat to forest resources in the reserve is firewood collection. While most villages, particularly those in the lowlands, have electricity, most residents do not have ovens and use firewood for cooking and heating. The vegetation surrounding these communities has been stripped, forcing villagers to look further afield for firewood.

Many of the locals make use of eucalyptus trees that grow on their land and typically harvest two or three trees a season to sell as firewood. This currently eases the pressure on the natural vegetation. However, with the potential increase in the population and activities within the reserve, an increase in local demand for firewood is foreseeable. At the same time, the projected increase in tourism and consequent opening of restaurants are also likely to increase demand for firewood. This incentive could spur local inhabitants to concentrate on gathering firewood from natural forests for commercial purposes. Compared to eucalyptus, wood from native species has a tougher consistency and burns longer.

Sheep and goat herds inhibit forest regeneration. The landscape reserve features forests of native species (Colle, Quinual, Quishuar, and others) which grow in small groves that are easily eradicated. Excessive grazing keeps new growth from appearing and these natural forests eventually disappear.

The region is part of the National Program for Hydrographic Watershed Management, PRONAMACHS, a state entity dedicated to reforesting hillsides, establishing plant nurseries, and providing training and promotion for forestry activities. Despite the presence of this agency in the region, forestry is small-scale. If the program is cut short or is halted, the scant planting done in the region to date will be stopped. There is no awareness or particular motivation for people to plant trees and reforest the area<sup>25</sup>.

Forest plantations are dominated by *Eucalyptus globulus*. Forest nurseries exist in the communities of Huancaya, Vitis, Miraflores, Piños, Carania, Alis and Laraos, producing on average 10,000 saplings each, though this production is not reflective of the number of actual plantings in the forest<sup>26</sup>.

### **Future threats**

- Major hydroelectric project
- Uncontrolled increase in trout farms
- Increase in disorganized tourism

#### ***Large-scale hydro-electric project***

The El Platanal construction project envisions a dam and reservoir within the landscape preserve to generate energy and irrigate the distant desert plains along the coast. The project plans to build a 200-meter high dam in the canyon formed by high mountains that hem in the Cañete River at the entrance to the reserve. The reservoir created will measure 8km long.



*Site of the future dam.*

The dam will flood large amounts of land currently used for farming, destroy Inca terracing and sections of native forests growing in gullies and on hillsides, and completely cover the homes and town of Llapay. The dam will also cover the access road into the area, requiring the construction of a 12 km detour. This has caused conflict within neighboring communities, each of whom want this new stretch of road to run through their communities.

The project will directly affect 60 families in the town of Llapay and 45 families who live alongside the river between the dam and Llapay – a total of 105 families will have to be resettled.

The project aims to provide irrigation to the plains of Cañete on the coast, an inhospitable desert area, expand the agricultural frontier, and spur development in the area. The plains have been settled by large numbers of Andean migrants, interfering with the project plans and threatening the project itself. Investors are pressuring the government for resolution so the project can get underway.

### ***Uncontrolled increase in trout farms***

There is growing interest among the communities in trout farming as a source of income. The potential increase in the number of fish farms, both on land alongside rivers and gullies, and as a floating web of cages on the lakes, could cause a visual impact on the scenery.

The concentration of trout in floating cages could lead to the eutrophication of the lakes. The increased levels of in excrement in the water would serve as a fertilizer for algae and other aquatic plant life, clouding the water, saturating the ecosystem, and impacting the aquatic flora and fauna.

### ***Increase in disorganized tourism***

Due to the extraordinary potential of the region and its legal status as a landscape reserve, an increase in tourism in the area is possible. Unless necessary measures are taken ahead of time, tourism could bring increases in litter, waste and excretion; crowding in areas of interest and campsites; the deterioration of archaeological sites; unequal changes in the local economy; and an increase in land prices. Without proper planning, the negative impacts of tourism will be that much greater and harder to manage. The potential exists that the area will find itself unable to handle tourist demand due to the lack of infrastructure and services. A negative visitor experience potentially leads to disorderly activity (indiscriminate use of resources, concentrated supply, non-existent zoning).

## **Recommended solutions**

### ***Mining***

Under current legislation, all activities affected by the declaration of a natural protected area maintain their rights<sup>27</sup>. Investments, operations, concessions, and contracts existing prior to the declaration of the reserve may continue and cannot be forced to withdraw. This applies to mining activities in the area, which cannot be forced out, only made to comply with environmental regulations and standards. Mines have the obligation to operate according to the Environmental Adaptation Programs (PAMA) presented at the start of every operation and approved under the corresponding legislation<sup>28</sup>. All clandestine and informal mining operations must be eradicated from the preserve.

The San Valentín mine needs to upgrade its operating technology and strategies to prevent further pollution of Lake Pacocha. The mine needs to design appropriate tailing pads and hermetically sealed storage dams to prevent the mine from continuing to pollute water resources.

The calcium carbonate mine located in Tinco de Alis along the access road leading into the reserve urgently needs proper management to minimize the impacts of extraction and mining operations on the landscape.

Local authorities must pressure mining companies and the Ministry of Energy and Mines to disclose the results of the regular run-off and riverwater monitoring they are required by law to perform<sup>29</sup>. Armed with this information, local stakeholders can denounce or pressure the government and industries in cases where standards and established limits have not been met.

## ***Tourism***

There is excellent potential for tourism in the landscape reserve. Currently, the promotion of tourism to the Peruvian public and foreign tourists is nearly non-existent. Promotion of the protected areas as a tourist destination must involve studies of the capacity and sustainability of the area's points of interest, existing local infrastructure, and the perception and willingness of the local population<sup>30</sup>.

The landscape reserve needs to be zoned and defined for the appropriate use of resources and sectors. Ruins, terracing, lakes, rivers, forests and fauna found in other sectors need to be promoted to prevent tourism from concentrating solely in the lakes of the community of Huancaya. More publicity is needed for the different tourist options and products in the area.

Signposting and posters are necessary, but should blend with the surrounding landscape without detracting from it. Election campaign slogans are still visible in the area, marring the landscape: painting of boulders and hillsides within the reserve must be prevented and penalized.

Future development of local infrastructure by town halls can also have negative impacts on the landscape. This process must be done with careful planning, according to the objectives of the protected area so works do not have a negative impact on the landscape and the current characteristics of communities in the area.

Regulations need to be designed and implemented for tourist use. Protection mechanisms for the area, such as guard posts and park rangers, need to be established. Town halls need to coordinate entry fees and rates for services.

It is important to foster awareness of the benefits of the tourist trade. If tourist earnings stay in the area, this will give communities an incentive to respect the protected area.

## ***Waste and pollution***

Until basic sewage infrastructure problems resolved, pollution and contamination from human waste remains a serious issue. Solid and liquid wastes are currently dumped directly into the region's waters. Local town halls must assume responsibility for solving problems of disposal of waste and urban sewage.

Efficient garbage pick-up systems need to be designed and appropriate sites selected far enough away from the river, tourist attractions and towns. Local town halls, together with schools and peasant farming communities, need to educate their communities and make them aware to proper disposal of garbage and domestic waste. Regulations need to be established for proper waste management, and tourists and visitors need to be notified. Trash cans and temporary dumpsters need to be installed in campsites to concentrate garbage and facilitate its removal.

### ***Farming and slash-and-burn agriculture***

Though the soil in the area is suited for agriculture, it is stressed by poorly managed cattle and sheep herds and disturbed regrowth cycles. Dairy cattle need to be marked and controlled. Farmers should not be allowed to concentrate large numbers of cattle in pastures that cannot stand heavy usage. Internal coordination is needed within communities to facilitate cattle rotation. The conflict between the capacity of the pastures, which depend on rainfall and climactic conditions, and the needs of dairy cattle, which strain the pastures, suggests that herders consider other alternatives.

Projects also need to be implemented to repopulate the highlands with Andean camelids such as vicuñas, alpacas and llamas. These native species have coevolved with the native vegetation. Due to their physical form and diet, they are gentler on the pastures and soils.

### ***Fishing and hunting***

Some communities are already implementing measures to ban fishing in their lakes. The communities need further guidance regarding fishing, hunting and trout farming. The following regulations are needed for fishing and hunting: defined seasons, minimum size requirements, species requirements, legal harvest methods, and maximum catch. Local authorities and the population need to be trained to guarantee the protection and sustainable management of these resources.

### ***Destruction of terraces and archaeological sites***

There is evidence of sustainable management for agricultural production systems in the terraces and irrigation systems in Vitis, Laraos, Carania and Alis. These communities use the terraces for farming purposes without destroying them. Their experiences and methods need to be researched, promoted, and incorporated into management plans for the area. Local authorities need to organize neighborhood watch committees to control the destruction of archaeological sites and to promote sustained farming and tourism purposes. The National Cultural Institute needs to heighten its presence in the area.

### ***Loss of forest resources***

Grazing must be banned in and around natural forests and key natural vegetation in the area. The local population needs incentives to reforest the area. The National Program for Hydrographic Watershed Management, PRONAMACHS, maintains a presence in the region, but needs financial and institutional backing to work with greater efficiency. Additionally, PRONAMACHS needs to shift strategy and incentives to ensure forestry is a sustained industry. Ideally, a majority of the local population will voluntarily get involved in reforestation, showing greater awareness of the importance of forest management and firewood provision. Finally, PRONAMACHS needs to incorporate more native species in its reforestation efforts.

### ***Dam Project***

Like the mining projects, the El Platanal hydro-electric and irrigation project reserves development rights pre-dating the declaration of the protected area. The project will shake up

the regional situation, both in terms of landscape and socio-economic changes. Given the scale of the project, it is important to ensure El Platanal strictly complies with conditions established in its environmental impact studies, environmental management plans, corresponding legislation, and corporate HSE (Health, Safety and Environment) regulations. Mechanisms and opportunities for dialogue need to be provided for stakeholders (the project, authorities, and the population) to coordinate steps to minimize the project's impacts and ensure proper water management and distribution.

## **Conclusions**

The Nor Yauyos–Cochas Landscape Reserve is a recently created protected area. It features picturesque Andean scenery, soaring mountains, rivers, lakes and archaeological sites. The main aim of declaring the area a reserve was to protect the landscape and promote tourism. The reserve's proximity to the city of Lima lends it major potential for weekend tourism.

Within the reserve itself there are a number of towns and villages with large populations that mainly live off agriculture and animal husbandry. The protected area is currently vulnerable to and threatened by a number of problems. The main threats include: mining, disorganized tourism, waste and pollution, intensive farming and livestock herding, forest fires, fishing and hunting, increasing trout farms, destruction of terraces and archaeological sites, loss of forest resources, the future construction of a dam, and the current lack of administration and management in the protected area.

Active mining operations need to adapt to the established regulations, implement environmental clean-up programs, and environmental management plans required by the government. Similarly, tourist promotion requires designed management plans and local organization. It is important that all activities in the area are carried out in harmonious coexistence with the concept of the protected area.

More local participation is needed in the decision-making process and management of the landscape reserve at the level of local governments and peasant farming communities. This is key for the conservation of the reserve and for the success of any administrative management. The implemented reserve management plan will be more widely accepted when the local populations help identify the problems currently challenging the area and the needs the park will meet in the future.

## **Publications about the Nor Yauyos- Cochas Landscape Reserve**

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### FOOTNOTES

<sup>1</sup> “Diagnóstico de la Zona Reservada Alto Cañete y Cochas-Pachacayo (Área Nor Yauyos)” Corporación de Desarrollo de Nor-Yauyos (CODENY) (*Documento de Trabajo*) Lima – Perú. Mayo 1999. p.12.

<sup>2</sup> UDVARDY, Miklos. A Biogeographical Classification System for Terrestrial Environments. In: National Parks, Conservation and Development. The role of protected areas in sustainable society. Edited by Jeffrey A. McNeely and Kenton R. Miller. IUCN Commission on National Parks and Protected Areas. Proceedings of World Congress on National Parks. Bali, Indonesia 11-22 Oct. 1982. Published by Smithsonian Institution Press, Washington DC. 1984. p 34.

<sup>3</sup> Plan Director del Sistema Nacional de Unidades de Conservación (SINUC). Una aproximación desde la diversidad biológica. Centro de Datos para la Conservación, Universidad Nacional Agraria La Molina. 1991.

<sup>4</sup> The Holdridge Classification is based on types of vegetation, levels of humidity, levels of altitude and longitudinal regions. See: HOLDRIGE, Leslie. Ecology based on life zones. Inter-American Institute of Agricultural Sciences. Editorial IICA. San José, Costa Rica, 1978. Page 7.

<sup>5</sup> CODENY Op. Cit. Cuadro No. 4, p 9.

<sup>6</sup> Ibid. p. 52. Species in aquatic environments: phytoplankton: pelo verde *Spirogyra* sp.; *cloroficea filamentosa* *Ulothrix* sp., *Oedogonium* sp., *Cladophora* sp.; *cloroficea Pediastrum* sp., *Scenedesmus* sp., *Closterium* sp., *Cosmarium* sp.; *diatomea Gomphonema* sp., *Cymbella* sp., *Gomphoneis* sp., *Navicula* sp., *Synedra* sp., *Epithemia* sp., *Denticula* sp., *Rhopalodia* sp., *Pinnularia* sp.; *cianóficea Oscillatoria* sp. Species of macrophytes: watercress *Rorippa nasturtium*; cola de caballo *Equisetum* sp.; patacón *Hydrocotyle umbellata*; juncos *Scirpus* sp.; totora reed *Scirpus totora*; cane *Arundo donax*, *Gynerium* sp.

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Land-based vegetation: the area is home to reed marshes that grow in clumps. Research in the marshes has discovered nine species including perennifoleous and caducifoleous (forming separate clumps) bushes and grasses; six species of bushes that form perennifoleous clumps. These include mainly shrubs, subbushes and bushes, plus trees up to 5 meters high. These include trees used for firewood in residual forests of Queñual *Polylepis* spp. and Colle *Buddleia coriacea*, which, while covering small areas (3,600-3,900 meters), protect hillsides and make up a bank of native species for reforestation. These species are used by the local population for wood, mainly as firewood.

<sup>7</sup> Ibid. Cuadro 15, Pag. 19.

<sup>8</sup> Ibid. Page 20-21. Zooplankton and meiobents: *Daphnia pulex*, *Scapholeberis kingi*, *Chydorus sphaericus*, *Pleomoxus* cf. *aduncus*, *Alonella* sp., *Alona cambonei*, *Alona affinis*, *Macrothrix* cf. *rosea*, *Camptocercus* sp., *Boeckella occidentalis*, *Eucyclops neumanni*, *Hyalella* sp. Benthos: *Planorbis* sp., *Littoridina* sp. Fish: rainbow trout *Oncorhynchus mykiss*, an introduced species, as well as the chalgüita *Orestias* sp. Amphibians: *Bufo spinulosus*, *Telmatobius rinac*, *Telmatobius jelskii*.

<sup>9</sup> Ibid. Page 52.

<sup>10</sup> Ibid. Table 21, Page 24.

<sup>11</sup> WALSH PERU S.A. "Diagnóstico ambiental para el EIA del proyecto hidroeléctrico El Platanal". Vol. I y II. Lima - Perú, 1999.

<sup>12</sup> CODENY Op. Cit. p 24.

<sup>13</sup> Peru's natural protected areas are managed by the General Department of Natural Protected Areas under the administration of the National Institute of National Resources (INRENA), an entity which is part of the Ministry of Agriculture. Current administration is covered by Law No. 26834, the Law of Natural Protected Areas of 30/06/97 and by regulating Supreme Decree No. 038-2001-AG.

<sup>14</sup> Conversation with Laraos Mayor Willy Brañes Espinoza. 28/10/02.

<sup>15</sup> CODENY Op.Cit. Page 33.

<sup>16</sup> Ibid. Table 34, Page 37.

<sup>17</sup> Data provided by SAIS Túpac Amaru management, 20/01/03.

<sup>18</sup> Ibid. Table 6, Page 10.

<sup>19</sup> Ibid. Page 38.

<sup>20</sup> Conversation with local inhabitants.

<sup>21</sup> Under the terms of the Law of Natural Protected Areas No. 26834, Article 22, landscape reserves are areas which protect environments whose geography features a harmonious relationship between Man and Nature, and which is home to an important natural, aesthetic and cultural heritage.

<sup>22</sup> Ibid. Page 54.

<sup>23</sup> Ibid. Page 57.

<sup>24</sup> Ibid. Page 51.

<sup>25</sup> Conversation with PRONAMACHS official in the field.

<sup>26</sup> CODENY Op. Cit. Page 26.

<sup>27</sup> Article 2 of Supreme Decree No. 033-2001-AG which created the Nor Yauyos-Cochas Landscape Reserve establishes that according to Article 54 in the Framework Law for the Growth of Private Investment, Legislative Decree No. 757 and Article 5 of Law No. 26834, the Law of Natural Protected Areas respects rights obtained prior to the creation of the landscape reserve.

<sup>28</sup> Board of Directors' Ruling No. 036-97-EM/DGAA del 20/12/97. Approval of regulations for steps, investment programs, and the percentage of physical progress made on the PAMA Environmental Adaptation Program, monitoring and supervision of commitments and obligations of the Environmental Management Plan.

<sup>29</sup> Regulation for environmental protection in mining and metallurgical operations. DS 016-93-EM dated May 1, 1993.

<sup>30</sup> For areas of recreation, visitor capacity is defined as the maximum level of usage by visitors that an area can handle while providing a satisfactory service for visitors and minimum negative effects on resources. See: BOO, Elizabeth. "Ecotourism: Potential and Obstacles. WWF & The Conservation Foundation, USAID. Washington, DC. 1990. Page 26.