









# PROPOSAL TO INSCRIBE TEIDE NATIONAL PARK ON THE WORLD HERITAGE LIST

## Santa Cruz de Tenerife, january 18, 2006

MINISTERIO
DE MEDIO AMBIENTE

TEIDE
PARQUE NACIONAL

Gobierno de Canarias

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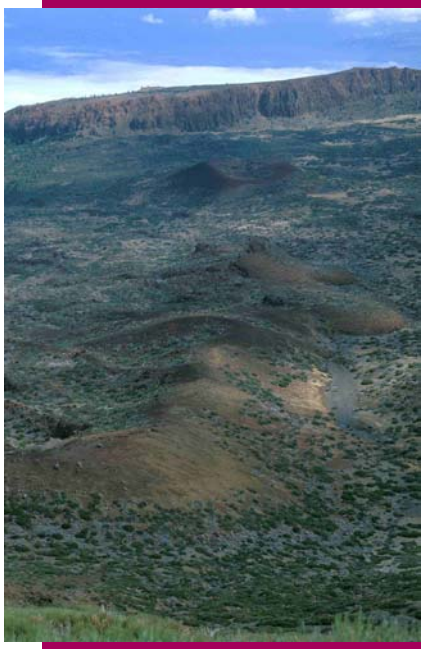

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# Introduction

The natural, cultural and conservation values of Teide National Park make it one of the most astonishing places on Earth, a fact that has been acknowledged by science through the work of its most important geographers, geologists and biologists. Mt. Teide possesses outstanding global value as a comprehensive geographic complex and also for its uniqueness and remarkable geo-diversity derived from its altitude, latitude and insularity. The National Park responds to the most demanding geological, physiographical, biological, conservationist and aesthetic evaluation criteria, both for the natural system it contains and the geographic landscape that shapes it. Few volcanic constructions on Earth, even those that have the physical presence of Teide, have such harmonious landscapes, such a remarkable geological structure and such clear biological integration.

For these reasons, in 2002 the Mixed Management Commission of the Canarian National Parks started the long journey toward including Teide National Park on the World Heritage List as a natural property of outstanding universal value. Subsequently, in a meeting of the Historical Heritage Council held on April 2, 2004, Teide National Park was included on the Spanish Candidates List and a year later on June 17, 2005 the council decided to present it as an official candidate to the World Heritage List in 2006, the reason why this Proposal to Inscribe Teide National Park on the World Heritage List has been prepared following the format for the nominations of properties for inscription in Annex 5 of the *Operational Guidelines for the Implementation of the World Heritage Convention* (february, 2005). Next, the Inscription Proposal was voluntarily submitted to the Secretariat of the World Heritage Committee before 30 September, 2005. *Finally, once the relevant procedures have been completed, this proposal officially contain Teide National Park's candidacy for inscription on the World Heritage List.*

Maps and posters, as complement and support to the literal information, as well as audiovisual material of a different nature has been attached to the Inscription Proposal documentation.



*Line of volcanic cones*

# Executive Summary

***State Party***
*Spain*

***State, Province or Region***
*Autonomous Community of the Canary Island; Province of Santa Cruz de Tenerife*

***Name of Property***
*Teide National Park*

***Geographical coordinates to the nearest second***
Latitude: N 28º 09′ 00″ - N 28º 20′ 00″
Longitude: W 16º 29′ 00″ - W 16º 44′ 00″

***Textual description of the boundary(ies) of the nominated property***

The limits of this protected natural property are defined in Annex II of the Resolution made on October 14, 1999 by General Secretary of the Environment that published the Accord to expand the limits of Teide National Park by incorporating lands adjacent to it. These new boundaries substitute those that were established in Annex I of Law 5/1981, March 25, that reclassifies Teide National Park and they are textually described as follows:

North: Starting from the 8.3 kilometre point of county road TF-38 (Chío-Las Cañadas), the boundary of the Park traces a straight line toward the peak of Mt. Teide, but without reaching the peak, until reaching an altitude of 2,000 m. The boundary continues along this height until reaching the Hoya del Cedro promontory, located next to the old apiary at 2,000 m, and from here traces a straight line until reaching Los Castillos at 1,654 m. From here the boundary heads north until reaching 1,600 m, continues along this altitude until reaching the line that unites Cruz de La Vieja and Montaña Abejera Alta, whereupon it follows this line until reaching 1,650 m, continues along this height until reaching the no-exit Los Areneros forest path, then follows this path until reaching the Barranco del Brinco, also known as Barranco del Pino (a *barranco* is a ravine), and then climbs the length of the ravine until reaching an altitude of 1,800 m. At this point the boundary traces a straight line until reaching the current municipal border between La Guancha and San Juan de la Rambla at an altitude of 1,900 m and then continues at this height until reaching the Barranco de la Degollada, also known as Barranco de Ruiz, climbs this ravine until reaching 2,000 m and then continues at this height until reaching the path that connects with El Cabezón and the El Portillo Visitor Centre, it then follows



*High mountain scrub*



*Descurainia bourgeauana*

this path toward the Visitor Centre until once again reaching 2,000 m, then continues at this height until reaching the east-west axis that transverses the 31.6 kilometre point of county road TF-24, the boundary then follows this line until reaching the 31.6 kilometre point just mentioned, and then follows the TF-24 heading north until reaching the north-south divide of the island near Montaña de La Crucita.

East: Starting from the intersection between the TF-24 and the north-south divide of the island, the boundary follows the divide until it reaches the 34.3 kilometre point of the TF-24, then follows this road until reaching the paved path that leads to the Izaña Astronomy Observatory, it then follows this path until it connects with the municipal border between Fasnia and Güimar, the boundary then follows this border heading south until it reaches the curve at 2,100 m, it then follows the curve heading west, along the northern border of the Monte del Estado pine forest known as the Cumbres de Fasnia, until reaching the municipal border between Arico and Fasnia. The boundary then follows the municipal border between Arico and Fasnia heading north until it reaches the Degollada de Abreu, from this point it continues along the northern border of Arico until it reaches Montaña Colorada. From here it continues along the crest of the Circo de Las Cañadas until reaching the Degollada de Guajara where it converges with public-utility mountain (PUM) Nº3, Pinar de Granadilla de Abona. From here it continues downward through the Barranco del Río along the northeast border of PUM Nº3 until it connects with the border of the PUM known as Contador y Cumbre, at the escarpments on the left margin of Barranco del Río en Los Andenes.

South: The boundary continues in a straight line from the escarpments of the left margin of the Barranco del Río en Los Andenes toward Montaña de Las Arenas without reaching the mountain at an altitude of 2,250 m, then continues south at this height until reaching the straight line that unites Montaña de Las Arenas and the Roque del Encaje, it follows this line until reaching 2,150 m (not reaching Roque del Encaje), then continues at this altitude north until reaching the Barranco del Carnero riverbed, it then climbs following this ravine, just along the western border of the PUM Nº3, Pinar de Granadilla de Abona, until reaching the Degollada del Valle de Ucanca. From here, it continues west along the crest of the Circo de las Cañadas until reaching the point where it meets with PUM Nº7, known as Vica y Lajas, it then descends along Barranco de La Magdalena until reaching 2,250 m. The boundary then continues west at this height until reaching Barranco del Dornajito, then descends this ravine until reaching the 57.4 kilometre point of the TF-21, here it follows the road until reaching the curve at the 54.2 kilometre point and from here it ascends in a straight line until reaching the Roques de Ucana (also known as Roques de Ucasme) at an altitude of 2,051 m.

West: From Roques de Ucana or Ucasme, the boundary traces a straight line to Montaña Cangarro and then to Roques de Chavao and from here in a straight line to Montana Chasogo and then continues along the current boundary of Teide National Park until reaching county road TF-38, next, it follows the road until reaching the 8.3 kilometre point.

The private property grouped in the Caserío del Portillo Alto and Portillo Bajo are excluded from these limits (approximately 8 ha).

***Map of the nominated property, showing boundaries and Buffer Zone.***

A map in DinA4 format that includes the boundaries of the National Park and the Buffer Zone is attached.

***Justification. Statement of Outstanding Universal Value***

Teide National Park includes a group of geological elements that combine to create exceptionally beautiful landscapes that are of particular scientific interest because they display the complete evolution of a very advanced phase of volcanic ocean island development consisting in the partial destruction of an explosive volcanic edifice in its terminal phase, the formation of a vast landslide-caldera and the construction of separate large volcanic apparatuses nested in the interior of the caldera.

This series of processes is an outstanding example of the most important milestones of the evolution of the planet, in particular the evolution of intra-plate volcanic ocean islands. It is also unique because the rest of the islands in this category have not developed this advanced phase of the magmatic series, which includes the formation of these differentiated central volcanic edifices.

The geological and volcanological characteristics that have outstanding universal value are represented in their entirety, in the different concatenated processes and also the volcanic materials, formations and structures of the complete magmatic series related to hot spot ocean islands.

***Criteria under which the property is nominated***

The criteria under which Teide National Park is nominated, from those established by the World Heritage Committee in the document *Operational Guidelines for the Implementation of the World Heritage Convention* (february 2005) are the following:



*The Peak of Teide and Black lava flows*

- (vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

- (viii) be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.

***Name and contact information of the official local institution/agency***

Organisation: Teide National Park
Address: c/ Emilio Calzadilla, nº 5, 4º piso. 38002 Santa Cruz de Tenerife.
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E-mail: teide@oapn.mma.es
Web Page: http://www.mma.es/parques/lared/teide/index.htm



*Cyclyrus webbianus*



***Pimelia ascendens***



# Properties for Inscription on the World Heritage List

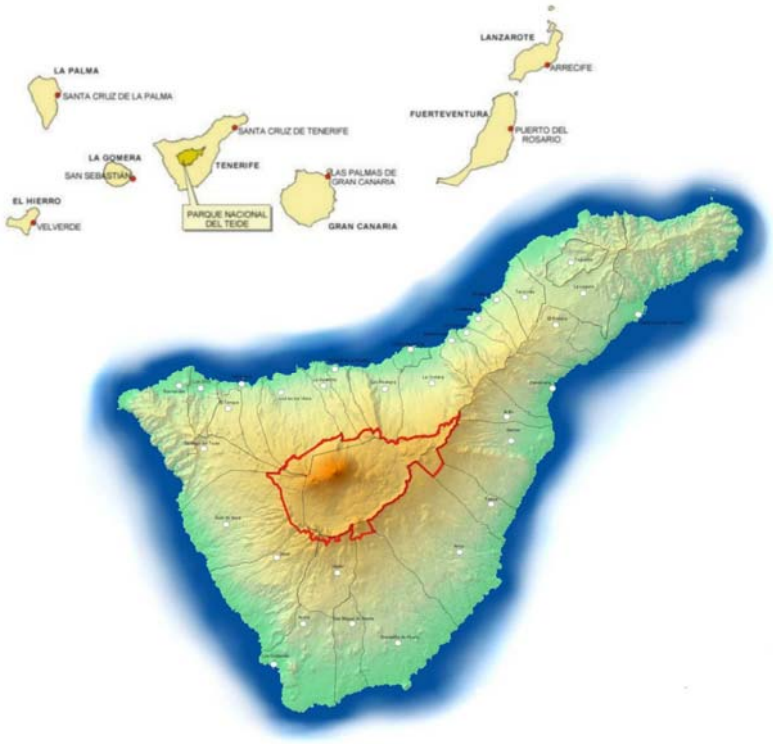
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# 1. Identification of the property

The Canary Islands are in the eastern sector of the North Atlantic, located approximately at a latitude between 27º and 29º N and a longitude between 14º and 18º W, around 100 km from the African continent. This geographical location gives it a strategic position at the crossroads between Africa, Europe and America.




The archipelago contains a group of seven volcanic islands: Lanzarote, Fuerteventura, Gran Canaria, Tenerife, El Hierro, La Gomera and La Palma, four islets (Alegranza, Graciosa, Montaña Clara and Lobos) and various rocks that all together have a surface area of 7,490 km$^2$. The Canaries, along with the Azores, Madeira, Savages and Cape Verde comprise the bio-geographical region known as Macaronesia, considered to be one of the most interesting biological enclaves in the world.



Tenerife has the largest surface area and highest altitude among the islands that make up the Canarian Archipelago, with Teide National Park as its pinnacle, perched above a sea of clouds.

The Park covers an area that lies between 1,650 m at its lowest point to 3,718 m at the top of Teide, the highest peak in all of Spain. It contains a giant volcanic caldera located at around 2,100 m and an impressive stratovolcano, the Teide-Pico Viejo is located within the caldera, surrounded by different categories of volcanic structures and materials. The most representative ecosystems of this territory are high-mountain scrubs that possess a biota rich in endemic species that are adapted to the rigours of the high-mountain conditions. All of this creates an impressive aesthetic panorama that is enhanced by the exceptional quality of the atmosphere.

**1.a Country**
Spain.

**1.b State, province or region**
Autonomous Community of the Canary Islands; Province of Santa Cruz de Tenerife

**1.c Name of property**
Teide National Park

**1.d Geographical coordinates to the nearest second**
Latitude: N 28º 09′ 00″ - N 28º 20′ 00″
Longitude: W 16º 29′ 00″ - W 16º 44′ 00″

**1.e Maps and plans, showing the boundaries of the nominated property and buffer zone**

The cartography contained in the annex documentation of this Proposal, includes the maps of the boundaries and Buffer Zone of Teide National Park, zonification and topography. In addition, other general and specific maps are annexed related to geology, vegetation, vascular flora, landscape units and archaeology that display specific characteristics of the property.

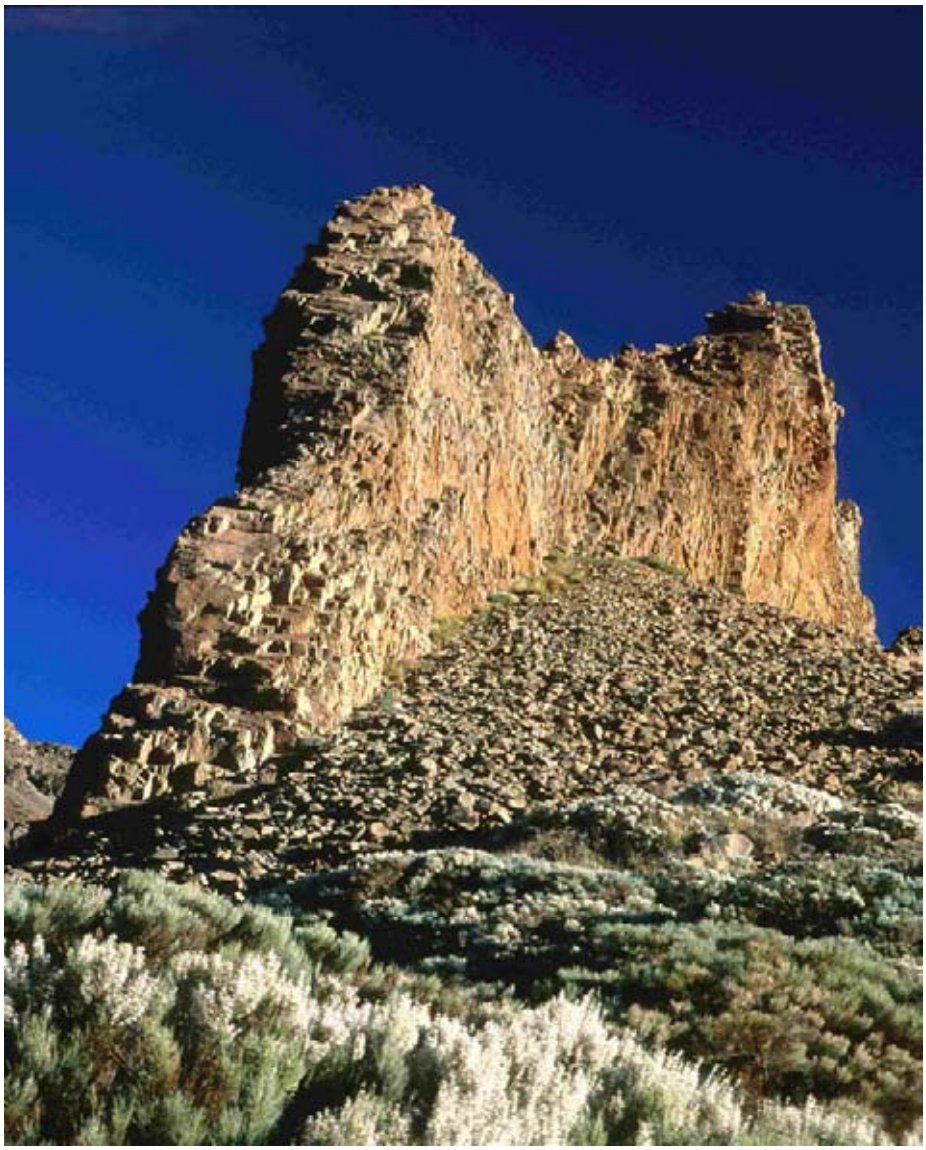
**1.f Area of nominated property (ha) and Buffer Zone (ha)**

| | |
|---|---|
| Area of nominated property | 18,990.0 ha |
| Buffer Zone | 54,127.9 ha |
| Total | 73,117.9 ha |

The Buffer Zone is an area surrounding the property that includes the Peripheral Protection Zone and the Corona Forestal Natural Park.

The Peripheral Protection Zone covers an area of 7,515 ha. Law 5/1981, March 25, on the reclassification of Teide National Park delimits a continuous and peripheral exterior protection zone in order to guarantee the complete protection of the natural resources that justified the creation of the Park and to avoid possible impacts on the ecology and landscape from outside of the Park. In addition, the appropriate organisations will classify all terrain in this area as non-buildable land under special protection, thereby prohibiting all construction, except when a report by the Patronage certifies that it is in the public interest. In addition, said organisations will adopt the measures necessary to protect the terrain, flora, fauna, landscape, waters and other natural elements, impeding the introduction of exotic animal or plant species and the transformation of the forests that must be conserved in their natural state.

The Corona Forestal Natural Park ha 46,612.9 ha and its legal regime is established in the Legislative Decree 1/2000, May 8 that approves the Unified Text of the Territorial Organisation of the Canary Islands and Canarian Natural Spaces laws.



***Fonolític dike***

# 2. Description

## 2.a Description of Property

This section describes the proposed property as it is today, mentioning its outstanding characteristics, the different ways that its natural resources are used and the methods employed to use them.

***Description of the proposed property and its outstanding characteristics***

### Geology and geomorphology

Teide National Park is essentially configured by geographic elements that have very defined morphological and geological elements. Without a doubt, the most dominant geographic element is the Teide-Pico Viejo stratovolcano that was created in the Pleistocene and that is still active today. This fact is confirmed by the high activity of the fumaroles in the areas near the crater and the recent eruptions that occurred a few hundred years ago from its slopes and from its central crater.

The stratovolcano is ***located*** in the centre of a large depression known as Las Cañadas Caldera that is delimited to the north, east, south and part of the western zone by a wall of abrupt escarpments of up to 650 m that displays the geological history of the area all along its 25 km and within its different stratum.

Between the base of the stratovolcano and the foot of the wall there is an extensive field of lavas and recent pyroclasts that came from Teide-Pico Viejo and its adventitious cones, as well as from other emission centres located in the interior of the caldera. This area is completed by plains of pooled volcanic sediments located at the base of the wall, Las Cañadas.

It also has spectacular recent samples of historic volcanism that are associated with the emission of basaltic magmas, such as the Fasnia Volcano, whose activity occurred in 1705, and the eruption of the Narices del Teide (Teide's Nostrils) that occurred in 1798 and whose lavas cover a surface area of around 4.5 $km^2$ within the Park's limits.

The National Park is a paradigmatic enclave for geology and volcanology, both for its creation and history and for the great variety of volcanic materials that can be found, which allows for the observation and study of a broad range of processes and structures within a sheltered and clearly delimited space. Because of its content, level of conservation and excellent display, this



*Historical eruption*



*Frozen scrub*



*Teide - Montaña Blanca*

volcanic complex is unique in the world and constitutes a reference point for volcanologists and everyone who is interested in these types of natural processes.

**Climate**

There are a series of factors that combine to give the Canary Islands its famous temperate climate. First of all, because the archipelago is found on the passage to the tropics it is influenced by the temperate and tropical world; the fact that it is located in a high pressure zone gives it atmospheric stability and constant winds throughout the year, but mostly in summer. Furthermore, its proximity to the high temperatures of the African continent is counterbalanced by the Canarian cold marine current that lowers and mellows its temperatures, which are generally maintained around 20º C. The combination of winds blowing from different directions and altitudes at these latitudes, along with the factors already mentioned, creates a thermal inversion at around 1,000 m that also has a great effect on the ecology of each island.

The thermal inversion and the insular orography on the summits of Tenerife (the only Macaronesian island with a large percentage of area above 2,000 m) isolates the area from marine influences, thereby creating climatic parameters that are more similar to those of continental territories than those of the rest of the islands in the archipelago.

Consequently, the altitude determines the harsh climatic system of Las Cañadas which decisively affects both the physical and natural environments.

Teide National Park practically encompasses this entire climatic domain distinguished by its strong daily oscillations (variations of more than 15 degrees) and inter-annual oscillations (with lows below -15º in winter and highs above 30º in summer). The precipitation is below 500 l/m$^2$, with more than 50% falling in winter, a third of which is snow. Nevertheless, the central area of Tenerife, occupied by the Las Cañadas depression, is one of the principal aquiferous reservoirs of the island.

The insolation (exposure to sunlight) is also the highest in Spain: the yearly average being 3,448.5 hours of sunlight. This amount of sunlight, coupled with the low humidity and low pressure, create an exceptionally limpid atmosphere which is especially good for astronomical observations.

The predominant winds blow from the northeast, the trade winds or counter trade winds. Westerly winds caused by Atlantic storms are less common and can reach up to 200 km/h. Southern winds are linked with invasions of Saharan air. The climatic rigours that affect the high mountain can create exceptional

morphogenetic processes in ocean environments close to the tropics. The presence of active periglacial forms are evidenced by freezing and thawing processes in solid-fluid flows, polygonal soils, snow garlands or the colloquial *caminos de cabras* (goat paths): false paths created by mechanical processes associated with freezing and thawing.

**Flora**

The biota found in Teide National Park is the result of a particular evolution. Adaptive radiation and isolation caused by insularity have encouraged the proliferation of a multitude of plant species that have adapted to the extremely severe conditions over time.

All of this leads to the uncommon "double-insularity" phenomenon because Tenerife is not only isolated physically by its insularity but also ecologically by its special climate and lack of geological maturity; this gives its summits an especially rich flora, in stark contrast with the apparent dryness of the territory. This phenomenon manifests itself in the fauna and in the flowers. Good examples are plant species like *Adenocarpus viscosus*, *Argynanthemum teneriffae*, *Echium wildpretti*, *Echium auberianum*, etc. that only grow in this territory, while a few kilometres outside of the Park and the summit area the following congeneric taxons develop: *Argynantemum frutescens*, *Adenocarpus foliosus*, *Echium virescens*, etc. In other cases the colonisation has not come from the lower altitudes of Tenerife but rather from other, possibly continental, extra-insular mountainous areas. For example, an exclusively endemic species such as *Stemmacantha cynaroides* is the only Canarian representative of a species that comes from the Atlas Mountains in the African continent.

The diversity of vegetation in Teide National Park is striking for its richness and singularity, sheltering abundant endemic insular, regional and local species

The level of phytogenetic diversity is also very high. Because the Canary Islands are close to the African continent (its primary source of floristic resources) it has a much higher level of diversity than other ocean islands, in fact, it is closer to the levels reached by continental ecosystems. In this sense Teide National Park is a world class example of unique and well conserved phytogenetic diversity.

Because of this Teide National Park has become one of the best examples in the world of how evolutionary forces affect the flora and fauna of high ocean mountains with its great diversity and high level of endemics that are not easy to surpass in tall continental mountains. The National Park is without a doubt the

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*Silene nocteolens*



*Aeonium smithii*

most diverse and probably the best conserved high-mountain ecosystem on an Atlantic island.

The vascular flora of Teide National Park is made up of 220 taxons, of which 73 are endemic of the Canarian Archipelago and 33 are endemic of Tenerife, a level of endemics that reaches 50%. Moreover, 16 taxons are exclusive to the National Park. The most characteristic endemic elements are the Teide white broom (*Spartocytisus supranubius*), *codeso* (*Adenocarpus viscosus*), *Teide flixweed* (*Descurainia bourgeauana*), the Teide violet (*Viola cheiranthifolia*) and *rosalillo de cumbre* (*Pterocephalus lasiospermus*).

On the other hand, species such as *Helianthemum juliae* (*Cistaceae*), *Gnaphalium teydeum* (*Asteraceae*) or *Stemmacantha cynaroides* (*Asteraceae*) that are exclusive to the Park only reach around 200 specimens. Others, such as *Bencomia exstipulata* (*Rosaceae*), barely reach 60 specimens, which accounts for almost 75% of the natural specimens of this endemic taxon on the summits of Tenerife and La Palma.



*Pterocephalus lasiospermus*

Non-vascular flora is present in a variety of environments. Briophytes and hepaticas usually present a markedly local character, generally associated with humid environments such as fumaroles, etc. Up until now, 74 species of moss and eight hepaticas have been counted. Lichens are more widely distributed; in fact, they usually are the only plants that cover the recent lava flows of the Park.

In addition to this floristic diversity, the Park also has a noticeable number of vegetation units that generally define the majority of the habitats since they are crucial to the conservation of biodiversity. This fact has been highlighted in the Council of the European Union Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora. Using the criteria of this Directive, Teide National Park has eleven Community Interest habitats occupying 75% of its surface area.

Cartography of plat communities as well as distribution maps of the most important taxa are included in the annex documentation.



*Viola cheiranthifolia*

**Fauna**

Regarding vertebrate fauna, the Park has three endemic species of reptiles: a lizard (*Gallotia galloti galloti*), a salamander (*Tarentola delalandii*) and a skink (*Chalcides viridanus viridanus*).

Twenty species of birds have been observed, among which the endemics are the Blue Chaffinch (*Fringilla teydea teydea*), a veritable symbol of the Park, the blue tit (*Parus caeruleus*

*teneriffae*) y the great spotted woodpecker (*Dendrocopos major canariensis*).

There are five species of bats, a relatively high number in such a small territory but not surprising given the great variety of invertebrate fauna that they can feed on.

A part of the invertebrate fauna lives in practically sterile lavic flows that are perfect the perfect environment for many invertebrate species whose only nourishment is organic material carried by the wind. The majority of these lavic flow elements are carnivorous insects or nocturnal animals that live on decomposing material (saprófagos). The most unique species in this habitat is the vine tendril (*Anataelia canariensis*).

One of the most interesting habitats is made up of a network of crevices and small caves where the environmental conditions have allowed for the development of remarkable evolutionary adaptations. One of the most extreme cases is that of the endemic beetle *Domene vulcanica* that apart from an astonishing lack of pigmentation also has a body and appendages that are more stylised than those of its congeners.



*Aculepeira annulipes*

The best represented groups are the coleopterans, hemipterans, dipterans, hymenopterans and arachnids with 195, 167, 163, 105 y 102 taxons respectively. All of these display extraordinary endemic levels greater than 40% with 70 species that are exclusive to the National Park.

This section is complimented by information on vertebrate and invertebrate fauna that is attached to the annex documentation.

**Ecological value**

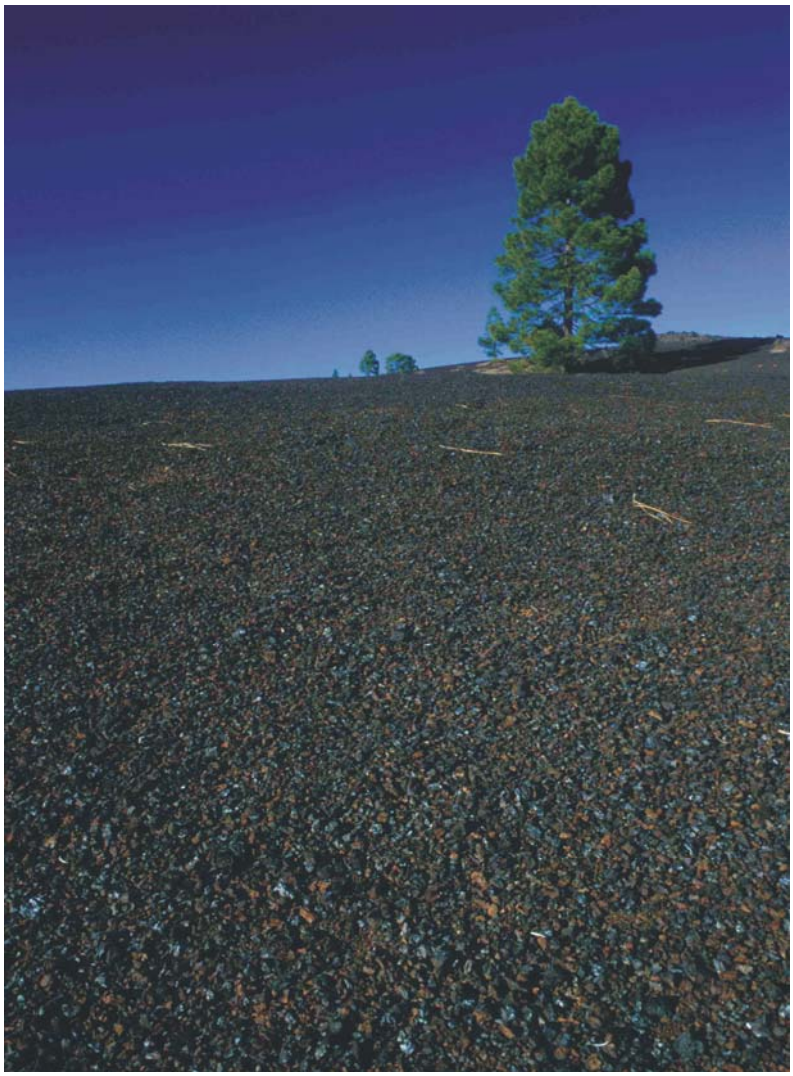
From an ecological point of view the biodiversity of Teide National Park is exceptional because it holds such a large number of endemic species of fauna and flora in a relatively small space (the Park holds the only or largest population in the world of close to 50 vascular plant species and also an extremely rich faunal biodiversity, especially in invertebrates). The large number of endemic species in the biota is caused by the convergence of two insular phenomena: first, the inescapable physical isolation of an ocean island, and second, the further isolation of its high-mountain ecology due to its tremendous altitude (the peak of Mt. Teide is the pinnacle of the Atlantic Ocean and after Hawaii, the highest volcanic island in the world).

The Park is one of the few volcanic island spots in the world that has zonal ecosystems above the altitude where trees can grow (“timberline”), giving rise to two unique ecosystems: the

summit *retamar* and the peak ecosystem. Furthermore, Teide National Park varies in altitude by more than 2,000 m, a distance larger than the height of Gran Canaria, giving it the best defined slope in the archipelago and, along with the Hawaiian Islands, the best defined in the world. This is an especially valuable aspect of Teide National Park because it provides one of the best natural experiments on primary ecological succession in the world, closely tied to the variety of the materials emitted and the adversity of the climate that slows the process down tremendously.

Finally, from a biogeographic point of view, although the high-mountain scrub of Tenerife is made up of totally different species, it is somewhat similar to the mountain scrub found on alpine mountains of comparable height in the southern Iberian Peninsula and in northern Africa. Teide National Park also holds one of the best examples of adaptive convergence in the world, an adaptation found in the silverswords (*Argyroxiphium*) of Hawaii and the *taginastes* (*Echium*) of the Canaries.

This topic is exhaustively explained in the Ecological Value section of the Annex Documentation.



***Pyroclast flatlands***

## Landscape

Seen from the sea, Teide has gained renown throughout the centuries for its gigantic silhouette that seems to float above the Alizé clouds. Standing tall above the archipelago, Teide combines the singularity of its ocean geography with the distinctiveness of the Canary Islands and that of the area around the mountain which has many forms linked together on different scales. The shapes of its landscape reveal units on different scales - processes from various epochs, diverse relief constructed and shaped in patterns that are not only congruent with each other but also with the geographic system of the Teide-Cañadas complex - combining to create large sectors made up of separate havens that at the same time give rise to and separate unique plant landscapes. The first thing our sea-faring observer perceives is the harmony and beauty of the stratovolcano complex soaring 1,700 m above the Las Cañadas landing or atrium. Then his eyes drift down to the Las Cañadas atrium itself, whose crescent moon-shaped floor stands at around 2,000 m above sea level. Today the huge volcanic caldera is teeming with a network of smaller volcanic mouths, lava flows from Teide and Pico Viejo and their peripheral domes - lavas that range from light flows to viscid discharges of obsidian blocks - and with plains of fine alluvial and endorheic deposits trapped and interspersed between those lavas. Next, peering through a spike of rocky, rune-shaped spires that divide the atrium in two, the observer sees Los Roques de Garcia, and closing the complex to the south, the rest of the distinctly linear and slightly arched volcanic edifice emerging from Teide; this edifice is affected by the Las Cañadas Caldera, more than 2,700 m tall at its highest point, an asymmetrical edifice that has a pronounced slope partially covered by large amounts of debris, and to the south it slopes sharply toward the middle heights and even toward the nearby shoreline.



*La Fortaleza wall and Los Guancheros dale*

This area is also covered by medium-sized and small forms like lava flows, ridges, cones, craters, volcano fields, domes, fissures, walls, taluses, plains, blocks, needles, tubes, jameos, channels, badlands and lahars, all of which are in stark relief.

The landscapes found on Teide are broadly defined by their major relief elements, such as the caldera and the stratovolcano, and in more detail by elements like the culmination of the great stratovolcano in the recent lava cone, by the black lava flows that spill over its flanks, by the double stratovolcano's ancient lava flows, by the peripheral domes and their flows, by the cones of the smaller parasite apparatus, by the mouths and lavas of the historic Las Narices del Teide eruption, by the large and complex crater at the top of Pico Viejo which constitutes one of the most remarkable parts of the complex, by the Los Roques ridge, by the different scarps and talus of Las Cañadas, by the domatic mesas of this edifice, by the marks left by torrential incisions and rock flows, by the alluvial and endorheic deposits.

The extensive Las Cañadas scarp has a characteristic composition and layout: from east to west it starts with alternating layers of lava flows and explosion debris, followed by an arc of pumice deposits, then outflow deposits, then it is raised by a central area of domes and massive flows before continuing with discontinuous flows cut by dikes and crowned with mesas. This group of landscape elements reveals the different phases of construction and remodelling that the entire volcanic complex has undergone and accumulates a nurtured geo-diversity in a coherent system.



***Pico Cabras or Echecere***

Sharp, strong colours come alive under the noonday sun: greys, blacks, whites, reds, browns, ochres, sometimes even shades of blue, in addition to the bright greens of the *retamas*, the undertones of the *apagados* and *codesos*, the intense colours of the *margaritas* and the yellows of the *hierba pajonera*. The strong colours of the landscape reveal its unique and powerful nature. This power can be seen by observers able to distinguish between the landscapes; there are burgeoning elements - depending on the scale on which we observe - inserted among the gnarled lava flows, pumice, sediments, etc. that appear to be natural “gardens” enclosed in metric spaces, and there is the broader associations of groups of elements according to the largest formations and communities. These associations are entirely differentiated by altitude, by the nature of the island within the Island and by the area created by the compound edifice in this volcanic cupola.

The dynamic landscape evolves over time, principally due to eruptions. A visit to the top of Teide with its fumaroles, or to a domatic crater with its lavas stretched by the friction of viscous outflow, or to Las Narices del Teide, a structure displaying the force of a recent eruption, or an observation of the black flows or of the southwest volcano field, allows us to see cones and lavas that seem to have been frozen in a recent eruption, the current formations have the appearance of an abruptly interrupted dynamism. There is also dynamism in the way erosion has shaped the forms, which can be seen in the Corbata del Teide torrent or in the debris talus on the Las Cañadas wall, indicators of different climatic periods after the opening of the caldera and the edification of the stratovolcano.

The distribution of its peculiar high-altitude vegetation- influenced by its rocky soil, the varying humidity in different places, the stratified climate and the shadows and sunny spots on the mountain, as well as the ancient pastures and the most recent eruptions - show high levels of natural harmony with that substrate and a liveliness that contradicts the superficial impression of sterility in a rocky, cold and dry environment. In addition, throughout the year the Teide landscape goes through a phenological variation filled with pronounced contrasts that is especially remarkable considering that the island is known precisely for its mild seasons.

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*Atrium and Las Cañadas wall*



*Rug made from flowers and coloured soils*



*El Riachuelo gallery*

### *Use of natural resources*

The ways that the natural resources have been used over time are related to water, apiculture, the extraction of coloured soil and the gathering of flowers as well as firewood and dry culm. These activities are regulated in section 11 of Decree 153/2002, October 24, approving the Teide National Park's Management and Usage Administration Plan.

The importance of these uses and the methods used to benefit from them are described in the following section:

### Extraction of coloured soils and the recollection of flowers

For more than a century, multi-coloured soils and different species of flowers from the National Park have been used to create artistic "carpets" to decorate the Town Hall Plaza and the streets of La Orotava during the celebration of the Octava del Corpus Christi, an important and unique cultural tradition of the villa.

This small-scale collection of soils and flowers is done manually on specific occasions on the periphery of Teide National Park and on the sides of the county roads that pass through it, taking advantage of naturally occurring soil run-off.

The collection is done with authorisation by the Administration which establishes where they can be collected, how much and under what conditions, as well as the monitoring and supervision systems. The extraction of soils and flowers that are in reserve zones in the Park for restricted use is prohibited.

### Water use

This resource is accessed via springs and galleries. Between the end of the 19$^{th}$ Century and the beginning of the 20$^{th}$ Century, subterranean water extracted using galleries was used for agriculture and human consumption.

The length of these galleries is generally short, the volume extracted and production small and therefore quantitatively this use was not very important when compared to the rest of the island. However, qualitatively, it was significant; first of all because of the irregular precipitation and the lack of alternative water sources at altitudes higher than 2,000 m, it was important to supply the National Park in this manner.

The exploitation of water in the Park is controlled by the Management and Usage Administration Plan. This plan monitors the legally constituted water exploitations and the volume of water that the competent organisation in the Administration authorises.

Because the number of exploitations and volume of water extracted cannot be increased, there will be no new authorisations.

**Apiculture**

Tenerife's orographic, climatic and vegetal conditions created nomadic traditions and so the beehives have been transported from the coast to the summit for ages. The hives are moved in order to find flowering plants during the spring and summer and adequate temperatures. At the end of autumn they are returned to their winter settlements.

Each year during five or six months, depending on the blooms, an average of 150 bee-keepers and around 1,500 hives are transported to the National Park and settled in 20 apiaries that have been authorised by the Administration and in accordance with legislation that regulates this utilisation of the Park.

The bee-keepers in Tenerife only work part-time and although their work is based on tradition, they use modern technology.

The importance of this use of the Park comes from the ancestral custom of transporting the hives to Las Cañadas. To this deeply rooted cultural factor the urban development of Tenerife and the characteristics of apiculture have to be added (an activity that has been limited to certain specific sectors), thus explaining why so many of them decide to transport the hives to the National Park every year.



*Manipulation of a beehive*

**The collection of firewood and dry scrub culm**

The collection of firewood and dry scrub culm dust is permitted in the area of Llano La Rosa - Montaña Limón.

The collection is done manually and limited to dead scrub branches. Only small quantities are removed by inhabitants of La Orotava who have a long tradition of using the Park in this way. In the last few years this activity has declined to such an extent that no solicitudes for this activity have been submitted between 2000 and 2004.

## 2.b History and Development

The Teide and Las Cañadas are not only a “monument” of the History of the Earth and Nature but also monuments of human history. For more than 2,000 years, two essential cultural traditions affected the formation of its landscape: the first is the North African proto-historic line, linked with the first inhabitants of the island, the Guanches, and the second is the European cultural line that starts in the Low Middle Ages of the Renaissance that later fused with the first and reaches the present day.

The first communities arrived in Tenerife, just as in the rest of the Canarian Archipelago, in the first half of the 1st millennium BC. The linguistic, anthropological and archaeological evidence indicates models from the North African proto-Berber and Berber area. These aboriginal settlements reflect the convergence of traditions that these groups brought with them with new traditions that arose from their adaptation to a singular environment, creating new cultural patterns of great anthropological value.



*Living space*

In the Guanche cosmography Teide represented the ultimate Sacred Mountain and was also a symbolic reference for the aborigines that lived on the other islands. Teide’s tacit importance has been maintained today by the peasant population.

The sacredness of this mountain and its surroundings was reinforced over time by various volcanic eruptions that we now know for certain were witnessed by the aborigines. This led to a reinterpretation of the volcano, emphasising its malignancy, which was recorded by the first written narratives by Europeans about the aborigines in the 15th and 16th Centuries, in consonance with the fear and superstition with which mountains were regarded in this period. In the first atlases and cartographic representations of the Atlantic islands the word “hell” was used to denominate the island.

The Canary Islands and the Teide, as its most visible element were a reference point for navigation between the Strait of Gibraltar and the Atlantic coast of Africa since Antiquity. It has been proven that the colonising peoples of the Mediterranean were interested in the Atlantic coast of Africa and that they had some knowledge of the islands.

In his encyclopaedia, Pliny the Elder (1st Century AD) indicates the existence of the insulae Fortunatae; a name that deeply rooted in the mythic tradition of the Mediterranean peoples and from then on the islands became a navigation milestone of the Atlantic in the Ancient World. As J. Delgado has indicated, the historical interests of colonising peoples were mainly focused on

the narrow coastal strip that extended from Tingi (Tangiers) in the north to the Roman colony of Sala (around Rabat) in the south. The archaeological, epigraphic, numismatic and literary imprints of the Phoenician, Punic and Roman presence clearly demonstrates this. Nevertheless, the coast that extended to the meridian was not totally unknown: there is material evidence that proves that certain coastal and insular enclaves like Mogador - Essaouira were at least known at some historical point and clues from documentation makes it likely that other islands (like the insulae Fortunatae) were also known.

These navigators must have perceived the symbolic significance of these sacred enclaves in the Atlantic with growing intensity as they advanced toward the meridian; the few times that they reached the Canary Islands, the probable limit of their explorations, they would have attributed great religious value to its highest summits, particularly Teide. The best evidence for this is found in a well known passage of Pliny (Naturalis historia VI, 202-205) integrating these islands in the classical tradition of “high places with religious connotations” and thereby leading us to believe that at some point the mountains of the Canarian Archipelago were a guide for Ancient mariners and the residence of their gods.

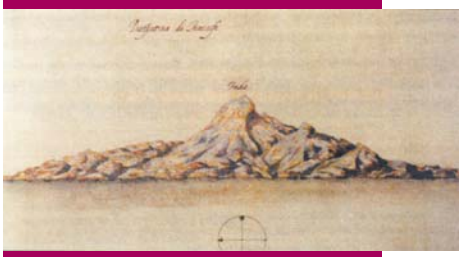
Over the centuries, the Canary Islands and the Teide would continue being a reference point for Atlantic navigation and therefore played fundamental role in the discovery and colonisation of America. The path that Columbus took in his search for a western route to the Indies started in Port Palos of Huelva “heading toward the Canaries”. “This day’s journey for Admiral Columbus in 1492 would convert the islands in an obligatory supply stop for ships during the last years of the 15th Century, the Age of Discovery, and during the 16th, the Century of Colonisation”, heading to the New World.

Teide’s role as a geographical reference point in the early moments of Atlantic navigation gave it “cultural importance” among European nations. Renaissance travellers and navigators emphasised the broad knowledge that existed of Tenerife’s mountain, especially among hegemonic sea-faring nations (England, Holland, France and Spain). It therefore forms part of the European landscape of American discoveries and colonisation.

Evidently, Teide and Las Cañadas didn’t only form part of the cosmography of the Guanches but also, and for the same reason, this area was a distinctive element of their cultural landscape. They quickly began to use the resources offered to them by they high mountain, understanding the idea of resource in its broadest sense, including material and ideological aspects. Their occupation of the summits and mountains of the islands left



*Edrisi’s world map*



*Torriani’s profile of Teide*

behind a large quantity of archaeological vestiges that today provide us with a unique example of the Guanche way of life and their adaptation to living in a volcanic island environment. It is logical that over 2,000 years the reason that the aborigines occupied these areas would change. The eruptions that occurred at different times after the arrival of the first settlers and the regular contact that they had with Europeans starting from the 13th Century surely modified their conception of the insular territory. The most common idea about the Guanche occupation of Las Cañadas has to do with their herding traditions.

The archaeological remains found around the Teide correspond to a temporary and seasonal human occupation. Innumerable structures have been conserved that are the remains of their modest and simple homes -huts, refuges and shelters- the majority of which were found in Las Cañadas. These sites give a unique insight into the way of life of these societies. The most common structures are related to their old living compounds (huts) that extend throughout the territory of the national Park with greater or lesser concentrations in certain areas depending upon the habitability of the surroundings or its resources. The concentration of these sites in parts of the national Park converts these areas in exceptional archaeological zones of the island; for example, Cañada Blanca, Cañada de La Grieta and La Angostura. These areas and others of interest are spatially displayed on the Archaeological map that is attached to this documentation. These ancient huts were oval or circular and generally built near rocks or natural formations of the environment. In the interior and exterior of these sites it is easy to see the vestiges of the Guanche way of life, with numerous remains of ceramic plates and lithic utensils.



***Valle Chafarí archaeological excavation***

Volcanic caves, crevices and tubes of appropriate dimensions were also used as living spaces or burial spots. The small hollows that are so abundant in lava flows also had their specific use, becoming a special category of Canarian archaeological sites known as escondrijos (hiding places), whose best and most representative examples have been found in these areas. This custom, initiated by the aborigines was later imitated by traditional herders. The lavic flows in Las Cañadas have become a “unique refuge” for a great quantity of aboriginal and ethnographic material that today make up a substantial part of the different museum collections on the island.

Another important practice of the Guanches that has left an imprint on the landscape is the use of obsidian. The absence of metals or other rocks on the island led its prehistoric inhabitants to use volcanic rocks, especially obsidians, to make their unique tools.



*Obsidian quarry/workshop*

The discoveries in this area are also often associated with death. Important sites have been found in Las Cañadas of collective or individual sepulchres with human remains, some of which have been mummified.

The processes of acculturation and transculturation that took place after the conquest of the island created peculiar social patterns. The natives were incorporated into the new economy and society fundamentally for pasturing because they knew the terrain and because of their tradition in raising livestock.

During these years new social structures were consolidated on the islands; the mountain and Teide took on a new and fundamental importance that, like the earlier era, included ways of exploiting their resources and other ideological and symbolic reasons.

The establishment of the new society fractured the indigenous populations in two: those that lived in areas inhabited by the colonisers quickly adapted their customs and those that lived far from the European settlements continued living their traditional way of live and even maintained their own language.

New ways of understanding Teide and its surrounding area were also introduced in the first years of the European colonisation. The Medieval concept of danger was quickly replaced by the "scientific" value of the mountain and by the exploitation of its resources using concepts introduced by the socio-economic interests of the new society. Hence, after the conquest and the first years of European colonisation new behavioural patterns were developed regarding the mountain by the island population, introducing ways of using its resources that would be reflected by the territory and in distinct cultural traditions with great anthropological value. This is how different traditional uses of Teide's resources and its surrounding area emerged. These practices would develop their own characteristics and historical evolution, leaving behind their particular imprints in the landscape that would add to archaeological and ethnographic richness that had already been left behind by the original Guanche indigenous populations.

Pasturing, collecting firewood and culm, coal making and apiculture are the main uses of plant species found on the mountain. Firewood and coal were indispensable energy sources for different domestic uses and coal making on the summits lasted until the second half of the 20th Century.

The exploitation of minerals basically focused on sulphur and pumice stone. At the end of the 19th Century some businessmen legally exploiting sulphur from the crater and adapted a path from Altavista that reached La Rambleta in order to transport this mineral. In theory, the commercial exploitation of sulphur ended in 1918, however there is documentation that makes reference to illegal extraction beyond this date.

Because of the lack of roads and lorries, pumice stone was exploited in small quantities using beasts of burden, but the development of transportation, the construction of county roads and the demand for these products in agriculture and construction led to the increase of its extraction in different parts of the national Park such as Montaña Blanca, Montaña Majúa and even difficult to reach areas like the summit of Guajara.

The extraction of coloured soils and the collection of flowers in the National Park in order to create the rugs that decorate the Town Hall plaza and the streets of La Orotava during the celebration of the Octava del Corpus Christi is a tradition brought from Italy by the Monteverde y del Castillo family who covered the

outside of their house this way in 1847. In 1906 they started creating these special rugs in the Town Hall plaza in order to celebrate the visit of Alfonso XIII.

In the 17th century snow was freely collected in hollows, crevices and snowdrifts on the summit, turning to the Ice Cave when it melted at lower altitudes. The Ice Cave or Snow Cave, described in various accounts of the 17th, 18th and 19th Centuries, was a perfect natural deposit and safe place to store fresh water during the summer. The Teide and Las Cañadas guides had the custom of stopping by the grotto after coming down from the crater in order to supply themselves with water for the rest of the journey. Travellers, visitors and sulphur workers also went to the grotto for the same reason.

The exploitation of plant species, water, snow and the extraction of minerals for different reasons was interrupted by the creation of the Park in 1954, the creation of a Regulation of the protected natural space and, above all, the 1981 Reclassification Law and the Management and Usage Administration Plan in 1984.

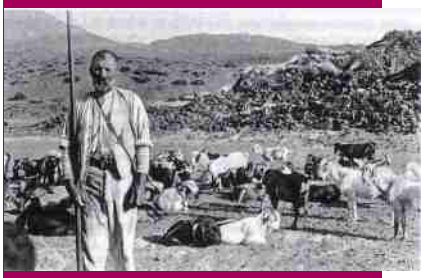
Teide and Las Cañadas have also played an important role in the History of Science and of knowledge: they have been the object and support of scientific research in various fields. Teide's proximity to Europe, its location at a crossroads of ocean routes, its ecosystems and accessibility explain why naturalists, scientists and members of the sophisticated European elite were attracted by the huge volcano.

In the 18th Century, English scientists included Teide in their experiments with references appearing in the first publications of the Royal Society of London. The first climb to its peak for scientific purposes was done by Abbot Feuillée who was important for his contributions to cartography and geodesy. The mathematician and geodesist J. Ch. Borda wrote an essay on the article with data about their population, customs and economy.

In scientific botany, the Canary Islands were the most honoured place of the 20th Century: Linneo and Masson classified and collected plants and Broussonet described new species for the Canaries, creating a basis for later studies of the flora of the islands.

In 1799, Alexander von Humboldt arrived in Tenerife and made a great contribution to science, the analysis of plant landscapes, describing the plant coverage of the island for the first time with the help of Bomplant and Broussonet's manuscript notes. The panorama was completed by Bory de Saint-Vicent who created the first printed account of plants and animals in the Canary Islands.

TEIDE
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*Pasturing in Las Cañadas*

Studies that have been done on Teide have made great contributions to volcanology and, more specifically, on the creation of volcanic calderas. The founder of scientific volcanology, Leopold von Buch, visited the islands in 1815 and carried out the first climatological and geological studies of the archipelago, coining terms such as “caldera”. He also came up with the first theory explaining the creation of Las Cañadas, the “elevation craters” theory and attributed for the first time the creation of La Orotava Valley to a giant landslide. Lyell, one of the fathers of geology, also visited the island and included his work on Tenerife, Teide and other places in the Canaries in his magnum opus. The Germans Fritsch, Hartung and Reiss elaborated a study and a map of geology in Tenerife.

The study of Canarian nature by two important researchers, S. Berthelot and Ph. P. Webb, resulted in a French publication of one of the most important naturalist studies of the 19th Century: The Natural History of the Canary Islands. E. Haeckel, founder of the science of ecology notes his stay on the island in his book From Tenerife to Sinai.



*Collecting firewood*

The excellent conditions that Mt. Teide and Las Cañadas offer as observation points led to the visit of the Astronomer Charles Piazzi Smyth and his wife Anne Duncan in the 1850s and also to that of Jean Mascart the following century. Las Cañadas has been consolidated as a privileged site for astronomical research by the installation of observatories by the Astrophysics Institute of the Canary Islands (IAC). The exceptional meteorological conditions in Las Cañadas also awoke great scientific interest in the 19th Century, leading in 1909 to the installation of pre-fabricated houses in Cañada de La Grieta, donated by Emperor Willhem II of Germany in order to carry out agrological studies. It has also led to the installation of the Izaña Atmospheric Observatory, the principle North Atlantic reference point for the measurement and monitoring of global atmospheric pollution.

In the second half of the 20th Century Teide became one of the first nature tourism centres; the first tourist guides of the archipelago were published in this period and the stories of O. Stone and G. Grahan-Toler projected the construction of the Altavista Refuge, the first facility built on Mt. Teide specifically for tourism.

The climate of Las Cañadas was considered to be healthy by the inhabitants of the island. From this belief led to a sort of custom where people would climb Teide to cure certain skin diseases such as psoriasis, parapsoriasis and leukoderma, respiratory diseases like asthma and general diseases such as anaemia. From a medical point of view, the dryness of the climate and the absence of allergenics helped to cure these ailments.

Since the inhabitants of La Orotava and other parts of the island demanded the creation of a sanatorium, an Anti-Tuberculosis Hospital was started in 1922 with the construction of the doctor's house and stables, but the rest of the project was never carried out. Because of this use today it is still called El Sanatorio (the sanatorium).

In order to exploit the natural resources, exchange products, explore and carry out research in Las Cañadas, goat herders, coal makers, bee-keepers, snow collectors, firewood collectors, gangocheros, scientists and adventurers used the paths that connect the north and south of Tenerife via the summit. The most important of these was the Camino de Chasna, which was economically important until the first half of the 20th Century, when the road from La Orotava to Vilaflor and the one between La Esperanza and El Portillo began to be used (the Chío road was finished at the beginning of the 1970s). The trails and paths used today by visitors of the National Park were open connections in pre-historic and historic times.

El Portillo was created from the spatial configuration of the road that connects La Orotava and Vilaflor. As a consequence of tourism between 1955 and 1967, plots of land belonging to the Municipal Government of La Orotava were acquired via concession, donation or purchase in order to construct the Parador de Tourismo de Las Cañadas del Teide, La Ermita de Las Nieves, the Teide cable car, the DISA Service Station and the Montaña Rajada telephone relay.

This section is exhaustively explained in the Archaeology and History section of the Annex Documentation.



*Siete Cañadas trail*

# 3. Justification for Inscription

## 3.a Criteria under which inscription is proposed

In accordance with the guidelines found in section II.D of the "Operational Guidelines for the Implementation of the World Heritage Convention" (february 2005), the Proposal to Inscribe Teide National Park on the World Heritage List is based on criterion (vii), concerning superalative natural phenomena or areas of exceptional natural beauty and aesthetic importance and on criterion (viii), referring to outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.

***Criterion vii***

The Cañadas-Teide volcanic system, located in the centre of the Canarian Archipelago, was created where the Atlantic structural area -environment of the ocean ridge- and that of the African continent -the Atlas mountain range- meet. The configuration of the immense structures emblematic of this volcanic system and that of its lesser elements, form a distinctive geometry that reflects this connection. From Iceland to the Antarctic, it is impossible to find a similar configuration along its longitude, and if you trace a line from east to west along its latitude, from Sinai to the Eastern Sierra Madre, you will not find anything similar either. Tenerife itself is an elevated island topped off by an enormous dormant volcanic structure that towers above the surrounding marine abysses; the imposing silhouette of this unique environment seems to float above the clouds of the subtropical mountains, allowing travellers to locate the island beneath, although they cannot see it.

Another outstanding aspect of its landscape is the uncommon frequency of the eruptive forms, explosive and effusive constructions and different kinds of cones and flows that are found concentrated in a reduced area. Although this area radiates chaos, there is actually a precise order and strict logic found in the activity, spaces, evolution and material of the time periods, rocks and raised shapes found there. The external impression of a sterile, rocky, cold and dry environment belies an ecological and chromatic liveliness; even the distribution of its outlandish, high-altitude vegetation reveals the natural harmony that exists between the plant life and the substrate. This unusual landscape consists of powerful shapes and intense, rough colours covered by



*Teide over the clouds*

only a light film of vegetation that simultaneously reflects both the aesthetics of immense volcanoes and that of vast deserts. The variations in the continuity and coating of the vegetation, along with the different combinations of flower species, emphasize the geomorphological features of the area, further accentuating the different types of raised shapes and their distribution. The originality produced by its geographical location can be seen in certain physiognomic traits of its vegetation. Despite being largely made up of the shrubbery characteristic of temperate mountains, its vegetation includes rare and extremely beautiful elements such as species from the *Echium* genus reminiscent of the vegetation found in the heights of tropical mountains, indicating the transitional nature of this high mountain in the Atlantic.



***Teide neck and black lava flows***



*Roques de García*

The aesthetic qualities that Teide contributes to the landscape change at different times of the year and throughout a single day, creating an ever-changing panorama. For instance, the changing phenology of the Teide landscape is filled with contrasts. Although this kind of variation is found in many places, some of its aspects are quite pronounced on Teide, especially if we consider that it occurs in an environment known for moderate changes between seasons: in the winter the landscape is blanketed by snow; in spring there is an explosion of plants in bloom, such as Spartocytisus supranubius and Echium sp.; the dry summer brings minerals back into the forefront; and autumn is marked by periods of heavy rains and the bright colours of the changing leaves, among them the hierba pajonera's yellow. Throughout the day the intense quality of the light also creates striking contrasts, from daybreak, when the extended rays of light and long shadows highlight the different colours of the lava flows and plants, to the inexorable light of the midday sun at its zenith, to the ephemeral sunset that briefly spreads gentle tones across the landscape putting all of the volcanic shapes into sharp relief. And yet, the night-time sky is even more remarkable. At night the atmosphere is so pure and diaphanous that the sky seems to overflow with uncommonly sharp constellations and the spirals of the Milky Way gleam brightly. The presence of astronomy observatories is testament to the outstanding qualities of Teide's high atmosphere, which provides a singular high-mountain environment at subtropical latitude in the Atlantic Ocean.

In addition to the richness of the natural aspects of the landscapes on Teide, this space also contains the biggest, most accessible and best studied active volcanoes in the world. Because of this accessibility it has become a universal standard for culture and science, as well as a spectacular and world renowned site for geo-tourism. This majestic landscape is a feast for the senses and the mind, equally attractive to tourists and scientists. Despite the fact that some of the geomorphological elements found in the Teide landscape exist in other places, they are only found individually or partially; what sets Teide apart from other areas is that it is the only site where all of these elements can be found in the same place, with easy access for education or research.

***Criterion viii***

The principal reasons that justify this singularity and universal value are:

- Teide National Park includes a central volcano that, in the final stage of its creation, was shaped by explosive eruptions (plinian eruptions). This volcano has a great caldera on its summit (Las Cañadas Caldera) with the Pico Viejo and the Teide, two large stratovolcanoes, nested in its interior; the still active Teide rises 3.718 m above sea level (7.500 m above the ocean floor), making it the third highest volcanic structure on the Planet.

- The geological processes that configured Teide National Park (and continue today) are very representative of intraplate ocean island volcanism, occurring here in exceptional conditions. Several conditions that are very unusual for intraplate ocean islands coincide in the Canary Islands, such as the slow movement of the African plate (which is an order of magnitude lower than that of the Pacific plate), the lower intensity and low fusion rates of the magmatic plume that generated the archipelago, and its uncommon position on the margin of a passive continent (100 km from the coast of Africa), which has prevented the relatively quick sinking (subsidence) that is habitual among this type of islands. This exceptional geodynamic setting has prolonged the volcanic history of the islands (>23 ma, Tenerife 12 ma), giving the magmas time to evolve into highly differentiated products, a process that has never been able to culminate in the remainder of the intraplate volcanic islands where the most differentiated products (felsic) of the magmatic series remain incomplete. Because of these conditions, the Canary Islands have products, features, structures and eruptive processes that only exist in such spectacular variety in this archipelago; and in Tenerife, currently at the peak of its geological development, these elements have their best representation, particularly in Teide National Park.

- The natural landscapes present in Teide National Park are exceptionally beautiful, and their interest is incremented by the outstanding geological processes that created them. A giant instantaneous lateral landslide carved out an extensive horseshoe-shaped depression whose head is the current Las Cañadas caldera, 16 km in diameter bounded by a rim 600 m high. Later eruptive activity completed the construction of two felsic stratovolcanoes -Pico Viejo and Teide-, the latter reaching an altitude of 3718 m, nested in the depression. This landscape, readily viewed because of the scarce vegetation (although a spectacular flora with

abundant endemisms) and many lookout points (the peak of the Teide being the most impressive), has in itself outstanding universal interest, complementing the above-mentioned geological and volcanological values.



*Las Cañadas Caldera*

The geological elements that constitute Teide National Park are the final result of differentiation processes and they represent the entire range of the magmatic series, with a large amount and variety of felsic (phonolitic) products, circumstances that do not occur in other volcanic intraplate oceanic islands (for example, the Hawaiian Islands) where these evolved terms are poorly represented. Among the UNESCO World Heritage properties offered by intraplate ocean islands, Teide National Park is unrivalled in this representation. The only natural site in this class that offers geological elements that are equally unique and outstanding is the Hawaii Volcanoes National Park, but this property only affords volcanic eruptions involving the least evolved magmas of the intraplate oceanic island magmatic series (OIB). With the inclusion of the Teide National Park, these two volcanic scenaries represent with greater integrity the entire evolution of intraplate oceanic islands.

The fundamental idea underlying this proposal is that Teide National Park not only does not duplicate or compete with sites that are already integrated into the network of World Heritage sites, but will actually complement and complete the representation of intraplate island volcanism in the world, thereby considerably increasing the value and integrity of the list.

- Among the geological processes important in the formation of the relief and the natural landscape and the relevant geo-morphological and physiographic structures in Teide National Park the following stand out:

    - The Las Cañadas volcano: an exceptional case in intraplate oceanic islands of the growth of differentiated (felsic) volcanoes capable of explosive phonolitic eruptions (plinian eruptions) and probably caldera-forming eruptions.
    - The Las Cañadas caldera: one of the most spectacular, best displayed and accessible calderas on the Planet, its origin is still a subject of scientific debate between vertical collapse, gravitational landslide or a combination of both.
    - The active north-west and north-east rifts: an excellent example of active rifts and the role these structures play in controlling crucial processes in the development of oceanic islands, in their growth and subsequent mass-wasting destruction by giant gravitational landslides.
    - A possibly exceptional example of the role that the rifts play in generating consecutive, complex processes that give place to landslide embayments



*Roques de García*



*Abejera mountain*

and later fill them in, inducing magmatic differentiation resulting in the construction of felsic stratovolcanoes nested within these depressions.

- Two large phonolitic stratovolcanoes - Pico Viejo and Teide: the Teide, still active and 3.718 m high (7500 m above the ocean floor), the third highest volcanic structure on the Planet. The magnificence and accessibility of these stratovolcanoes are unique among volcanic oceanic islands.
- An excellent example of the complete evolution of the magmatic series pertaining to intraplate oceanic islands (Oceanic Island Basalts or OIB), with an outstanding representation of the initial, intermediate and more evolved products of this series, as well as less frequent processes of mixing of basaltic and phonolitic magmas.

These unique geological processes have created exceptionally beautiful natural landscapes that add the purely aesthetic enjoyment of spectacular landforms and relief structures (at certain times of year augmented by a splendid blooming of endemic flora) to the cultural and scientific interest of the area.

The Teide and the Las Cañadas caldera have had an important role in the History of Science and important contributions were made here to the development of modern Geology and Volcanology. The island of Tenerife, and in particular the present Teide National Park, has attracted the interest of naturalists and geoscientists from all over the world, including pioneer work by naturalists at the beginning of the 19$^{th}$ Century such as Leopold von Buch, Alexander von Humboldt and Charles Lyell, who established the basic concepts of Geology and Volcanology while studying this island. In this cultural and scientific context, Teide National Park could be to Europe what Hawaii Volcanoes National Park is today to the United States and Japan.

The economy of Tenerife is based on tourism and therefore the island is readily accessible, especially from Europe. The number of inhabitants (almost a million, about five times larger than that of Hawaii) and the number of visitors (more than 4 million annually) guarantee that the unique and outstanding geological and scenic value of the Park will be enjoyed by a large number of people. Complementarily, improving and publicizing the knowledge of the island will undoubtedly contribute to reinforce the protective measures already in place.

In addition to the outstanding geological and scenic value, Teide National Park has other qualities that are equally outstanding, such as the endemic flora and fauna, aboriginal archaeological sites and the pureness and transparency of the atmosphere which have made it the seat of one of the most

important astrophysics and atmospheric complexes observatories in the world. Without a doubt, these valuable characteristics make this property one of the most complete and extraordinary sites in volcanic oceanic islands on the Planet. The ready access to this property for a large public is guaranteed since tourism is the main economic activity of Tenerife, one of the best connected islands in the world.

The justification of criteria (vii) and (viii) is complimented by reports that are attached to the Annex Documentation, supported by cartography and posters.



*Las Cañadas wall and Teide lava flows*

## 3.b Proposed Statement of Outstanding Universal Value

As indicated in earlier sections, the reasons to propose Teide National Park for inscription on the World Heritage List can be summarised in the following concepts:

- Teide National Park has exceedingly beautiful landscapes and presents outstanding geological and volcanological elements that represent the entire evolution of the magmatic series of intraplate volcanic oceanic islands, whose main episodes include the partial destruction of an earlier evolved and explosive central volcano in its terminal phase, and the subsequent formation of a spectacular depression partially filled by the construction of large felsic nested stratovolcanoes.

- This sequence of processes provides an outstanding example of important milestones in the evolution of a major stage of earth's history such as the intraplate oceanic islands. It is also unique, because the remainder of the islands in this category, with shorter volcanic histories, have not reached the most evolved phases of the magmatic series that give way to the formation of these felsic central volcanoes.

- The universally outstanding geological and volcanological elements located in Teide National Park represent on a large scale and with integrity the complete magmatic series of intraplate oceanic islands, as well as the related products, structures and eruptive processes.



*Teide-Pico Viejo stratovolcano*

## 3.c Comparative analysis

The Global Volcanism Program (GVP), the Smithsonian Institute's international database on volcanoes and eruption information has records for approximately 1500 volcanoes active since the start of the Holocene period. Of these, approximately 60% (900) are stratovolcanoes (alternatively known as composite volcanoes), the others being shield or fissure volcanoes, or volcanic domes and monogenic vents, such as maars. The Teide National Park protects the summit area of the Cañadas volcano, which the GVP classifies as a stratovolcano.

While the GVP contains some information on the eruptive history and morphology of individual volcanoes and provides a basis for a simple review, there is no single database anywhere in the world that allows researchers to compare the qualities and values of individual volcanic forms. Indeed, these features will not have been recorded on most volcanoes, and even where they have the details will be hidden in scientific papers. It is not therefore possible for this comparative study to interrogate volcanological databases to demonstrate the Outstanding Universal Value of any particular feature. Rather, such a comparison must rely on summary texts and the personal knowledge of individual scientists.

### *Geological context for comparative analysis*

There are two ways in which a volcano may be classified: by form (morphology) and geophysical context, although the two are inter-related through magma type.

The table that sohws the Sites inscribed for their outstanding volcanic landscapes and active volcanic processes, abstracted from Bloom (1998), and adapted from Rittman (1962), presented at the end of this section, classifies volcanic form under the criteria of magma type, the nature of the volcanic activity, and the volume of material erupted. From this table it will be seen that the forms of stratovolcanoes are usually characterised by large volume, mixed effusive and explosive activity, arising from a magma that is usually more viscous than basalt. Another way of classifying volcanic form is by the history of the activity, whether the form is the product of a single period of activity, in which case it will be monogenetic, or there have been multiple periods of activity from the same vent, in which case the form will be polygenetic. Confusingly, some geologists (e.g., Francis, 1993) classify stratovolcanoes (or composite volcanoes) as simple or composite, although both forms are polygenetic in origin.



*Teide crater*



*Pico Viejo crater*

In geophysical terms, volcanoes may be classified according to their location relative to the boundaries of the Earth's lithospheric plates. Fissure and shield volcanoes are typical of the divergent boundaries, while stratovolcanoes are the type volcano of the convergent boundaries (subduction zones). This is a gross simplification, however, and varying volcanic forms may also develop over point heat sources thought to be caused by ascending plumes of hot magma in the mantle (or 'hot spots') and/or by the chemical evolution of the magma supply. Volcanoes forming over hot-spots on the ocean floor typically erupt more fluid basalts and build shield structures. However, as the movement of an ocean lithospheric plate carries a volcano and its magma chamber away from the heat source, the magma may become more silicic by the process of fractional crystallization, resulting in more explosive activity and the construction of a stratocone on the basalt plinth. Hot spot activity may also occur beneath continental crust, where partial melting and assimilation of continental rocks may cause the eruption of highly felsic magma, giving give rise to the construction of very explosive stratovolcanoes, caldera complexes and domes (Mount St. Helens, USA; Emi Koussa, Chad).

Thus, while chemical evolution of the magma occurs to a varying extent beneath most ocean floor intra-plate volcanoes, it is only in a slower moving, longer-lived, volcano that differentiation continues sufficiently to generate felsic magma and cause explosive activity, with the construction of a significant composite stratocone and caldera. While there are other intra-plate ocean floor stratovolcanoes (e.g., Pico do Pico, Azores; Fogo, Cape Verde Islands), only a handful (e.g., Mount Halla, Korea) are located on slow-moving or stationary lithosphere. However, none of the latter are as well studied, as large, or exhibit as wide a diversity of structures and landforms as the Cañadas volcano. The Cañadas volcano on Tenerife therefore represents the world's finest example of this type of structure.

***Regional significance***

Europe and the North Atlantic region have some highly significant volcanoes, both in terms of their geology and history of scientific study. These include the famous Italian volcanoes of Vesuvius, Etna, Campi Flegri, Vulcano, and Stromboli, Thera in Greece, the Eiffel district in Germany, the Puy district in France, the Tertiary volcanic province in the UK, and the Atlantic Ocean volcano groups in Jan Mayan, Iceland, Azore, Madiera, Selvagens, and the Canary Islands. The Cañadas volcano stands out in this group because it is the dominant intra-plate structure, the largest and most complex stratovolcano, and with Vesuvius and Etna, one of the best studied volcanoes in the region. It is has the most impressive caldera, eruptive rift system, and felsic lava flows. Within the boundary of Teide National Park the summit area

with its diversity of landforms and special ecosystems is especially well protected, and it is the most visited of any volcano in the region.

***Importance of the volcanic system***

Like all other stratovolcanoes, the Cañadas edifice possesses a range of associated forms and structures, although on Tenerife these are particularly well defined and comprehensive. Especially important is the fact that all the associated landforms are represented within the boundary of the Teide National Park, a situation that make the Cañadas volcano one of the most important protected volcanic landscape in the world (see below). In addition to the edifice of the volcano itself, the site contains an internationally significant caldera, a clearly defined eruptive rift system, sector collapse scars, subsidiary cones and vents, domes and explosive and effusive deposits. While individually each of these features may be found on other stratovolcanoes, it is unusual for all of them to be so well displayed in the summit area of a single edifice. In addition, some of these features stand out as having special scientific qualities and values. For example, the caldera is larger than most others associated with stratovolcanoes (for example, Crater Lake, Idaho; Tambora, Java), and its formation has revealed some of the best and most accessible rock exposures known on any volcano. Particularly relevant also are the huge gravity slides that scallop the flanks of the volcano and the unique magma system that erupts both basaltic and phonolitic lavas.



***Meridian wall of Las Cañadas Caldera***

***Comparison with other volcanoes on the WH List***

Investigation of the World Heritage List reveals that there are 26 sites located in volcanic terrain (this contrasts with UNESCO's Draft Global Strategy for Geological World Heritage Sites, March 2004, which lists only 17 sites under the category Volcanoes/Volcanic Features). The 26 sites are included in the table that shows the Sites inscribed for their outstanding volcanic landscapes and active volcanic processes. While some of these sites (e.g., Kamchatka, Russian Fed.; Hawaii Volcanoes National Park, USA; Tongariro National Park, New Zealand; Aeolian Islands, Italy) were inscribed for their natural values in which volcanic landforms and processes figure significantly, many others were inscribed for their biological or cultural values and their geology is secondary to their inscription (e.g., Ngorongoro Crater, Kenya; Pico Vineyard Culture, Azores, Portugal ; Central Eastern Rainforest Reserve, Australia).



***Pilón de azucar***

Analysis of the citated table reveals the following relevant facts:

- The list does not contain any example of an ocean floor inter-plate stratovolcano (although as explained above the shield volcanoes of the Hawaiian Volcanoes National Park site are representative of ocean floor intra-plate volcanism).
- With the exception of the volcanoes within the Hawaiian Volcanoes National Park, none has received the depth of study that the Cañadas edifice has.
- Three of the volcanic sites exposed in the table fall within the Europe/North Atlantic region, although two of these (Thingvellir National Park, Iceland, Pico Vineyard Culture, Azores) do not include a major volcanic edifice. The remaining Aeolian Island WHS lies over a convergent plate boundary (subduction zone), rather than ocean floor.
- Calderas are represented on the World Heritage List, but the caldera of Yellowstone National Park is of the resurgent type, while others associated with stratovolcanoes (e.g., in Kamchatka and Tongariro National Park) are far less imposing or accessible than the Cañadas caldera. With the exception of Yellowstone, the only other large caldera is Ngorongoro, but because of its great age this has been extensively modified by weathering and erosion.
- Sector collapse or gravity slide is a feature ubiquitous to stratovolcanoes and ocean shield volcanoes, and while collapse will be a feature of most volcanoes on the World Heritage List, it is only specifically mentioned in the inscription of the Pitons Management Area WHS, St. Lucia (although the central features of this site are two prominent dacite lava domes).
- The World Heritage List contains representatives of ocean island volcanic groups (e.g., Lord Howe Island Group, Heard and McDonald Islands, Galapogos Islands, Rapa Nui, Gough and Inaccessible Islands, NewZealand Sub-Antarctic Islands), but with the exception of Heard and McDonald Island these islands are generally built from seamounts or shields, and even the stratovolcano of Mawson Peak on Heard Island is far less mature and studied than the Cañadas edifice.

Thus, in summary, while there are sites with stratovolcanoes inscribed on the World Heritage List, these are usually located over convergent plate margins (e.g., Kamchatka, Russion Fed.; Tongariro National Park, New Zealand; Aeolian Islands, Italy; Pitons Management Area, St. Lucia). Some ocean floor island group WH Sites do contain stratovolcanoes, but the majority of these are formed from seamounts and shield vlcanoes, and none of the stratovolcanoes rival the Cañadas volcano in size, complexity, age, depth of study, or relevance to science. The

World Heritage List also contains examples of calderas and sector collapse, as well as other associated volcanic features, but these are no-where displayed so dramatically, so comprehensively, and as an integral part of the volcanic system, as on the Cañadas edifice and within the Teide National Park.



***Acrettion balls***

### *Educational values*

The Cañadas volcano and Teide National Park receives millions of visitors annually specifically to view the caldera and ascend to the summit of the Teide stratocone. Visitors are attracted by the unusual landforms, the fact that this is an active volcano, and the majestic scenery and colourful beauty of the National Park. There are many other volcanoes in the world that attract a significant number of tourists to view their volcanic landforms and, if lucky, an eruption (e.g., the US volcanic National Parks, Vesuvius and Mt Etna in Italy, Iceland, Undara National Park in Queensland, Australia, Roturua in New Zealand, etc.). Nevertheless, as reveals the table that shows the annual recreational visits in 2004 to the world's most popular volcanic geotourism sites, Teide National Park (with 3.5 million annual visits) can justifiably claim to be the most visited for the purpose of geotourism of all the volcanic sites in the world. In the Teide National Park the high educational values of this form of geotourism are reinforced by education and interpretation programmes that are as good, if not better, than those of other important world volcano sites.



***Teide stratovolcanoand adjacent cones***

| SITES INSCRIBED FOR THEIR OUTSTANDING VOLCANIC LANDSCAPES AND ACTIVE VOLCANIC PROCESSES | | | |
|---|---|---|---|
| **Name of World Heritage Site** | **Country** | **Type of volcanic features** | **C*** |
| Giants Causeway | UK | Columnar basalt | |
| Hawaii Volcanoes Nacional Park | USA | Kilauea and Mauna Loa volcanic shields, calderas, basaltic volcanism. | ✓ |
| Galápagos Islands | Equador | Whole archipelago, basaltic lavas and shield volcanoes, some with summit calderas | |
| Isole Eoliae (Aeolian Islands) | Italy | Stratovolcanoes Stromboli, Vulcano, Lipari, sector collapse | ✓ |
| Pitons Management Area | St. Lucia | Dacite domes, collapsed stratovolcano, sector collapse | ✓ |
| Sanguy National Park | Equator | Stratovolcanoes Tungurahua, El Altar, Sanguy, caldera | ✓ |
| Tongariro Nacional Park | New Zeland | Stratovolcanoes in two groups, with other vents, domes and craters: In N group - Kakramea, Tihia, Pihanga; in S group - Tongariro, Ngauruhoa, Ruapehu. | ✓ |
| Ujong Kulon Nacional Park | Indonesia | Stratovolcano and caldera Krakatoa | |
| Virunga Nacional Park | Congo | Stratovolcano Nyamulagira, shield volcano Nyiragongo | ✓ |
| Volcanoes of Kamchatka | Russian Fed. | As many as 300 volcanoes, most being stratovolcanoes with all associated features represented | ✓ |
| Yellowstone Nacional Park | USA | Resurgent caldera. | |
| **OTHER INSCRIBED SITES NOTABLE FOR THEIR VOLCANIC INTEREST** | | | |
| **Name of World Heritage Site** | **Country** | **Type of volcanic features** | **C*** |
| Central Eastern Rainforest Reserve | Australia | Dispersed (serial) site with dissected Tertiary basaltic structures, incl. the Tweed shield volcano. | |
| Gough and Inaccessible Islands | UK | Eroded summit of Tertiary volcano | |
| Heard and McDonald Islands | Australia | Basaltic stratovolcanoes incl. active Mount Mawson | ✓ |
| Komodo NP | Indonesia | Volcanic bedrock | |
| Kahuzi-Biega Nacional Park | Congo | Part of W mountains of Gt Rift Valley - Mt Kahuzi and Mt Biega are Tertairy volcanoes | |
| Lord Howe Island Group | Australia | Eroded shield volcano - part of 1300 km seamount chain | ✓ |
| Mount Kenya | Kenya | Tertiary volcanic complex | |
| Mount Kilimanjaro | Tanzania | 3 large stratovolcanoes | ✓ |
| Morne Trois Pitons Nacional Park | Dominica | Dissected Tertiary stratovolcano, with domes and fumaroles | |
| New Zealand Sub-Antarctic Islands | New Zeland | Basaltic lavas and shields | |
| Ngorongoro Conservation Area | Tanzania | 17 km diameter Tertiary caldera | ✓ |
| Pico Island, Azores | Portugal | Walled vineyard landscape on basaltic lava flows (site does not include Pico stratovolcano) | |
| Rapa Nui (Easter Island) | Chile | Basaltic shield and lavas | |
| St. Kilda | UK | Volcanic bedrock | |
| Thingvellir Nacional Park | Iceland | Holocene basaltic lava field, graben | |

**C*: inscribed volcanic properties that have characteristics similar to those of Teide National Park.**

| ANNUAL RECREATIONAL VISITS IN 2004 TO THE WORLD'S MOST POPULAR VOLCANIC GEOTOURISM SITES | |
|---|---|
| NAME OF SITE | ANNUAL NUMBER OF VISITS |
| **Teide National Park**, Spain<br>Source: pers.comm.park admin. | 3,540,195 |
| **Vesuvio National Park**, Italy<br>Source: Report by Park Director in the Journal Iniziativa Meridionale per il Mezzogiorno Del Europe, nov. 2001. | 1,000,000 |
| **Aeolian Islands WHS** (Vulcano, Stromboli, etc.), Italy<br>Source: UNEP/WCMC WHS datasheet | 200,000* |
| **Mount Etna Provincial Park,** Sicily, Italy<br>Uncertain source: local web-site | 240,000* |
| **Giant's Causeway**, UK<br>Source: Northern Ireland Tourist Board | 500,000* |
| **Yellowstone National Park**, Wyoming, USA | 2,868,317 |
| **Mount Rainier Nacional Park,** Washington, USA | 1,217,750 |
| **Haleakala National Park**, Hawaii, USA<br>Source: US NPS Public | 1,455,477 |
| **Hawai Volcanoes National Park**, Hawaii, USA<br>Source: Use Statistics Office | 1,307,391 |
| **Crater Lake National Park**, Oregon, USA | 417,066 |
| **Lassen Volcanic National Park, California**, USA | 379,667 |
| **Galápagos Islands**, Equador<br>Source: UNEP/WCMC WHS datasheet | 60,000* |
| **Geysir,** Iceland<br>Source: pers. comm. | 122,000* |
| **Tongarira National Park**, New Zeland<br>Source: UNEP/WCMC WHS datasheet | 1,000,000* |
| **Monte Fuji**, Japón<br>Source: these are unofficial figures from http://web-japan.org/atlas/nature/ nat25.html. N.B. - 1) the larger figure is the number of visitors to the Fuji-Hakore-Izu National Park, which is a popular holiday destination with lakes and resort villages; 2) Fuji has spiritual significance and it is the intention of every Japanese citizen to visit it at least once in their lifetime-therefore visits are not specifically made for geotourism. | 103,000,000* |

**(*) Numbers aproximated**



***Montón de Trigo wall and dale***

TEIDE
PARQUE NACIONAL



*La Fortaleza wall*



*Stratovolcano and Roques de García*

## 3.d Integrity and/or Authenticity

Teide National Park meets all of the integrity conditions required to be declared a World Heritage Site, including in this case not only the primitive magmas, but also the intermediate and more evolved terms of the magmatic series. This circumstance is based on the longer volcanic history of Tenerife (12 million years, as opposed to the 6 million years of the oldest island in the Hawaiian Archipelago), which unlike the Hawaiian Islands is not affected by subsidence and early submersion.

Furthermore:

- TNP includes all of the required elements to show its outstanding universal value and with a sufficient representation.
- The landscapes and geological elements are superbly preserved.
- Teide National Park encompasses the entire series of geological and landscape-forming processes concurring in the formation of a landslide caldera and felsic nested stratovolcanoes:
    - o The pre-caldera explosive volcano (Las Cañadas volcano).
    - o The gravitational collapse that formed the caldera (Las Cañadas caldera).
    - o The rifts (NW and NE) that partially filled the depression.
    - o The magmatic differentiation processes that supplied the magmas to form the stratovolcanoes nested within the caldera (Pico Viejo and Teide).

- The magmatic series can be observed in its integrity in Teide National Park, with all of its products (basaltic, intermediate and felsic rocks, as well as interesting mixes of basaltic and phonolitic magmas); volcanic forms (pyroclastics, “aa” and “pahoe-hoe” flows, blocks lavs, volcanic channels and tubes, dikes, plugs, etc.); and volcanic structures (basaltic lapilli and phonolitic pumice strombolian cones, domes and lava domes, phreatomagmatic vents, stratovolcanoes, etc.).

- The volcanic processes represented in Teide National Park correspond to the same series of intraplate oceanic island magmatism, but appear only in Tenerife on a large scale since the rest of the islands in this class have not reached the same stage of evolution. Therefore including this property on the World Heritage List would afford integrity to the global representation of intraplate oceanic islands by providing geological and

volcanological elements related to the intermediate and evolved lavas of this magmatic series, thereby completing the equally extraordinary elements displayed by Hawaii Volcanoes National Park, focused on the less evolved, juvenile stages of this magmatic series.

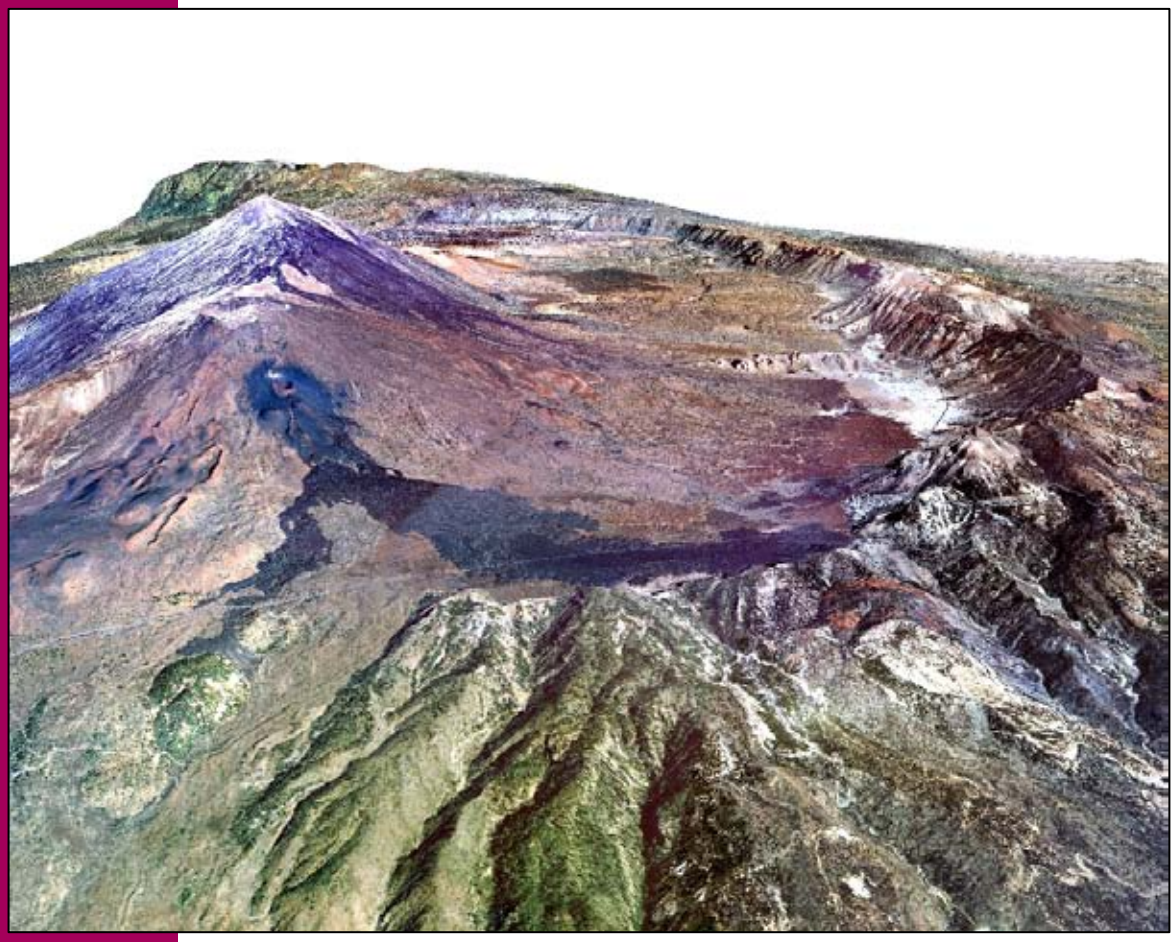
By the other hand, it is extremely rare to find a volcanic landscape that in such a limited space contains so many major variations, minor modifications and gradations in materials, structures, forms, plant species and mosaics of vegetation as Mt. Teide. Teide National Park encompasses the distinctive landscape of the Tenerife highlands, including the old Cañadas Edifice, which consists of the Las Cañadas wall, La Fortaleza, Los Roques de Garcia. It also includes the Teide-Pico Viejo double stratovolcano, with its adventitious basaltic volcanoes surrounded by basal domes, as well as an intermediate plain that shows few signs of recent monogenic eruptions and, most characteristically, the lava flows genetically associated with the stratovolcano and the detritus-accumulating plains that have formed between the tallest relief forms. The western and eastern edges of this protected space come in contact with the volcanic macrostructure complex and the two adjacent and simplest of the volcanic dorsals known as Pedro Gil and Abeque, characterized by recent volcanic eruptions that are concentrated both in time and space, creating a diverse landscape within the general features of the rest of the heights of the island. Not only do these peripheral areas contribute to the variety of volcanic forms and types of vegetation landscape, but they also allow us to better understand the spectacular central structure, located where these two volcanic dorsals intersect in perpendicularly opposite directions.

Remarkably, all of the different landscapes produced by the geomorphological and ecological processes occurring in this tectonic and bioclimatic area can be identified in this relatively compact space, along with their successive temporal variants. The varying landscapes are in harmony with each other and within the space as a whole, connecting or mixing together according to how closely they are observed. This National Park is set apart from the rest of the island and the rest of the high mountain volcanoes on the planet by its absolutely unique geography, a geography which enclosing a hierarchy of successively smaller worlds within its cosmos. In the Park, one can see Teide and its Planets.

Despite the fact that humans have been present at this site and used it for different purposes since well before the conquest of the islands, there are few places as accessible as this volcanic landscape that have been conserved so well. Although many of the directly volcanic forms are extremely ancient, they still appear as fresh as they did when they were created, with vast lava flows, needles protruding from the domes, the perfect lava channels of Teide's black lava flows and the spectacular Pico Viejo crater that

in and of itself is a veritable museum of volcanic forms. The Teide landscape's dynamism is closely related to the preservation of these forms. The fact that the lava flows remain in contact with the craters that emitted them, although they are occasionally hidden by other lava flows superimposed on them, coupled with the abundance and diversity of petrified flows that have been shaped by the unevenness of the terrain, create a particular aesthetic that makes us feel as if we are witnessing a real eruption.

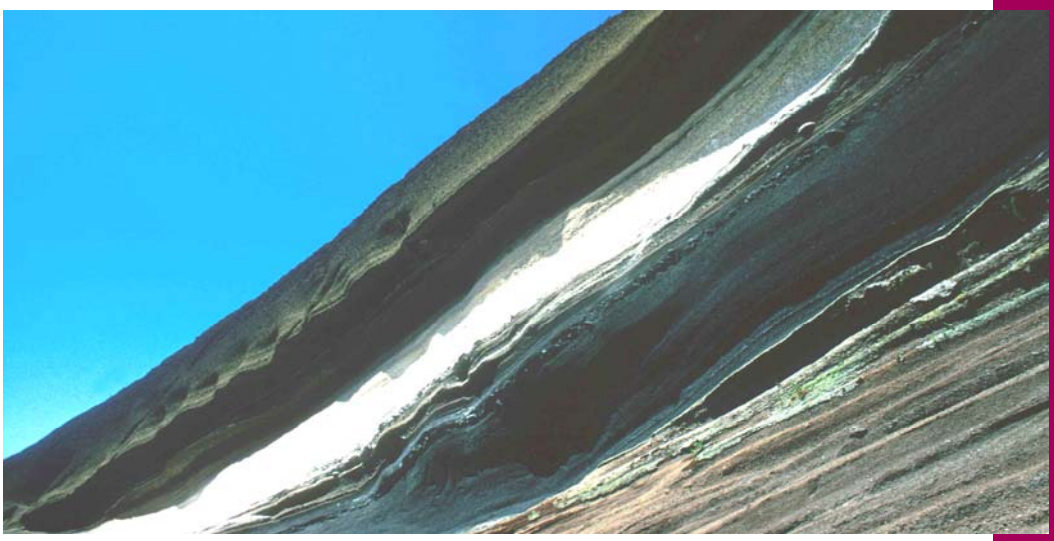
In some areas, only the passage of time has eroded the sharpness of the volcanic forms. Torrential deposits that have covered the lower sides of Pico Viejo have diversified the landscape, leading to the creation of a unique mosaic of vegetation that bears witness to natural processes in accord with a precise combination of climatic conditions, forms, rock types and the slopes. Even in the Las Cañadas wall, which is the area where erosion has had the most time to degrade the volcanic structures, all of the relief features continue having a harmonious organization congruent with the volcanic history of the edifice and its recent morphoclimatic evolution.



*View of Teide National Park*

Although at present the vegetation of the landscape is allowed to grow spontaneously, throughout history it has been the element most affected by human activity. But ever since this space was declared a National Park, thereby prohibiting its use for pasturing, the association between the morphological components and vegetation has become increasingly evident. The fact that both travellers and scientists in the 19th and 20th Centuries noted that the sparse vegetation found in this area almost exclusively consisted of the shrub *Spartocytisus supranubius*, coupled with the plant evolution reported by people who habitually trek through the Park, indicates that there has been a progressive biological occupation of the area over the last 50 years that has established diverse habitats and ecological niches that have not yet been completely defined. This is why from a scientific point of view Teide is not only a volcano laboratory but also a remarkable example of the vegetation landscape of a subtropical mountain in volcanic territory.

The outstanding natural aspects of Teide National Park are mainly a product of the processes that generated the relief forms. These processes are fundamentally related to volcanic eruptions and, to a lesser degree, the modifications of original forms by torrential and periglacial processes and slippage. They are all related in that gravitational pull conditions the positioning of the resulting forms in the same place that they are generated and in the spaces directly below them in altitude. The fact that the National Park is located in precisely the highest part of the island of Tenerife guarantees that none of the spaces genetically related to the Teide landscape is located outside of the Park.



***Aerial projection deposit***

# 4. State of Conservation and factors affecting the Property

## 4.a Present state of conservation

The occupation of Las Cañadas (initiated in the era of the Guanches and prolonged after the conquest of Tenerife) consolidated a series of ways of using the natural environment mostly having to do with pasturing. Later, other activities such as apiculture, the extraction of firewood and Teide white broom culm, coal making, sulphur, ice and mule driving were established. The majority of these traditional practices were slowly disappearing to the rhythm of the new economic necessities of the island and others were specifically prohibited after the National Park was declared in 1954, leading to the progressive elimination of pasturing and the prohibition of white broom extraction.

Historical sources reveal that use of vegetal resources in Las Cañadas of Mt. Teide was widespread, making it difficult for these plants to propagate naturally and impoverishing the vegetal biomass. Due to the predatory damage of livestock pasturing and an intensification of the extraction of firewood and culm in the first half of the 20$^{th}$ Century, formerly abundant plant species such as the Teide flixweed (*Descurainia bourgeana*) or the rosalillo de cumbre (*Pterocephalus lasiospermum*) were almost driven to extinction. Today these species have recuperated fully and are now among the most common flowers found throughout the geography of the National Park.



*Pterocephalus lasiospermus*

Other local activities (the use of pumice stone, military exercises, the manufacture of public use buildings corresponding to demands that no longer exist, as well as minor forest repopulations) have been totally eliminated in the last thirty years. Only a few traditional practices are permitted in the protected area. The tremendous amount of visitors to Teide National Park supposes a continuous and arduous job to ensure that they enjoy its natural resources with absolutely no risk to their safety while they themselves respect the environment. In order to facilitate this work, an exhaustive analysis of the distribution of the different resources (landscape, geological elements, flora, fauna and archaeological sites) has been carried out in order to create a precise zoning of the territory. This study has led to restricting entry to areas that because of their uniqueness and fragility can only be accessed for scientific or conservation purposes that have been properly authorised.

Now that all of the elements or activities that are not part of the natural functioning of the high-mountain ecosystem have been eliminated, today only two threats remain in the National Park: the rabbit (*Oryctolagus cuniculus*) and the Corsican mouflon (*Ovis gmelini musimon*). These two threats have become the park administration's principal concern. A plan to recuperate endangered plant species devotes a substantial part of its effort into isolating natural populations from the effect of these animals by erecting protective fences.

A recent analysis of the evolution of the vegetation reveals that despite the multiple factors that have negatively affected the natural ecosystem of Las Cañadas throughout history, the current state of the vegetation is surprisingly good. This study compares the progression of summit scrubland from 1964 to 1996, revealing a positive balance in the changes in the surface cover. An extract of this study is included in the annex documentation under the title: "Spatial analysis of the landscape through aerial footage".

Of the natural resources in the national park only the flora shows the effects related the threats mentioned as well as the herbivores that were introduced into the Park. Nevertheless, since 1988 the Recuperation Plan has stabilised the populations of endangered species and limited all kinds of threats.

TEIDE
PARQUE NACIONAL



*Monitoring and census*



*Plantations*

## 4.b Factors affecting the property

### *(i) Development pressures*

At present only two factors could become a threat to the integrity of the natural resources of the National Park: exotic species of flora and fauna and the large number of visitors to the Park.

With the exception of the introduction of some conifers (*Pinus insignis* and *Pinus canariensis*) and Atlas cedars *(Cedrus atlantica*) in the 1940s and 1960s, respectively, that have since been eradicated, the species of flora that have been introduced into found in the Park have been purely involuntary, related to later human interaction with the natural environment that is today insignificant and supervised. As a result, adventitious flora is an ephemeral threat that is a low risk for the Park's natural resources since they don't compete with the native populations or have any impact on essential ecological processes.

Since the first catalogue of these species was made in 1987 (numbering 78 species), the majority of these neophytes have been discovered to be weeds that feed on nitrogen; therefore they have settled in areas where visitors concentrate, especially service areas and the sides of the main roads, and are particularly vulnerable to activities meant to eradicate them.



*Mouflon (Ovis gmelini musimon)*

Nevertheless, given the potential risk that they may pose, the administration of the national Park established a programme in 1998 to control these species which encompasses the constant updating of the catalogue mentioned above, monitoring these species, precise localisation of their settlements and annual eradication campaigns. Currently, the occasional presence of these species in 41 locales has been identified and mapped. Moreover, 43,247 specimens belonging to 30 species have been eradicated, leading to the disappearance of some of the species. Furthermore, when paths have been closed in more fragile areas of the Park these species have not been able to survive without the presence of human activities.



*Vegettion harmed by mouflons*

Two types of exotic fauna exist in Teide National Park, introduced herbivores that pose a threat to the conservation of the flora in this space. Article 6.4.b) of the Management and Usage Administration Plan legislates the creation of a plan to control introduced herbivores. This plan is currently being elaborated and its goal is to eradicate the mouflon from the Park and maintain the population of rabbits at a level where it doesn't pose a threat to its flora. In addition to the active control of the introduced herbivores, protective fences have been erected to protect endangered plant populations in different parts of the Park.

The wild rabbit (*Oryctolagus cuniculus*) was introduced during the colonisation of the Canary Islands. The impact that this species has on the vegetation of the Park has been evaluated since 1987 demonstrating the damage that it causes on various types of endangered flora.

In order to reduce the impact of this species, every year campaigns to control the rabbit population are held with the participation of local hunters. The methods employed in these campaigns include trapping these animals with dogs and ferrets as well as the use of shotguns during part of the campaign. This has been the most efficient technique and does not generate secondary damage to other components of the ecosystem.

On May 26, 1999 the Plan to Control the Rabbit Population in Teide National Park was approved by the Mixed Management Commission of Canarian National Parks. This plan is designed to reduce the population of this species during each campaign in order to maintain it at a tolerable level and also to regulate how the campaign is carried out. In order to evaluate the rabbit population and the effectiveness of the campaign, a census is taken of the species at the open and close of the campaign. The analysis of each campaign allows the Park to evaluate the dynamic of its population and to understand its ethology.

The mouflon (*Ovis gmelini musimon*) was introduced into Teide National Park in 1971 as game for hunters and ever since its numbers have progressively increased, occupying the central part of the island at the same altitude as a large part of the endemic species. It poses a potential threat to the conservation of certain plant communities. Together with the competent administrations, the Park is promoting the implementation of a plan to eradicate the mouflon in Tenerife. Since action needs to be taken in the Park without delay, the Park administration has coordinated campaigns to control the mouflon inside the Park with the annual campaigns to control the mouflon outside of the Park in the territory managed by the *Cabildo Insular* of Tenerife. The goal is to put down the most animals possible and eventually eradicate the species from the Park. The Mixed Management Commission of the Canarian National Parks approves the regulations of this activity every year.

Every year the Park administration also carries out censuses of the mouflon in its territory during the winter and spring as well as other activities to monitor the species in order to evaluate the composition of its population. Various methods of capturing the animal alive have also been tested.

The animals that have been captured have been fitted with collars with radio transmitters so that they can be monitored in the wild. These animals are known as “cabras Judas” (Judas goats)

TEIDE
PARQUE NACIONAL



*Ferret*

because their collars give away the location of groups of animals that are later put down.

Regarding public use of the national Park, all new construction as well as the renovation, adaptation or modification of existing infrastructure is regulated. All types of construction and installations are prohibited within Teide National Park, regardless of whether they are public or private, except for those that are authorised by the procedure established in article 5.3 of Law 5/1981, March 25, or those established in the Management and Usage Administration Plan or in its development by areas, that will be of public use when the Mixed Management Commission promotes it.



***Radio-tracking the mouflon***

In any case, all of the relatively important updates must be accompanied by an estimate of its environmental impact and possibly a provision that guarantees that it will be integrated into the landscape with the same type of architecture as the place where it will be located.

The constructions within the national Park that belong to its administration are the following: El Portillo Visitor Centre (with annexes that include a garage, motor room and the future laboratory of the Botanic Garden), Cañada Blanca Visitor Centre, El Portillo fire fighting and first aid post, El Portillo office, Los Celorrios House, Los Herreros House (these last four are located in El Portillo Alto), Juan Evora House, Montaña Blanca Refuge, Montaña Blanca Cottage, Fasnia House and El Capricho Cottage. In addition, there are other constructions in the Park that are not managed by its administration: the Parador de Las Cañadas del Teide, Las Nieves Hermitage, the cable car (base and upper station), the Montaña Rajada telephone relay, the houses of El Sanatorio, Caseta de Obras Públicas and the mountain climber shelter, Cruz de Fregel Hermitage, Altavista Refuge. There are also other constructions located on private property in El Portillo Alto, but outside of the protected space.

Regarding the houses located in the area of El Sanatorio, the Teide National Park Management and Usage Administration Plan has established that these structures can no longer be used and will be demolished in order to restore the terrain to its original state. To achieve this, the Park administration will buy or expropriate these structures and then demolish them just as it has done in the past with other old constructions in the area.

In addition, outside of the Park the following constructions exist: the future Administration, Interpretation and Services Centre in La Orotava; Los Realejos Forest House and annexed facilities located in Monte Cumbre del Realejo Bajo and the Emilio Fernández Muñoz Nature Activities Centre (CANEFM) also on the same mountain.

Regarding the private constructions located outside of the Park in El Portillo Alto, just as it has done in the past, the Park will acquire these properties with the goal of incorporating the area into the National Park.

TEIDE
PARQUE NACIONAL

### *(ii) Environmental pressures*

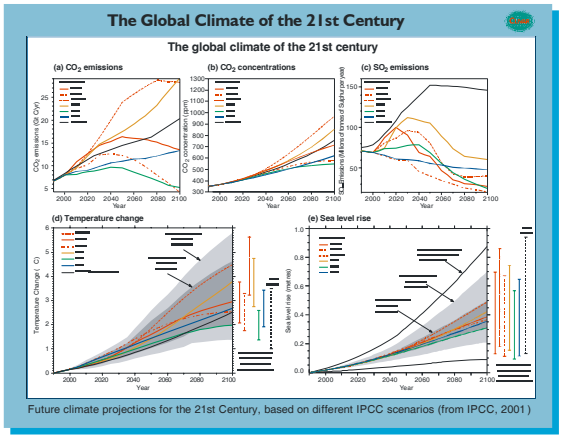
## Climate change

Global climate change is taking place around the Planet. Without entering into the debate about whether or not human activity has exacerbated this phenomenon, the facts demonstrate with certain precision that the polar ice caps have receded and the global temperature has risen progressively during the last century. These changes have been more palpable in mountainous regions, where glacial recession can be seen more clearly, as well as obvious variations in the tapestry of plant life, changes in thermal and pluviometric oscillation associated with the seasons, etc.

The Canarian Mediterranean climate of gentle winters and dry summers has not been immune to these processes and these changes have been especially noticeable in the high mountains, although not as severe as in other parts of the Planet. Along these lines a progressive increase in the average annual temperature (around 1-1.5 ºC) has been measured during the last 80 years, along with a prolongation of the summer drought and, although a clear decrease in the average annual pluviometric levels has not been measured, drastic changes in how it rains has been noticed, so that in the last few decades the norm now seems to be short periods of torrential rains that are possibly related to the changes that have taken place in the dynamic of the Atlantic Ocean and a greater frequency of tropical storms.

This general change has not only been registered in oral tradition that reminds us of snow on the Teide edifice well into summer, but also in written chronicles detailing the various wells used to conserve and sell snow and ice during the summer, a business that lasted until the beginning of the 20th Century. Today the majority of these wells or *neveros*, some of them located below 2,000 m (above sea level) barely have any ice at all during the coldest winter months.

The outlook for the future isn't very promising as various international organisations who are studying global warming prognosticate a temperature increase of around 1.5-2 ºC during the next 100 years in this area of the Atlantic, fundamentally during the summer months.

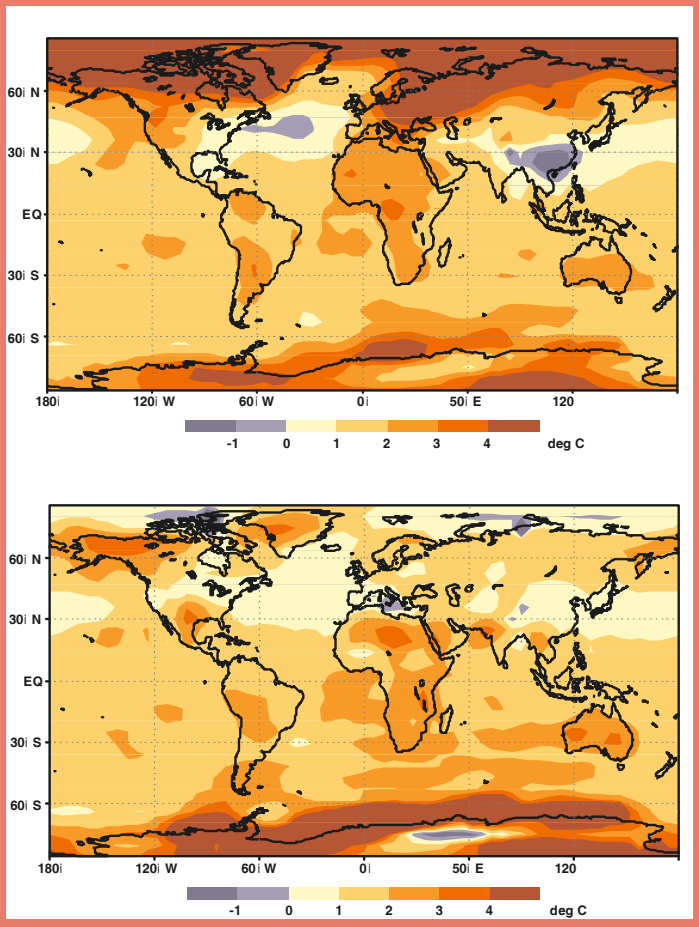


Future climate projections for the 21st Century, based on different IPCC scenarios (from IPCC, 2001)

Although these global changes have noticeably altered the plant life in some parts of the world, such as the tundra, where rare vegetation is starting to be replaced with scrub, the effects on Teide National Park are not yet clear. Nevertheless, it is certain that the decline suffered by certain plant species may be caused by climate change since they have to withstand progressively harsher and more prolonged summer droughts that make it impossible for them to regenerate their populations.

To combat these effects, and in accordance with the United Nations Framework Convention on Climate Change, ratified by Spain in 1994, Teide National Park, along with other Parks that represent the Spanish forest ecosystems, will be included in a Global Change Monitoring Network. Among the variables that will be monitored are the basic climatic parameters and the evolution of the diversity and dynamic of the different populations of the most representative plant species.

## Modelling Climate Change




Seasonal change in surface temperature from 1880 - 1889 to 2040 - 2049 in simulations with aerosol effects included. Contours every 1°C. Upper panel: December to February; lower panel: June to August (after IPCC, 1996 , Cambridge University Press, 572pp; Hasselmann et al., 1995, Proc. ÒModern dynamical meteorologyÓ, Symposium in Honour of Aksel Wiin-Nielsen, Ed.: Ditlevsen, P., ECMWF, Reading, 203-221).




*Dosimeter*

## Atmospheric pollution

The potential negative effect of pollutants in natural ecosystems and the transportation of these pollutants to remote areas is a reality that is impossible to ignore. The analysis of pollutant concentrations in mountain regions provides vitally important parameters that need to be monitored in order to understand global change.

Dosimeters are installed in Teide National Park to obtain data on $SO_2$, $NO_2$, $NH_3$ and $O_3$ concentrations under the supervision of the Protection against Harmful Agents Service (SPACAN) a department of the Ministry of the Environment. The results obtained in the first three years of monitoring have revealed relatively high concentrations of Ozone due to the exceptionally high altitude of the sampling area; the levels of nitrogen oxides (indicators of the proximity of industrial activity and road traffic) obtained in the Park are barely detectable; the levels of ammonia, (precursor to agricultural and cattle-raising activities, as well as industrial sectors) that have been detected are also negligible, with the exception of two spikes detected in summer months due to the increase in temperature; finally, the sulphur dioxide level (also related to the proximity of industrial areas) is also practically undetectable.

In accordance with the Global Change Monitoring Network mentioned above, in addition to this monitoring, six new sampling points were introduced in the national Park at a higher altitude, varying the study parameters to incorporate only those that have significant local variations (NOx, $SO_2$ and CO). This creates a sampling network of the atmospheric pollutants most frequently used as indicators in this mountain area (the highest area among the island systems in the Atlantic Ocean).

## Biotic Agents

Using a methodology that is similar to the one used in the EC Forest Damage Network, since 1991 the Spanish National Parks Network has been subject to phytosanitary inspections via the Forests and National Parks Monitoring Network under the control of the Autonomous Organisation of National Parks. The monitoring encompasses a set of parameters (defoliation, discolouration and harmful agents) and its corresponding cartographic representation; in Teide National Park the observations are done on (*Spartocytisus supranubius*), one of its most representative species, as well as the canarian pine (*Pinus canariensis*) in areas close to the Park.

The total defoliation average in the sample of these species increased a great deal in the first few years that they were

monitored (1993-1995), reaching 18 to 32% defoliation; despite these percentages, there has been no significant growth in this area up until 2004.

The discolouration in the biomass is only light or moderate. Like the defoliations, this damage is fundamentally related to the impact of pathogenic insects and, to a lesser degree, abiotic damage such as wind and snow. Within the Park, the most harmful agent is the *Acmaeodora cisti* coleopteran that perforates the branches of the Teide white broom (retama), but its damage is only significant in a small area in the western margin of the National Park. Outside of the Park, the *Calliteara fortunata* lymantriidae has a notable impact on the canarian pine and only occasionally on the Teide white broom mentioned earlier and other species in scrublands that coincide with pine forests.

In general, the phytosanitary pressures within the National Park, apparently related to global change, are not particularly serious and are continuously monitored.



*Calliteara fortunata*

### *(iii) Natural disasters and risk preparedness*

The most dangerous natural disasters that could affect Teide National Park are volcanic eruptions and forest fires.

Spanish legislation on civil protection (Royal Decree 407/1992, April 24, approving basic civil protection policy) establishes that the Government of the Autonomous Community of the Canary Islands is responsible for these kinds of risks through the development of Special Plans.

#### Volcanic eruptions

This geological risk is part of the natural origin and dynamic of the Park. To prepare for it, a Coordinated Action Plan for the Risk of Volcanic Eruption in Tenerife has been developed and approved by the General State Administration, the Canarian Government and the Cabildo Insular (Island Government) of Tenerife.

The plan is based on the information and data provided by the Scientific-Technical Committee, which is integrated by competent official organisations involved in volcanic research and monitoring such as the Technological Institute of Renewable Energy (ITER), the National Geographic Institute (IGN), the Superior Council of Scientific Research (CSIC) and the University of La Laguna.



*Fumaroles*

The IGN has competences that include monitoring volcanic seismic activity. To carry out its activities it has created a seismic danger map and developed a Volcanic Monitoring and Instrumentation Plan for Tenerife (valid during the next three years), concentrating most of its efforts on the Teide-Pico Viejo edifice.

The ITER has competences on volcanic monitoring and has created an extensive monitoring network distributed throughout the island of Tenerife.

The CSIC, via the Canary Islands Volcanological Station, has elaborated the first edition of a volcanic danger map of Tenerife, defining the predictable scenarios of future eruption on the island.

Volcanic monitoring in Tenerife is multidisciplinary because it incorporates geophysical, geochemical and geodesic techniques for the early detection of volcanic activity.

The geophysics programme is constituted by the National Seismic Network (with eight stations in Tenerife), the CSIC Telemetric Seismic Network and the Temperature Registry Network (with two stations in Tenerife). Moreover, periodic measurements of pressure gradients are taken at the peak of Mt. Teide to study the diffuse emission of gasses, the spontaneous potential (in collaboration with the Japanese Universities of Kyushu and Hokkaido) and thermometry.

The geochemical programme, integrated by the Canarian Geochemical Network, measures the evolution of radon gas and has eight stations and one hydro-geochemical station in Tenerife. Moreover, occasional measurements of diffuse emissions of gasses ($CO_2$ and $H_2S$) and $CO_2$ emissions are taken at the peak of Mt. Teide.

The geodesic programme is integrated by the Canarian Geodesic Network and has four permanent GPS stations, one of them in Tenerife. This programme is co-financed by the Community Initiative INTERREG III B Azores-Maderia-Canaries.

**Forest fires**

Due to its environmental conditions, Teide National Park has a limited risk of forest fires.

To plan for this risk, the Canarian Government has developed the Canarian Civil Protection and Forest Fires Plan (INFOCA), approved by Decree 100/2002, July 26), that includes local fire risk maps and maps that divide the island into zones

defined by the type of combustible material present. The Cabildo Insular of Tenerife has created the Tenerife Civil Protection and Forest Fires Plan (INFOTEN) for the island (for which it is responsible).

These plans are the global-technical fire fighting framework in place for Teide National Park. When a forest fire arises the plan that is activated depends on the magnitude and risk of the emergency.

The responsibility for preventing and extinguishing forest fires has been transferred to the autonomous communities via specific royal decrees corresponding to each community. In the case of the Canary Islands, the competence was in turn transferred from the Canarian Government to each island's Cabildo (Decree 111/2002, August 9, transferring Public Administration functions from the Autonomous Community of the Canary Islands to the cabildos of the different islands).

Therefore, the Cabildo of Tenerife is responsible for putting out any forest fires in Teide National Park. Nevertheless, without interfering with or taking away responsibility from the Cabildo of Tenerife, Teide National Park has its own system to prevent and extinguish forest fires within its territory in order to reinforce and guarantee the highest level of protection possible in this natural space.

These special measures are coordinated under the supervision of the Cabildo of Tenerife and include detection of forest fires, early response to fire emergencies and surveillance against forest fires. Every year this self-protection system is organised during the maximum alert period (summer months), with similar means available in each campaign. For the 2005 campaign the following provisions were made:

- Five light-extinction units: covering different strategic points in the Park, 8 hours a day each, distributed in morning, afternoon and night shifts. Each unit is made up of a foreman and three specialised workmen, one of them working with a chainsaw, and an all terrain vehicle equipped with a water tank.

- Two units of drivers for fire fighting vehicles: a 3,000 litre self-pumping all-terrain lorry (URO), 24 hours a day, a 4,000 self-pumping all terrain lorry (UNIMOG), 24 hours a day.

- One permanent driving unit throughout the entire year.

- One fixed surveillance unit: 8 hours a day.



*Fire-fighting vehicles*

- One mobile surveillance unit: with a fire protection vehicle equipped with a 3,000 litre tank for an early response if necessary, 8 hours a day.

- A radio-transmitter service 24 hours a day to centralise information and coordinate in case of emergency.

At the beginning of the high-alert period, a training course on putting out forest fires is given to all of the personnel assigned to the units described above.

Moreover, technicians, nursery personnel and the foreman coordinator, do 24-hour watches during the high-alert period of the campaign.

One exception is a forest fire caused by a volcanic eruption. In this case the Management and Usage Administrative Plan states that these units will not intervene as long as the fires are limited to the proximities of the volcanic activity.

**Other types of risks**

The Island Territory Civil Protection Emergencies Plan of Tenerife (PEIN) confronts risks caused by natural disasters other than those that have already been described. This plan establishes the organisational and functional structure of all the means and resources that will intervene in such an emergency to protect people, property and the environment.

References of the cited documents:

Volcanic Eruption Risk in Tenerife Coordinated Action Plan: available at the Insular Administration of Urban Environment, Landscape and Civil Protection (Department of the Environment and Landscape of the Cabildo Insular of Tenerife).

INFOCA: available from the Official Bulletin of the Canary Islands, nº 1177, August 7, 2002 (http://www.gobcan.es/boc/2002/106) and in the offices of Teide National Park.

INFOTEN: available at the Technical Forest Service (Department of the Environment and Landscape of the Cabildo of Tenerife).

Seismic Risk Map: available at the National Geographic Institute (Ministry of Fomentation) and in the offices of Teide National Park.

First Edition of a volcanic danger map of Tenerife: available at the offices of Teide National Park.

PEIN: available at the Insular Administration of Urban Environment, Landscape and Civil Protection (Department of the

Environment and Landscape of the Cabildo of Tenerife); and also at the following website: http://www.cabfte.es/areasgc/medioambiente/proteccioncivil/PlanPEIN.

***(iv) Visitors/tourism pressures***

Teide National Park is the most visited protected natural space in Spain; it receives around 3.5 million visitors a year, an average of 9,600 people a day. The year that the most people visited the Park was 1999 with 3,773,990 visitors, an average of 10,340 a day. With this many visitors it may be thought that the property is being spoiled, but rather than causing any real damage to the natural resources of the Park, what is occurring is a deterioration in the quality of the visits. Occasionally there are concentrations of visitors in certain places in the Park and at certain times of day (principally at the foot of the cable car, the Ruleta look-out point and the San Jose Mines, especially between 11 a.m. and 1 p.m.) that lead to an increase in the number of vehicles on the main roads that travel through the protected space.

Studies available in the documentation of the Accesses Master Plan have estimated that the daily load that the Park could handle is 12,000 people a day, meaning that theoretically this protected natural space could handle up to 4,380,000 visitors.

Even so, measures have been and will continue to be taken to manage visits better (better distribution of visits during the day and throughout the year, less visual impact caused by the concentration of visitors and prevention of possible damage that may be done) including the following:

- Organising visits so that they are compatible with conservation. To achieve this, the Management and Usage Administration Plan divides the territory into four kinds of zones according to each zone's capacity to handle visitors, its permitted uses and its ecological fragility. There are four types of zones: Reserve Zones, Restricted Use Zones, Moderate Use Zones and Special Use Zones. In addition the Park has specialised personnel that monitor the areas with the highest concentrations of visitors in order to avoid damage to the environment.

- The offer and promotion of new alternatives for services and visits (expansion of the Park in 1999) and in the near future the expansion of the Cañada Blanca Visitor Centre; creation of an Administration, Interpretation and Services Centre outside of the Park in the municipality of La Orotava; promotion of evening and even at night visits; excursions guided by specialised Park personnel, etc.).

- Collaboration with competent administrations to regulate the use of the main roads that access the Park.

- Provide information to the visitors and possible future visitors about the laws, general directives and criteria of use and organisation of the Park (web site; distribution of informative and promotional material at information points and visitor centres and also outside of the Park; the media; specific courses, talks, etc.) so that the visitors better understand the Park and the local population and Park visitors become involved in its conservation.

- Promote institutional and social cooperation and local development.

- The majority of the paths in the Park are closed to traffic which means that vehicles travel almost exclusively via the public roads that lead to the Park.



***Fumaroles***

***(v) Number of inhabitants within the property and the Buffer Zone***

According to the Municipal Registry of La Orotava, updated on 22 December, 2005, there are three people living in the interior of the National Park and its Buffer Zone, in El Portillo, Las Cañadas and the Parador de Las Cañadas del Teide. The Municipal Registry also specifies that these people are only part-time residents.

El Portillo is made up of a number of dwellings considered “second homes" and by four restaurants, as well as facilities belonging to the Autonomous Organisation of National Parks under the management of the Administration of Teide National Park.



***El Portillo Alto***

# 5. Protection and management of the property

## 5.a Ownership

The land that makes up Teide National Park is owned by the state, municipalities and private entities. The distribution of the surface area and the percentages are illustrated in the following table:

| PROPERTY | SURFACE (ha) | PERCENTAGE (%) |
|---|---|---|
| **Municipal** | 17,619 | 92.78 |
| **State** | 1,367 | 7.20 |
| **Private** | 4 | 0.02 |
| **TOTAL** | **18,990** | **100.00** |

The table shows that the bulk of the land that constitutes Teide National Park is in public hands, with the municipalities contributing the majority of the Park.

### *Municipal property*

The following table displays the eleven municipalities that own land in the National Park in order of the amount of area that each has contributed to the Park.

| MUNICIPALITY | SURFACE (ha) | PERCENTAGE (%) |
|---|---|---|
| **La Orotava** | 13,672 | 77.60 |
| **Guía de Isora** | 1,561 | 8.85 |
| **Icod de Los Vinos** | 1,266 | 7.18 |
| **Granadilla de Abona** | 378 | 2.15 |
| **La Guancha** | 234 | 1.34 |
| **San Juan de La Rambla** | 223 | 1.26 |
| **Santiago del Teide** | 143 | 0.81 |
| **Los Realejos** | 62 | 0.35 |
| **Vilaflor** | 59 | 0.34 |
| **Garachico** | 20 | 0.11 |
| **Adeje** | 1 | 0.01 |
| **TOTAL** | **17,619** | **100.00** |

***State property***

Of the land in the Park owned by the State, 1,296.5 ha are registered to the Autonomous Organisation of National Parks. The rest of the State-owned land, 70.5 ha, is registered to TURESPAÑA (Ministry of the Economy and the Exchequer) and includes the Parador de Las Cañadas del Teide.

***Private property***

Private property constitutes a small percentage of the Park's land compared to the municipal and state property, totalling only around four hectares. This land is owned by the Sociedad Teleferico, S.A. and Telefónica de España, S.A.

The annex documentation includes a map that displays the distribution of the Park's property.

## 5.b Protective designation

The following is a list of the basic legislation affecting Teide National Park:

- Law 4/1989, March 27, on the Conservation of Protected Natural Spaces and Wild Fauna and Flora.
- Law 40/1997, November 5, that revises Law 4/1989, March 27, on the Conservation of Protected Natural Spaces and Wild Fauna and Flora.
- Law 41/1997, November 5, that revises Law 4/1989, March 27, on the Conservation of Protected Natural Spaces and Wild Fauna and Flora.
- Royal Decree 1803/1999, November 26, approving the National Parks Network Administration Plan.

The following is the legislation directly affecting the National Park (listed in chronological order):

- The January 22, 1954 Decree that creates Teide National Park.
- Law 5/1981, March 25, on the reclassification of Teide National Park.
- Decree 153/2002, October 24, approving the Teide National Park Management and Usage Administration Plan.

In addition, at an altitude above 2,400 m the Teide-Pico Viejo stratovolcano has been declared Natural Monument by Law 12/1994, December 19, on natural spaces in the Canary Islands, and reclassified as a Natural Monument by Legislative Decree 1/2000, May 8, approving the revised text of the Canary Islands Territorial Planning Law and the Natural Spaces in the Canary Islands Law. It has Conservation regulations according to the October 26, 2005 Resolution that Published the Accord that was reached by the Canary Islands Territorial Organisation and Environmental Commission during its 10 October 2005 session.

Regarding the management of Teide National Park, given its importance, the following considerations were made:

- As of the creation of Law 4/1989, March 27, on the conservation of protected natural spaces and wild fauna and flora, this material is jointly and equally competence of the General Administration of Spain (Ministry of the Environment) and the Autonomous Community of the Canary Islands, through the Mixed Management Commission of the Canarian National Parks. In addition, the Patronage of the Park participates, supports and helps to make decisions regarding its conservation. The Public Administration is represented within the Patronage, along with the other social actors implicated.
- Since the administration of Spain is increasingly decentralised, it is foreseen that by 2006 the management of its National Parks will become the exclusive competence of the autonomous communities, although the basic national legislation will be respected and the Spanish State will continue to coordinate in this area. As of the writing of this inscription proposal, the Mixed Management Commission of the Canarian National Parks still manages Teide National Park and the Patronage still participates, supports and helps to take decisions regarding the Park.
- The normal administration of this protected natural space is carried out by the National Park's technical team and this will not change when management is transferred to the Autonomous Community of the Canary Islands.

## 5.c Means of implementing protective measures

There are various means that guarantee the protection of Teide Natural Park but it is mainly based on applied legislation, the available material and human resources and inter-administration cooperation.

***Legislation***

- Law 5/1981, March 25, on the Reclassification of Teide National Park.

- Decree 153/2002, October 24, approving the Teide National Park Management and Usage Administration Plan.

Law 5/1981 reclassifies Teide National Park and assigns it a special legal regime that is designed, among other things, to protect it, limit the rights to use its resources, etc. It also delimits a protective buffer zone in order to guarantee the protection of the natural resources that justify the creation of the National Park.

Decree 153/2002, October 24, approving the Teide National Park Management and Usage Administration Plan, contains the legal basis for the protection of the natural resources throughout but mainly in the following sections:

- Section 3. Management Criteria

This section establishes general management criteria relating to natural and cultural resources, pubic use and visitor attention, scientific research and resource monitoring, traditional uses and practices, infrastructures, equipment and facilities and also the Park's relationship with its surroundings.

- Section 4. Zonification

In order to make protecting the Park compatible with its public use, and to minimise possible negative impacts, the Park's territory is spatially distributed according to its capacity to absorb visitors in Reserve Zones, Restricted Use Zones, Moderate Use Zones and Special Use Zones.

The following table displays in hectares and percentages the zoning established for Teide National Park and at the end of this section its spatial distribution:

| ZONIFICATION | AREA (ha) | AREA (%) |
|---|---|---|
| **Reserve Zone** | 1,265 | 6.7 |
| **Restricted Use Zone** | 12,964 | 68.3 |
| **Moderate Use Zone** | 4,703 | 24.7 |
| **Special Use Zone** | 58 | 0.3 |
| **TOTAL** | 18,990 | 100.0 |

The following defines the uses and limitations of each of these zones:

## Reserve Zones

These areas need the highest possible level of protection because they contain extremely important natural and cultural values that because of their scarcity, fragility or rich biodiversity are of great interest to science. They can also include areas that do not have these characteristics but that are in a process of regeneration or are particularly dangerous for the public.

Its goal is to guarantee the maximum protection of its resources, allowing them to be studied without human influence on them.

They can only be accessed for scientific or management purposes. The following is strictly prohibited in these areas: vehicles and mechanical artifacts; any kind of exploitation; construction of infrastructure or facilities (including new paths and trails) except for signage; scientific markers or instrumentation; collecting biological, mineral or cultural material that has not been expressly authorised by the administration of the Park.

These zones are closed to public use except for hiking on paths expressly authorised by the Administration Plan and climbing on the Roque and Topo de la Grieta paths that are established in the Public Usage Plan or, when this area is covered with snow, for transit expressly authorised by the Park administration.



*Poligonal soils*

**Restricted Use Zones**

These zones are highly natural areas that can handle moderate public use. Their natural and cultural values are reasonably well conserved.

Their objective is to guarantee the integral conservation of their values and resources and at the same time allow visitors to intimately enjoy the surroundings in the solitude that the Park offers.

The public is free to hike on these paths and trails. However, vehicles and mechanical artifacts are prohibited execept for research and management purposes that have been duly authorised by the Park administration and restricted to existing paths and trails. Vehicles are authorised on the roads that cross them in accordance with the regulations established on the Administration Plan or the documents that develop it. Any other kind of activity will be regulated and controlled by the administration of the Park.

The use of barriers, signs, instruments and artifacts can be authorised if they are designed for the control, orientation and security of the visitors, if they have scientific or management uses or for the construction of rustic hiking paths. The construction of paths, buildings or permanent building facilities can not be authorised, except in the cases defined in the fifth paragraph of section 12.5.1 of the Management and Usage Administration Plan.

**Moderate Use Zones**

These areas are dominated by a natural environment that is capable of accomodating more intense public use than the other zones. The conservation of resources, open air recreation and eduactional activites are compatible in these zones.

The objective of these zones is to integrate the conservation of resources, educational, interpretive and recreational public use, and traditional uses, minimising and monitoring the negative impacts that may occur.

The entire area is open to pedestrians. Authorised vehicles and mechanical artifacts on the roads, paths and trails may be regulated by the Park administration in accordance with the Administration Plan. Services, paths, small infrastructure and other elements exclusively related to public use, traditional practices, scientific research and management can be constructed. The surroundings will be respected at all times by using traditional materials and methods, minimising its environmental impact and integrating them as much as possible into their environs. Their

construction must be contemplated in the Administration Plan and article 5.3 of Law 5/1981.

**Special Use Zones**

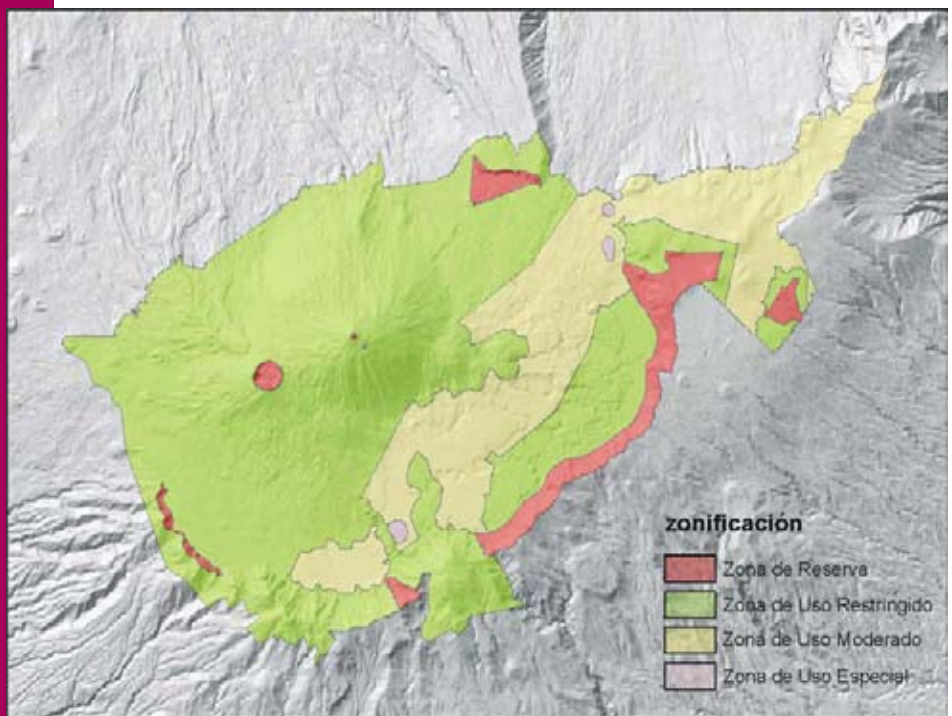
These are small areas where larger structures and facilities needed for the management, administration and public use of the Park are located.

Their goal is to create an area where services and facilities that are necessary for the public use, management and administration can be concentrated with the least impact, including preexisting installations that are necessary to maintain public services that are in accordance with the purpose of the Park.

These areas are open to the public except for spaces located in their interior. In addition to ordinary urban planning, proposed construction in these areas must respect the regulations contained on the Administration Plan and the documents that develop it. The environment must be respected as much as possible by using traditional materials and methods that integrate the construction into its surroundings. Buildings can only have one story, with the exception of those that already exist.

The service and parking areas in Teide National Park that are contemplated by the Access Master Plan will be included in Special Use Zones.

The following figure shows the spatial distribution of the different zones that are described above. In addition, a zoning map that covers this topic in detail is attached to the Inscription Proposal.



- Section 5. Protection legislation

This legislation differentiates between uses subject to administrative authorisation and unauthorised uses that are in violation of Law 4/1989, March 27, on the Conservation of Protected Natural Spaces and Wild Fauna and Flora.

The following table displays uses subject to administrative authorisation that are carried out through pre-established conditions:

| |
|---|
| ✓ Uses related to professional, commercial or mercantile film, radio, television, video, publicity or analogous |
| ✓ The celebration of (multitudinous) special acts |
| ✓ Research that is carried out within the National Park |
| ✓ All new commercial activities within a permanent establishment within the National Park |
| ✓ Working as an interpretive guide or tourist guide within the Park |
| The following exploitations:<br>✓ Water exploitation<br>✓ Traditional exploitation of wild rabbits<br>✓ Apiculture<br>✓ The extraction of coloured soils and flower collecting. |
| ✓ The use of rat poison or pesticides within the buildings. |
| ✓ The organisation and celebration of any kind of act that supposes a massive concentration of people in a certain place or area. |
| The following activities:<br>✓ Speleology<br>✓ Mountain activities in Reserve Zones when the terrain is covered with show and in the Restricted Use Zones off the paths.<br>✓ Climbing to the crater of Mt. Teide from the La Rambleta path.<br>✓ Camping<br>✓ Guided bike tours on the Filo path<br>✓ Some kinds of flying when it is adequately justified |
| ✓ Any construction and the renovation, adaptation or modification of existing infrastructure. |
| ✓ The use of the name “Teide National Park” for any commercial use. |

***Material means***

The materials that the administration uses to protect the Park include signs that indicate the National Park’s boundaries, trails and infrastructure. In addition, barriers are placed at the accesses to paths in order to protect the most at-risk resources.



*Barriers*

### *Human resources*

Park employees ensure that the stipulations of the Teide National Park Management and Usage Administration Plan are followed. There are 18 people assigned to this task including environmental agents, forest rangers and security guards. These personnel are increased at certain times of the year in order to closely monitor activities such as the hunting campaigns to control the mouflon and rabbit populations.

They also are supported by the Nature Protection Service (SEPRONA) of the Guardia Civil.

### *Inter-administration cooperation*

The administrations that manage Teide National Park and the Corona Forestal Nature Park cooperate and coordinate their activities in order to resolve different typology of problems that affect both protected natural spaces. In addition, it participated in the making of the planning document that will regulate the life of this Natural Park, so that it does not contradict the regulations of the Teide National Park's Management and Usage Administration Plan.

Finally, personnel in the visitor centres and information points explain to visitors why it is important to conserve the Park and the usage limitations that are necessary to achieve this goal. This is also the goal of the public use programmes that the administration develops. In addition, the informative material that is available to the public in the different infrastructures includes the legislation that governs this protected natural space.



*Teide seen from La Gomera*

## 5.d Existing plans related to municipality and region in which the property is located

The following table displays the planning documents elaborated by the Cabildo of Tenerife, including the dates they were approved:

| PLAN | APPROVAL DATE | INSTITUTION THAT PREPARED THE PLAN |
|---|---|---|
| **General Plan for the Public Use of the Island of Tenerife** | Approved by the Plenum of the Cabildo of Tenerife on July 24, 2002. | Cabildo of Tenerife |
| **Tenerife Insular Planning Document (PIOT)** | Approved by Decree 150/2002, on October 16. | Cabildo of Tenerife |
| **Tenerife Insular Tourism Planning Special Territorial Plan** | Definitively approved in part on April 6, 2005 by the Territorial and Environmental Planning Commission of the Canary Islands (COTMAC) | Cabildo of Tenerife |

These plans do not affect Teide National Park because the management of the National Park is based on Decree 153/2002, October 24. Nevertheless, the Tenerife Insular Planning Document (PIOT), which organises the usage of the island's resources, does regulate the central region of the island which includes Teide National Park; however, this law does not contradict the stipulations of the Management and Usage Administration Plan.

The following articles of the PIOT refer to Teide National Park:

- Chapter 1: General Aspects of the Territorial Planning Model
  - Section 3. The Territorial Planning Model
    - Articles 2.1.3.1. and 2.1.3.5.

- Chapter 2: District Planning Models
  - Section 4. Planning model for Abona
    - Articles 2.2.4.5. The road and transportation model
  - Section 9. Planning model for the Central Mountain Mass
    - Articles 2.2.9.1., 2.2.9.2. and 2.2.9.3. and 2.2.9.4.

- Chapter 4: Singular Infrastructure Operations
  - Section 1. General Information
    - Articles 2.4.1.2. 8
  - Section 9. Central mountain mass service complex
    - Articles 2.4.9.1., 2.4.9.2., 2.4.9.3. and 2.4.9.4., 2.4.9.5. and 2.4.9.6.

Details on these chapters are given in the Annex Documentation.

## 5.e Property management plan or other management system

The Teide National Park Management Plan is contained within Decree 153/2002, October 24, approving the Management and Usage Administration Plan of Teide National Park. Nevertheless, this protected natural space has had a planning document since 1984, approved by Royal Decree on November 14 which after being reviewed was repealed and replaced by the Administration Plan mentioned above.

The following section describes the objectives of Teide National Park and the objectives of the Management and Usage Administration Plan, following the content of the cited Decree:

***Objectives of Teide National Park***

The general objectives of Teide National Park are the following:

I. Protect the landscape, the integrity of the autochthonous fauna, flora and vegetation, in other words, the totality of its biodiversity, geological value, waters and atmosphere and, ultimately, maintain its functional dynamic and structure, as well as the environmental services of the ecosystems that comprise the Park.

II. Protect the integrity of its archaeological resources and of its important cultural values.

III. Provide ecological stability and diversity perpetuating its biotic communities and genetic resources in as natural state as possible, paying special attention to endangered resources.

IV. Facilitate scientific research and the study of the Park's resources, as well as the survellience and prevention of volcanic eruptions.

V. Facilitate public enjoyment of the natural space based on the Park's values and in a way that is compatible with its preservation.

VI. Promote environmental education and public knowledge of the ecological and cultural values of the Park and its meaning.

VII. Promote the socio-economic development of the communities in its environment, especially via the promotion of sustainable development programs and activities.

VIII. Extinguish as soon as possible the traditional uses and *derechos reales* (the right to exploit something that a property produces or the right to use the property in a certain way) in the interior of the Park that are incompatible with its objectives.

IX. Promote the coordination of the actions that take place outside of the Park but that may affect the Park and viceversa, with the aim of achieving that greatest synergy possible among all activities to the benefit of the Park and the island.

X. Provide the National Park Network with an example of general interest for Spain and highly representative of the volcanic processes and ecosystems associated with the high mountain environment of the Macronesian region.

XI. Provide an example of the outstanding value of Spanish-Macronesian nature for European and world heritage, promote and maintain its foreign acknowledgment and participate in international programs of nature conservation.

The Park's management is guided by the fufilment of these objectives, established according to Law 4/1989, March 27, on the Conservation of Natural Spaces and Wild Flora and Fauna, modified by Law 41/1997; Law 5/1981, on the Reclassification of Teide National Park; the international concept of National Park defined by the UICN in Buenos Aires (1994) and the policies of the National Park Network established in the National Park Network Administration Plan.

***Objectives of the Management and Usage Administration Plan***

The objectives to be fulfilled by the current Administration Plan, which will be valid for six years, are the following:

A.- Regarding the conservation of natural and cultural resources.

1. Improve the survival capacity of endangered animal and plant species and develop an ecological monitoring program that can make an integrated diagnosis of the state of the biodiversity and evalutate the effect that administration activities will have on the environment.

2. Establish a plan to progressively control the mouflon, the rabbit and the rest of the mammals that have been introduced into the Park, directed toward the total erradication of the first and the



*Teide seen from Llano de Las Mesas*

maintenance of the rest of them at a level that does not suppose a risk to the Park's flora.

3. Develop the measures necessary to protect all of the Park's archaelogical and ethnographic resources, establishing sufficient coordination between the competent institutions to achieve this goal.

4. Adopt the measures necessary to incorporate into the National Park the private land of the summits of Vilaflor, the group of houses in El Portillo and the Las Cumbre estate owned by the Ministry of Defence, according to the accord reached by the Council of Ministers on July 2, 1999.

B.- Regarding public use and planning.

5. Regulate and plan the massive visits in a way that is compatible with the conservation of the Park's resources and the dissemination of the Park's values.

6. Regulate outdoor sporting activities that are compatible with the purpose of the Park.

7. Regulate the use of the sections of the TF-21 and TF-38 county roads that pass through the Park with the goal of making it compatible with the Park's objectives.

8. Divulge the resources, services and rules of the Park so that the public understands them better and implicate the Park's users and local population in its conservation.

C.- Regarding research of Park values and their disclosure.

9. Disclose information in order to facilitate the management of the Park's resources, particularly on biological and phytosanitary aspects of endangered flora; on basic knowledge of invertebrate populations; on the basic concepts of biology and the impact that mammals introduced into the Park have on archaelogical and ethnographic resources, as well as how to establish a way to keep track of the environment and the visits, and the research necessary to establish the best way to gauge the Park's ecosytems.

10. Promote research and, in general, educational, scientific and cultural activities so that the knowledge and disclosure of the objectives and values of the Park reinforce the fulfilment of the goals set by Law 5/1981 on the Reclassification of Teide National Park.

D.- Regarding traditional uses and exploitations.

11. Regulate the uses of and exploitations derived from natural resources to make them more compatible with their conservation.

E.- Regarding the infrastructure, provisiones and facilities.

12. Reduce the amount of infrastructure and facilities located within the Park that are incompatible with the Park's goals.

13. Dictate the measures necessary to promote a greater integration and smaller impact of the infrastructure, provisions and facilities that may exist within the Park.

14. Coordinate the management of infrastructure by their corresponding owners with the goal of adapting them as much as possible to the purposes of the Park.

F.- Regarding the Park's relationship with its surroundings

15. Integrate the management of the Park with the adjacent land, especially with public properties belonging to the State.

16. Promote the cooperation of institutions, entities and individuals to reduce impacts on the natural space that come from outside of the Park.

## 5.f Sources and levels of finance

### *Financing*

As of the elaboration of this report, the financing of Teide National Park comes entirely from the State via its General Budgets and, more specifically, from the budget of the Ministry of the Environment on which the Autonomous Organisation of National Parks depends.

In the end, it is this organisation that assigns and distributes the budget of Teide National Park. In general terms the Park's budget for the last five years is displayed in the following table:

| YEAR | CHAPTER 2 | CHAPTER 6 | TOTAL |
|---|---|---|---|
| 2001 | 262,035,000 pts, | 211,871,896 pts, | 473,906,896 pts, |
| 2002 | 2,979,514.11 € | 1,738,068.47 € | 4,717,582.58 € |
| 2003 | 1,754,382.93 € | 1,944,316.01 € | 3,698,698.94 € |
| 2004 | 1,880,051.26 € | 2,653,295.73 € | 4,533,346.99 € |
| 2005 | 2,028,051.72 € | 2,852,830.44 € | 4,880,882.16 € |

Chapter 2 corresponds to "Commercial Expenditures", while Chapter 6 refers to "Investments".

The National Park also receives other budget contributions from the Star Programs of the Autonomous Organisation of National Parks that finance specific Park projects selected and managed by the organisation's administration.

***Grants***

The Autonomous Organisation of National Parks allots part of its budget to subsidise projects and activities of institutions and individuals that are integrated within the limits of National Parks or in its socio-economic areas of influence. These economic grants are earmarked for the improvement of infrastructure, social and cultural activities and job creation in the local environment and they are regulated by an annual call.

They are allotted to local governments, businesses, private owners and non-profit organisations that update conservation material and sustainable use in the socio-economic area of influence of the National Park.

The following table indicates the grants given during 2001-2004 and their distribution:

| **YEARS/ DISTRIBUTION OF GRANTS GIVEN** | **2001** (pts.) | **2002** (€) | **2003** (€) | **2004** (€) |
|---|---|---|---|---|
| **Local Governments** | 124,442,314 | 539,109.87 | 200,726.17 | 675,808.91 |
| **Businesses** | 4,900,000 | 51,278.10 | 62,026.47 | 15,080.36 |
| **Private owners** | 7,055,000 | 28,388.33 | 47,622.22 | 72,780.19 |
| **Not for profit organisations** | 6,815,000 | 21,176.26 | 60,347.65 | 11,500.00 |
| **TOTAL** | 143,212,814 | 639,952.26 | 370,722.51 | 775,169.46 |



***Teide National Park personnel***

## 5.g Sources of expertise and training in conservation and management techniques

Regarding the expertise and training of the personnel who contribute to the management of Teide National Park, a distinction has to be made between the personnel of the National Park's administration, who can be either permanent state workers or workers under contract, and people who are employees of public or private companies that are contracted to do specific work or projects for the Park on an occasional or temporary basis.

The expertise and training of the personnel of the Park is evaluated and demonstrated from the moment that they are given their position because everyone who works in a public administration has to pass state exams and personal-merit evaluations along with other candidates. This selection process more than ensures an adequate level of training and expertise in the position that the candidate is trying to win, in this case the environment in general and nature conservation in particular.

In order to take part in the selection process a candidate has to have certain academic degrees and once the process has been successfully completed, the candidate becomes a member of the personnel of the State Administration.

Park personnel that have completed this process also have access to different professional training programmes that update and deepen the knowledge, abilities and tools that they need to give better public service that in this case includes better management of Teide National Park.

Because these annual training programs have diverse content, all of the public employees can participate regardless of their category and academic degrees.

The institutional training for the personnel of Teide National Park is divided into three categories:

- Generic State Administration training, normally given by the National Institute of the Public Administration (INAP).
- Professional training organised by the Ministry of the Environment.
- Training for the personnel of the Autonomous Organisation of National Parks.

During the last five years the personnel of Teide National Park (in their different categories) have had access to the following courses:

- Conservation and handling of natural resources.

- Public use, information, interpretation and environmental education.
- Legislation.
- Budget, finances and administrative management.
- Management and administration of personnel.
- Computer programmes.
- Understanding and handling tools, equipment and specific technology related to their jobs.

In addition to this professional training system, the personnel of Teide National Park also habitually participate in forums, meetings, seminars, etc. organised by the Autonomous Organisation of National Parks or other institutions or entities that allow for the exchange of experiences, information on specific areas of work, updates of the general job knowledge and new technologies that can be applied to the daily management of protected natural spaces.

As indicated earlier all of this training corresponds to the competence and training of the Park personnel who are also incorporated into the State Administration.

The employees of external companies contracted by the Park administration to work in the National must have the level of expertise and training that was specified in the contract. These specifications define the level of quality that this contracted work must meet and therefore indirectly indicate a certain profile of expertise and training that their personnel must have.

## 5.h Visitor facilities and statistics

### *Visitors to Teide National Park*

The number of visitors to the Park is measured by gauges installed in the four entrances to the Park that have been counting vehicles since 1996. These mechanisms monitor the number of vehicles that pass by them, distinguishing between cars and buses. The average number of people in these vehicles is obtained by surveys and direct verification by Park personnel. Before 1996 the data was obtained by doing counts and statistics without mechanical assistance and only measuring visits between 9 a.m. and 4:15 p.m. This accounts for the quantitative jump that can be seen in the following table in the number of visitors to the Park from 1995 to 1996 (1995-2004).

| YEAR | VISITORS |
|---|---|
| 1995 | 2,600,000 |
| 1996 | 3,182,420 |
| 1997 | 3,237,910 |
| 1998 | 3,402,391 |
| 1999 | 3,773,990 |
| 2000 | 3,689,649 |
| 2001 | 3,581,164 |
| 2002 | 3,488,622 |
| 2003 | 3,364,873 |
| 2004 | 3,540,195 |

There has been a continuous decline in the number of visitors to the National Park since 1999, falling from 3,773,990 to 3,364,873 in 2003. Although last year (2004) the number rose to 3,540,195, it is still much lower (almost 235,000 less) than 1999, the year with the highest number of visitors.

There is a section entitled Statistics of Public Use in the annex documentation that breaks down the number of visitors to the National Park as well as those that visit Tenerife.

### *El Portillo Visitor Centre*

Located in the north access to the Park, this remodelled centre is installed in an inconspicuous building (705 $m^2$ between both stories) that is perfectly adapted to its environment. 560 $m^2$ of the surface area is dedicated to an exhibit area with a capacity of 120 people where information on the natural resources and processes of the Park is displayed. This information helps the visitor to understand the geological history of the Park, the formation of the landscape, the adaptations of the flora and fauna to the environment, the special climate of the area, etc. There is also an audio-visual presentation explaining the origin of the Canary Islands in general, and Las Cañadas and the Mt. Teide in particular, that is projected continually in a room that can seat up to 65 people. This centre, opened in 1977, was a pioneer in Spain and has restrooms, bookstore and parking spaces.

In the public use statistics collected in the annex documentation the number of people that used this centre from 2000 to 2004 is displayed.

### *Cañada Blanca Visitor Centre*

This centre is located in a wing of the Parador de Las Cañadas del Teide (hotel) in a beautiful area in front of Los Roques de García. This centre has a surface area of 182 $m^2$ and a capacity for 55 people. In this centre information is displayed explaining the interaction of human beings with Las Cañadas, the evolution of the different ways of life throughout history, the uses of the environment and the long history of research done on Mt.



*El Portillo Visitor Centre*



*Cañada Blanca Visitor Centre*

Teide. The centre has restrooms, a bookstore and parking spaces. The centre is currently being expanded to include a semi-buried projection room.

The number or people who visited this facility between 2000 and 2004 is displayed in the section on visitor statistics mentioned earlier.

***Boca Tauce Information Booth***

This booth is located in the south access to the Park at the crossroads between county road TF-21 and TF-38. It was opened in April of 1994. Every year around 25,000 people use the Boca Tauce Information Booth.

***El Portillo Botanic Garden***

In 1986 a botanic garden was created to exhibit the flora of Las Cañadas near the El Portillo Visitor Centre. The garden, which measures 4 hectares, 22 areas and 50 centiares, has been supplied with specimens produced in a nursery with the idea of integrating them with existing vegetation and identifying the species so that the visitors can learn about them. The original design of the garden respected the environment and the species found there as much as possible, taking care to make sure that its outer appearance was as natural and rustic as possible. At the moment more than 60% of the flora native to the Park is represented in the garden. In order to walk through the garden, a pathway of 1,705 m was custom-made with a capacity for 140 people.

***El Portillo fire fighting and first aid post***

This facility, located at the 33 km point of country road TF-21 (between El Portillo Bajo and El Portillo Alto), quarters personnel, vehicles and material to fight forest fires as well as a first aid post that is currently run by the Red Cross. This post has served as a base of operation for first aid and assistance in case of accidents in the National Park since 1987. The presence of this post ensures much faster emergency assistance than the far-off hospital services can provide, extremely important in a Park with the amount of visitors and special characteristics (altitude, orography, climate, etc.) of Teide National Park.



*Botanic Garden*

***Emilio Fernández Muñoz Nature Activities Centre***

This popular activity centre is located outside of Teide National Park in Monte del Estado Cumbres del Realejo Bajo but managed by the Park's Administration. The centre was built in a pine mountain at an altitude of 1,600 m, below the currents of the Elysian winds, and because it has many didactic possibilities it is

an ideal place to impart environmental education. In fact, it is used by many of the island's educational centres, mostly for activities related to the examination of the environment and the conservation of nature. Occasionally it is even used as a practice classroom. The centre has a capacity of 80 people.

Among the visitors (more than 2,500 people and around 60 groups annually) there were more groups from educational centres then any other organisation (municipal, social, youth, NGOs, religious, etc.). The facility is occupied an average of 225 days a year, the average stay was four days and the average size of the group was 52 people.

Various data on this centre is available in the Statistics of Public Use section of the Annex Documentation.

The informative material that is distributed to Park visitors includes a general information pamphlet (available in spanish, english, german and french), a pamphlet of Park routes, a pamphlet that explains the effect that the mouflon has on the Park's vegetation, a pamphlet that describes the botanical garden and, somewhat more technical, the Mountain Climbing Guide published by the Canarian Mountain Climbing Federation. The Autonomous Organisation of National Parks has also published a Visitor's Guide to the Park in spanish, english, german and french.

Other services offered to the visitors by private companies and other administrative units that don't depend on Teide National Park include the following:

- Altavista Refuge: located at an altitude of 3,264 m, it can house up to 50 people and is managed by the Cabildo of Tenerife.

- Parador de Las Cañadas del Teide: located next to the Cañada Blanca Visitor Centre, it has 37 rooms, as well as a restaurant and cafeteria.

- Teide Cable Car: located at the 42.6 km point of the TF-21 highway, in the cable car base station. Teleférico del Pico de Teide, S.A., offers restaurant service (with a capacity for 130 diners) and a cafeteria. The company has the right to manage this service until 2037.

- In the Buffer Zone that surrounds the Park there are several restaurants that are owned and run by private companies: *El Portillo* (located at the crossroads of country roads TF-21 and TF-24, in El Portillo Bajo, with a capacity to seat 30 diners), El Mesón (with a capacity to seat 360 people), *Teide* (with a capacity of 400 diners) and La Bamby (with a



*La Ruleta lookout*



*First Las Cañadas guide*

capacity for 340 diners), the last three are located in El Portillo Alto.

The Annex Documentation includes a public use map that indicates the infrastructure located in the Park and in the protective Buffer Zone.

## 5.i Policies and programmes related to the presentation and promotion of the property

The public use programmes in Teide National Park are:

- Official education programmes.
- General public programme.

***Programs designed for the scholastic community in Tenerife (official education).***

The educational activities are divided into two large groups:

**Activities carried out in the Park**

- Educational excursions (with students and teachers in different parts of the Park depending on the objectives of the educational centre, where they come from and the time available).

- Environmental workshops (carried out in the countryside or in the El Portillo Botanical Garden).

- Training excursions for teachers (supporting the activities organised by some Teachers Centres and educational centres).

- Elaboration of didactic and informational material (a map of the trail network, articles in different magazines, the Park's Visitor's Guide, corrections to the website, notebooks, etc.).

**Activities done outside of the Park**

- Workshops, talks and lectures in educational centres (developing topics related to natural spaces in general and Teide National Park in particular).

- Environmental education activities in the Emilio Fernández Muñoz Nature Activities Centre (supporting activities programmed by the users and carrying out activities designed by the Park personnel).

- Collaboration in training courses for teachers (giving talks, workshops, etc. in the teacher centres that solicit them).

Students from educational centres in Tenerife (2003/04 school year, data provided by the Canarian Government's Education Council):

| | |
|---|---|
| **Preschool** | 22,746 |
| **Primary** (from 1st to 6th)* | 49,959 |
| **ESO** (from 1st to 4th) | 38,506 |
| **Bachillerato** | 13,118 |
| **Training cycles** | 10,975 |
| **Special Education** | 498 |

*Approximately 16,653 from 5th and 6th.

There are 113,056 students (79,750 if only students in the 5th grade of Primary school and above are counted) who are potential users of the Environmental Education Support Service in Teide National Park. Preschool and the first few years of primary school are not included because this service not designed for students in those age groups. This does not mean that these groups are not attended to, but it depends on whether or not there are openings in the schedule because the higher grades are always given priority. Nevertheless, there are one-classroom schools, especially in rural areas, where students from different grades are taught in the same classroom and therefore they organise activities for all the different age groups.

The population of the Canary Islands is very young and their educational centres provide an environment and infrastructure that facilitate activities for children and adolescents. Therefore, it stands to reason that a well planned environmental education programme directed at this sector of society will eventually be translated into a good environmental education for a large part of the population that will also make up the majority of the citizens and leaders of the near future.

<u>Objectives</u>

- Explain the cultural and natural heritage of Teide National Park.
- Give essential information about our landscape.
- Help students to learn about the diverse ecosystems that exist on the island, as well as its historical, socio-economic, anthropological and cultural aspects.
- Create awareness for the need to protect the environment and respect nature.
- Use scientific methods and active participation that go beyond conventional classroom education.
- Give students the opportunity to relate to their classmates and teachers in an open and informal social setting.



*Talk given to students*

- Foment collaboration in maintaining and cleaning the environment among the students.

Methodology

The students should be introduced to the environment through their daily experiences so that their personal perceptions can intervene in the learning process. In addition, the study of the terrain should be promoted implying special methods of placement and use of pedagogical material (particularly audiovisual). This is essentially based on the discovery method in any of its forms.

Group learning should also be promoted because creating common goals and working in teams allows the students to experience new kinds of social relationships. Practicing being part of a group is fundamental for young people to learn how to be responsible as well as how to collectively define their immediate surroundings.

Basic activities: talks and guided excursions directed toward the scholastic community of the island.



*Montaña Blanca path*

The talks, usually given on Mondays, introduce the students to nature and the human activities carried out in Teide National Park. These talks are accompanied by approximately 60 slides, a number that may vary, depending on the level of interest that the group has in the topic. At the moment it is also possible to use computer projectors.

After hearing the talk given in the educational centre, the group of students, accompanied by teachers, walk through a route in the Park accompanied by guides that specialise in scholastic activities. This service is generally imparted on Tuesday or Friday within the scholastic calendar.



*Talks*

Although some may think that only teachers of material directly related to these kinds of spaces (biology, geography, etc.) are interested in these services offered by the Park, in reality teachers of all kinds are excited by the possibility of relating nature to Maths, Language Studies or Physical Education, to name a few.

The recipients are Tenerife educational centres with students of all ages, although this service is mostly directed toward students from the 5$^{th}$ grade of primary school on (5$^{th}$ and 6$^{th}$ grade Primary Education, 1$^{st}$ to 4$^{th}$ grade of ESO, 1$^{st}$ and 2$^{nd}$ grade of *Bachillerato* and Training Cycles).

During the 2003-04 school year 147 talks were given in 99 different educational centres in 26 municipalities of the island to 7,518 students and 803 teachers. There were also 111 guided

excursions given to 5,457 students and 340 teachers from 82 different educational centres of those 26 municipalities.

During the 2003-04 school year the Park worked with educational centres from 26 of the 31 municipalities in the island (84%).

99 of the 380 educational centres in the island participated in this programme, more than 26%, although this percentage would increase considerably if the centres that are not interested in this service or not capable of using it, or those whose students are too young to take part in its activities (preschool, the first years of primary school), or those who do not support certain extra-curricular activities were taken out of the calculation.

The school year has at most 160 days a year (discounting weekends and holidays) and last year personnel from Teide National Park gave 147 talks (an activity that normally takes place on a Monday) and 111 guided excursions in the Park.

The difference in the number of students who were given a talk (7,518) and those that were able to do a guided excursion (5,457) is due to the fact that some educational centres did not want to or could not travel to the Park and so they only asked for a talk in their own centre.

***General Public Programme***

There is a general consensus to try and foment new attitudes in the general public toward the environment by making people more aware and understanding of their natural surroundings. More than create a passive conservation attitude, the idea is to increase the level of participation and solidarity.

The goal is not a limited educational focus designed only to transmit information, but rather also to provoke an affective reaction that is fundamental in creating permanent behaviour. In this sense, the idea is to develop an affective component that helps to change attitudes.

Objectives

- Encourage interest (not in-depth education) in those that receive the information.
- Stimulate the senses as the most direct way of learning.
- Instil interest and curiosity about nature and its conservation, particularly in the National Park.

Infrastructures



*Mountain climbing*

- El Portillo Visitor Centre.
- Cañada Blanca Visitor Centre.
- Boca Tauce Information Booth.
- Botanical Garden.
- Emilio Fernández Muñoz Nature Activities Centre (CANEFM).
- El Portillo Office.
- Administrative Office in Santa Cruz de Tenerife.
- Trail network (21 in the main network and 14 secondary trails).
- All others where Park personnel are present, including those that are not managed by the Park Administration.

Materials and facilities

- Signage: information and orientation signs, path indicators, plaques, etc.
- Information tables located at the most interesting points of the Park. At the moment there are 26.
- Publications: pamphlets, maps, guides, notebooks, etc.

Main activities

- Excursions guided by specialised personnel and excursions where the visitors guide themselves. Within the Trail Network there are many paths that visitors can follow without the need of a guide by following the indicators installed throughout the trail and by using the available material: pamphlets, written guides, etc.
- Tours of the facilities and the entire Park.
- Talks and lectures to associations, groups, etc.
- News and attention for people who petition services (general information, services and facilities, activities, etc.)
- Training.
- Promotion and diffusion.

Summary of the guided excursions carried out for the general public (2004)

A total of 617 guided excursions were carried out (on foot and in vehicles) in which 6,843 people took part, an average of 11 people per excursion. The guided excursions are free and a large percentage of these users (between 10 and 25%) belong to educational centres, mostly from Tenerife but also from other islands and even the Spanish mainland and the Balearic Islands and, to a lesser degree, foreign countries. The excursions done with vehicles mostly involved groups of handicapped people.



*Guided excursion*

The Public Use Statistics section of the Annex Documentation gives more details on the number of people that have participated in the activities organised by the Park.

There are counters installed in the park's main trails in order to know the number of visitors that use each of them. Because of its fragility and low capacity, the access to the Telesforo Bravo path that connects La Rambleta (3,350 m) with the peak of Mt. Teide (3,718 m) is restricted: a permit is necessary to travel by this path.

In 2004 14,055 permits for 43,198 people were emitted. The number of people that spent the night in the Altavista Refuge (a facility managed by the Cabildo of Tenerife) and later climb to the peak in the morning (around 7,000 people a year according to the Cabildo of Tenerife) should be added to the first number.

Related to the public use of the park, in the office located in Santa Cruz de Tenerife more than 15,000 consultations were made in 2004 (telephone calls, letters, fax or individuals), without counting the people who went to the office only to ask for a permit to climb the peak of Mt. Teide.

***Training Programme***

Because there are so many visitors to Teide National only a small portion of them are actually attended to by Park personnel or use the facilities of the National Park and it is a constant challenge to attend to as many of them as possible. The Park tries to make the quality of the visits and the information that it gives as outstanding as the natural space itself. This is the reason why (in addition to complying with the Management and Usage Administration Plan) for six years the Park has organised a Teide National Park guide-certification course designed for professionals who want to be guides on Mt. Teide without discrediting any official degrees that have been certified by Administrations that are competent in this material. The goal is to assemble forces that help visitors to enjoy this natural heritage while reducing the negative impact that these activities may have since the guide also acts to promote the conservation of the Park. The possibility that they used interpretive techniques doesn't depend exclusively on us, but this training does reveal the magnificent possibilities to interpret the heritage in tourist activities. In 2004 the sixth edition of the Teide National Park guide-certification course was held.

In addition to these courses for guides, the last few years the park has also convened courses principally directed at the local population with the goal of informing and involving society in the understanding and management of this protected space. Some of these courses are: "Interpretation in Protected Natural Spaces",



*Guided excursion in vehicle*

Planning in Protected Natural Spaces", "Public use of Teide National Park" and "Control of Introduced Herbivores".

In 2005 the following courses will be imparted: "Teide National Park Guide Certification" (7th Edition) and "Risk prevention, security and first aid in the high mountain".

As far as training Park personnel, in addition to the training courses organised by other administrative units that are attended by the workers, sessions to update their knowledge are also held in order to exchange information between different Park departments and to give information about the work and reports done internally and externally so that all of the personnel is as up to date as possible on the characteristics and activities of the Park and can then transmit this information to the public.

***Practice classes and volunteers***

Ever since Central Services started the Volunteer Action Plan in the National Parks Network, each year a number of young people collaborate with Teide National Park as volunteers. In September of 2002, 18 volunteers participated in these activities under the supervision of a coordinator from the Spanish Ornithology Society (SEO) and, of course, personnel from the Park. In 2003, 9 volunteers collaborated with the Park, once again with the collaboration of the SEO, and again in 2004 with 8 volunteers. The volunteer programs generally take place in July and August, with three major groups of activities: managing flowers, public use program and managing fauna.

Every year various students or graduates do practice classes in Teide National Park, once they have signed a commitment to do so with the Autonomous Organisation of National Parks. Students have participated from the following universities: University of Salamanca, University Rey Juan Carlos de Madrid and the University of La Laguna.

In addition, there are agreements with the University of La Laguna and the Canarian Government's Agriculture, Livestock, Fish and Food Council to let their students do practice classes in the National Park. Specifically, eleven students from the Higher Education Centre of the University of La Laguna did practice classes in the Park (2001-02 school year). In following years a similar number of students have participated in practice classes in the Park; this year (2004-05) three students from the University of La Laguna are signed up for these activities.

Moreover, students from middle education institutes in Tenerife (mostly related with nature sports activities) have also participated in practice classes in the Park with the aid of Park personnel.

It is also common for associations and organisations in Tenerife to participate in campaigns to build awareness organised in conjunction with the National Park to remove waste from its grounds. Some of the most important collaborations are with the Canarian and Tenerife Hunting Federations, Canarian and Tenerife Mountain Climbing Federations, hunters associations, etc.

It should also be highlighted that through the corresponding accords a few years ago the National Park allowed conscientious objectors to do social work in the Park as a substitute for serving in the military. Now that there is new legislation that makes military service professional and non-mandatory, this offer is no longer valid.

***Promotion***

Among the promotional activities of the Park some of the most important are giving talks, participating in seminars, courses, conferences, symposiums and fairs (for example, the Ecological and Rural Environment Fair organised every year by the Municipality of La Orotava); carrying out informational campaigns (for example, the anniversary of the declaration of Teide or the acts to commemorate the 50th anniversary of the National Park, that will be prolonged this year to include a commemorative exhibit) or organising writing and drawing contests whose objective is to promote interest in Teide National Park among the scholastic community of Tenerife (this year the 13th edition was held).



***Roques de García***

## 5.j Staffing levels

Currently, Teide National Park has a staff of 23 workers: 11 permanent state workers and 12 are contracted labour.

These workers are categorised as follows:

- 4 Technicians.
- 7 Office Workers.
- 6 Environmental Agents and Park Rangers.
- 3 Maintenance and others.
- 3 Cleaning.

An important proportion of the activities in the Park are developed by companies under the supervision of the Park staff. In this way it is necessary appoint that the human effectives contracted by this companies for the Park activities are:

- 9 Technicians.
- 2 Office Workers.
- 12 Surveillance.
- 14 Public Use (reporters and guides).
- 77 Cleaning, maintenance, forest fire control and others.



*Spring in the Teide National Park*

# 6. Monitoring

## 6.a Key indicators for measuring the state of conservation

| INDICATOR | PERIODICITY | LOCATION OF RECORDS |
|---|---|---|
| **Number of threatened species** | 5 | Teide Nacional Park |
| **Number of specimens that can reproduce in a species in a critical state** | 3 | Teide Nacional Park. |
| **Number of populations of a species in a critical state** | 5 | Teide Nacional Park |
| **Coverage of potential plant communities** | 5 | Teide Nacional Park |
| **Coverage of serial plant communities** | 5 | Teide Nacional Park |
| **Number of mouflons** | 1 | Teide Nacional Park |
| **Number of rabbits** | 1 | Teide Nacional Park |
| **Number of introduced species** | 2 | Teide Nacional Park |
| **Number of visitors** | 1 | Teide National Park Visitor Centres. Network of gauges measuring the Park's traffic. |
| **Number of visitors that use guided routes** | 1 | Park's trail network |
| **Number of research requests** | 1 | Teide National Park Administration Centre. |

## 6.b Administrative arrangements for monitoring property

The development of monitoring activities related to section 6.a will be managed by the Teide National Park Administration via its team of technicians or via specific contracts with the universities of the Canary Islands.

Contact Address:

Parque Nacional del Teide
c/ Emilio Calzadilla, nº 5, 4º piso
38002 Santa Cruz de Tenerife
Islas Canarias. España

## 6.c Results of previous reporting exercises

Since 1989 Teide National Park has been awarded the European Diploma for Protected Areas given by the Council of Europe. To maintain the diploma, every year the Park has to give

a report on the state of conservation and management of the Park using a form and a series of recommendations that were given when the Park was first awarded the Diploma (1989) and in the subsequent renovations (1994, 1999, 2004). Therefore, 15 reports have been prepared according to the instructions of the Council of Europe and, more precisely, the section of recommendations:

- In the meeting celebrated on Thursday, October 24, 2002 in Las Palmas de Gran Canarias, the Council of the Canary Islands Government approved the new Management and Usage Administration Plan of Teide National Park. The plan was published in the Official Bulletin of the Canary Islands on December 11 and became valid on December 12, 2002. The National Park was enlarged by an Accord of the Council of Ministers on July 2, 1999, growing to 18,990 hectares and ever since it has been following the procedures to acquire the privately owned properties in El Portillo (La Orotava) and Vilaflor, and the possible addition of the Las Cumbres estate, currently owned by the Ministry of Defence, to this protected space.

- Section 3.8.1 of the Teide National Park Management and Usage Administration Plan states: “A special relationship or coordination and collaboration mechanisms will be established and maintained with the Administration responsible for the management of Corona Forestal Nature Park, a protected natural space that is partially located within Teide National Park, as well as its surroundings”. In addition to this direct reference in the plan, the Park Administration and the Government of the Canary Islands have maintained a relationship whose goal is to share the planning aspects of aspects that affect both natural spaces simultaneously, especially traditional uses and practices and public use. An effort has been made to ensure that there is continuity between the different usage zones, starting from the same work lines, in order to avoid contradictions.

- The annual hunting campaigns to reduce the rabbit population and maintain it at a tolerable level continue. In order to carry out this campaign the hunters of the island collaborate with the National Park. As for the mouflon the campaigns to eradicate this introduced herbivore also continue.

- As a result of intense collaboration between institutions with competences over this material, the commercial activities of the La Rambleta bar have been terminated. A study of the social, economic, environmental and legal significance has been carried out as well as an analysis of the possible repercussions of its disappearance.

- With the approval of the Management and Usage Administration Plan a procedure has been put into motion to definitively suppress the use of all of the constructions in the area of the El Sanatorio and their subsequent demolition, thereby returning the land to its original state. This decision was reached because the existence and current use of these constructions is incompatible with the purpose of the National Park.

- Studies on inter-population and intra-population genetic variability of some plant species have been launched with the purpose of learning the precise genetic heritage of the scarce resources of some of them.

- While the plan to increase the crow (*Corvus corax*) population on the island is being designed, bird-feeders and drinkers have been installed in the Park. Censuses of the Barbary partridge (*Alectoris barbara*) have been taken in the Park and in the Fasnia and Iserse Estates (which belong to the State) in order to study the current state of this species and improve its habitat. Bird-feeders and drinkers were also installed to increase the potential of the land apt for this species.

- The study, "Characterisation of habitats and determination of singular areas of interest for the invertebrate fauna of Teide National Park" has been completed. This report describes the major areas of interest from the perspective of invertebrates. In addition, the cartography shows the potential distribution of the most characteristic or singular species of the National Park. The conclusions of the report, as well as the Inventory of Invertebrate Fauna in the National Park were of course kept in mind while writing the Management and Usage Administration Plan.
-
- The area plans, the Access Master Plan and the Public Use Plan are being prepared in order to adapt visits to the calculated capacity of each area of the National Park.

- Regarding the help given to the populations that live in the National Park's area of influence, during these years subsidies have been given to municipal governments, companies, not for profit associations and individuals.

- Since 2000 the Ministry of the Environment has convened various selection processes to incorporate personnel in the different corps (Forest Rangers, Environmental Agents, General Service Agents, etc.), thereby increasing the size of the National Park's staff. Regarding the area that was

enlarged in 1999, a specific monitoring service was created in those lands, as well as the expansion of the evening-night hours for monitoring activities.

In addition, each year various general reports are prepared about the National Park (based on the corresponding plan of objectives and activities) that also serve as the basis for the elaboration of the Autonomous Organisation of National Parks and the National Parks Network reports.

As a compliment to the information cited, the Annex Documentation includes the Annual Report of the European Diploma (from October 1, 2003 to September 30, 2004) and the Teide National Park Report for 2004.



***Melted water in Llano de Ucanca***

# 7. Documentation

## 7.a Photographs, slides, image inventory and authorization table and other audiovisual materials

| |
|---|
| **Nº** 1<br>**Format:** DVD<br>**Caption:** Teide National Park<br>**Date:** January, 2006<br>**Director of the video:** Televisión Española.<br>**Copyright**: Televisión Española.<br>**Details of the Copyright:** Prado del Rey, s/n. 28223 Madrid. Telephone: 00 34 913464000<br>**Non exclusive cession of rights:** no |
| **Nº** 2<br>**Format:** CD-ROM<br>**Caption:** Teide National Park<br>**Date:** October, 2001<br>**Director of the video:** Fon-3, S.A.<br>**Copyright**: Autonomous Organisation of National Parks. MMA*.<br>**Details of the Copyright:** Gran Vía de San Francisco, nº 4. Telephone: 00 34 915965400<br>**Non exclusive cession of rights:** yes |
| **Nº** 3<br>**Format:** 35 mm slides. Fototeca CENEAM (20)<br>**Caption:** National Parks. Teide National Park<br>**Date:** 2003<br>**Photographer:** J.L. Perea, J.S. Socorro, S. Bregaza<br>**Copyright:** Autonomous Organisation of National Parks. MMA*.<br>**Details of the Copyright:** Gran Vía de San Francisco, nº 4. Telephone: 00 34 915965400<br>**Non exclusive cession of rights:** yes |
| **Nº** 4<br>**Format:** CD-ROM<br>**Caption:** Spanish National Parks Presentation.<br>**Date:** 2002<br>**Director of the video:** Fon-3, S.A.<br>**Copyright:** Autonomous Organisation of National Parks. MMA*.<br>**Details of the Copyright:** Gran Vía de San Francisco, nº 4. Telephone: 00 34 915965400<br>**Non exclusive cession of rights:** yes |
| **Nº** 5<br>**Format:** DVD Nuestros Parques Nacionales. Red de Vida.<br>**Caption:** Teide National Park<br>**Date:** 2004<br>**Director of the video:** Divisa Home. Video 2004<br>**Copyright:** Divisa Home Video 2004<br>**Details of the Copyright:** c) Los Astros, 2. 47009 Valladolid. Telephone: 00 34 983363363<br>**Non exclusive cession of rights:** no |
| **Nº** 6<br>**Format:** Digital Photography (10)<br>**Caption:** Teide National Park Digital Photography Archive.<br>**Date:** Various<br>**Photographer:** Diego L. Sánchez<br>**Copyright:** Autonomous Organisation of National Parks. MMA*.<br>**Details of the Copyright:** Gran Vía de San Francisco, nº 4. Telephone: 915965400<br>**Non exclusive cession of rights:** yes |
| **Nº** 7<br>**Format:** 35 mm slides (70)<br>**Caption:** Teide National Park Slide Archive.<br>**Date:** Various<br>**Photographer:** Diego L. Sánchez<br>**Copyright:** Autonomous Organisation of National Parks. MMA*.<br>**Details of the Copyright:** Gran Vía de San Francisco, nº 4. Telephone: 915965400<br>**Non exclusive cession of rights:** yes |

***Ministry of the Environment**

The information supplied in this table is thoroughly developed in the epigraph “audiovisual material” of the Attached Documentation.

## 7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts from other plans relevant to the property

The annex documentation includes a copy of the Reclassification Law 5/1981, March 25, also Decree 153/2002, October 24, approving the Management and Usage Administrative Plan and, finally, an extract of the content in the Island Territorial Planning Plan (PIOT) that refers to Teide National Park.

## 7.c Form and date of the most recent records or inventory of property

The following are the most recent documentation and inventories related to the flora and vegetation of the property (in chronological order):

- ARECHAVALETA HERNÁNDEZ, M., ZURITA PÉREZ, N. & OROMÍ MASOLIVER, P. 2001. *Caracterización de hábitats y determinación de áreas singulares y de interés para la fauna de invertebrados del Parque Nacional del Teide.* Recomendaciones de Conservación. Parque Nacional del Teide. Documentación inédita.

- CAMACHO SÁNCHEZ-BARBA, G., BOLAÑOS LÓPEZ DE LERMA, F.J. & ELENA ROSELLÓ, R. 2002. *Estudio sobre la evolución de la flora y vegetación del Parque Nacional del Teide.* Informe final. Parque Nacional del Teide. Documentación inédita.

- CARQUÉ ÁLAMO, E. 2004. *Inventario flora introducida. Parque Nacional del Teide.* Informes anuales: años 1995-2004. Parque Nacional del Teide. Documentación inédita.

- CARQUÉ ÁLAMO, E. & MARRERO GÓMEZ, M. 2005. *Análisis de la dinámica poblacional de Heliantemum juliae.* Parque Nacional del Teide. Documentación inédita. 28 páginas.

- FERNÁNDEZ, F.J., HIERNAUX, L., REINA, I., MUÑOZ, F. & DILME, J.M. 2004. *Revisión del Estado Fitosanitario de las masas forestales de los Parques Nacionales y Centros. Ministerio de Medio Ambiente.* Organismo Autónomo Parques Nacionales. Memorias años 1997, 2001, 2003 y 2004. Parque Nacional del Teide. Documentación inédita.

- OROMÍ MASOLIVER, P., ZURITA PÉREZ, N. & ARECHAVALETA HERNÁNDEZ, M. 1997. *Inventario de la*



*Roques de García. Detail*

*fauna invertebrada del Parque Nacional del Teide*. Informe parcial, Fase II. Documentación inédita.

- PRENDES AYALA, C., LORENZO BETHERCOURT, C., CABRERA PÉREZ, R. & HODGSON TORRES, F. 1997. *Estudio fitopatológico de la retama del Teide.* Informe final. Parque Nacional del Teide. Documentación inédita.

- RODRÍGUEZ DELGADO, O., WILDPRET DE LA TORRE, W., RODRÍGUEZ NAVARRO, L., CRUZ TRUJILLO, G.M. & BERMEJO DOMÍNGUEZ, J.A. 2002. *Estudio sobre la evolución de la flora y vegetación del Parque Nacional del Teide.* Informe final. Documentación inédita.

- SOSA HENRÍQUEZ, P. 1997. *Análisis isoenzimático de poblaciones naturales de los Géneros Cistus y Gnaphalium.* Resultados preliminares. Parque Nacional del Teide. Documentación inédita.

- SOSA HENRÍQUEZ, P. & GONZÁLEZ PÉREZ, M.A. 2002. *Caracterización genética de las poblaciones naturales de la especie Bencomia exstipulata de los Parques Nacionales del Teide y Caldera de Taburiente, y su aplicación al plan de recuperación.* Informe final. Parque Nacional del Teide. Documentación inédita.

- SOSA HENRÍQUEZ, P. & POLIFRONE, M. 2004. Caracterización genética de la especie *Helianthemum juliae* del Parque Nacional del Teide, y su aplicación a la conservación de sus poblaciones. Informe final. Parque Nacional del Teide. Documentación inédita.

- WILDPRET, W. & MARTÍN, V.E. 2003. *Inventario de la Flora y Vegetación del Parque Nacional del Teide. 2001-2003.* Parque Nacional del Teide. Documentación inédita.

The following archaeology inventories have recently been taken:

- RODRÍGUEZ RODRÍGUEZ, T. (dir). 2004. *Inventario Arqueológico de La Orotava*. CICOP. Dirección General de Patrimonio Histórico de Canarias. Documentación inédita.

- ARNAY DE LA ROSA, M. 2005. *Inventario Arqueológico del Parque Nacional del Teide (etapa 2004 - 2007).* 92 páginas y anexo. Documentación inédita.

- ARNAY DE LA ROSA, M. ET AL. 2005. *Inventario Arqueológico del Parque Nacional del Teide* (etapa 2004 - 2007). Informe número 2. Documentación inédita.



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- ARNAY DE LA ROSA, M. ET AL. 2005. *Inventario Arqueológico del Parque Nacional del Teide* (etapa 2004 - 2007). Informe número 3. Documentación inédita.

Public Use of the Nacional Park and Meteorological Net monitoring constitutes actualiced documentation:

- *Seguimiento anual de visitantes al Parque Nacional del Teide.* Años 2003-2004. Documentación inédita.

- *Seguimiento mensual de las redes de meteorología del Parque Nacional del Teide.* Años 2003 y 2004. Documentación inédita.

## 7.d Address where inventory, records and archives are held

The material used to elaborate the Proposal to Inscribe Teide National Park on the World Heritage List and that have served as the basis for its development is found deposited in the library and archives of the Teide National Park Office. This office is located in Santa Cruz de Tenerife, in c/ Emilio Calzadilla, nº 5, 4º piso.

Nevertheless, there are also other institutions that have part of the documentation in their facilities. The following is a list of addresses where this documentation can be found:

***Geology documentation***

Instituto de Productos Naturales y Agrobiología
Centro Superior de Investigaciones Científicas
Avenida Astrofísico Francisco Sánchez, nº 3
38206 San Cristóbal de La Laguna

***Archaeology and history documentation***

Dirección General de Patrimonio Histórico
Consejería de Educación, Cultura y Deportes
Gobierno de Canarias
c) Villalba Hervás, nº 4 , 5º planta
38007 Santa Cruz de Tenerife

Unidad Orgánica de Patrimonio Histórico
Cabildo Insular de Tenerife
San Pedro Alcántara, nº 5, 3º piso
38003 Santa Cruz de Tenerife



Museo Arqueológico del Puerto de La Cruz
c) El Lomo, 9A
38400 Puerto de la Cruz

Fondos de Canarias de la Universidad de La Laguna.
Campus de Guajara
38071 La Laguna

Departamento de Prehistoria, Antropología e Historia Antigua de la Universidad de La Laguna
Campus de Guajara
38071 La Laguna

## 7.e Bibliography

This section organises by material the bibliographic references that contain the most important aspects that support the *Proposal to Inscribe Teide National Park on the World Heritage List*.

### *Geology bibliography*


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# 8. Contact Information

## 8.a Preparer

The following is the name, address and contact information of the person responsible for preparing the proposal:

- Name: Julián Martínez García
- Title: General Director of Art and Cultural Properties. Ministry of Culture.
- Address: Plaza del Rey, nº 1. 28004 Madrid
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E-mail: julian.martinez@dgba.mcu.Estimado señor o señora:

## 8.b Official Local Institution/Agency

The following is a list of addresses of the administrations that are managing Teide National Park at the moment of the preparation of this proposal:

- Ministerio de Medio Ambiente
  Plaza de San Juan de la Cruz, s/n
  28071 Madrid

- Comunidad Autónoma de Canarias
  Viceconsejería de Medio Ambiente
  Avenida de Anaga, nº 35
  Edificio de Usos Múltiples I, planta 6ª
  38071 Santa Cruz de Tenerife



*Zapatilla de la Reina*

## 8.c Other local institutions

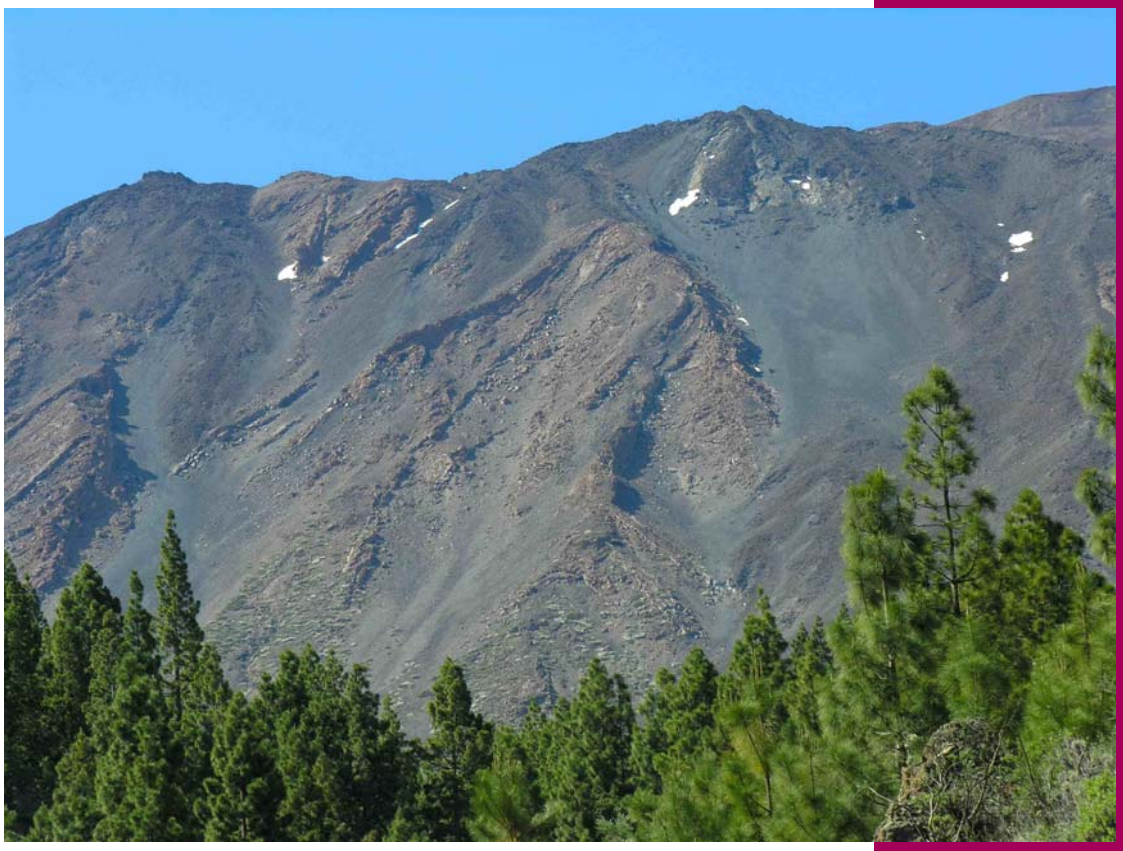
The offices and museums that should receive the free bulletin “The World Heritage Newsletter” on events and information concerning world heritage are the following:

- Oficina de Turismo del Cabildo Insular de Tenerife
  Plaza de España, s/n
  38003 Santa Cruz de Tenerife

  Telephone: 00 34 922239592
  Fax: 00 34 922239811
  Email: lale@cabtfe.es

- Oficina de Turismo de La Orotava
  c) Carrera, nº 2
  38300 La Orotava

  Telephone: 00 34 922323041
  Fax: 00 34 922334512
  Email: turismo.orotava@cabtfe.es



*North face of Teide*

- Organismo Autónomo de Museos y Centros del Cabildo Insular de Tenerife.
  Prolongación Ramón y Cajal
  Edificio Salesianos, nº 3, semisótano 2
  38003 Santa Cruz de Tenerife

  Telephone: 00 34 922209320
  Fax: 00 34 922279333
  E-mail: administración@museosdetenerife.org

This autonomous organisation groups the following museums: the Tenerife Anthropology Museum, the Museum of Science and the Cosmos, the Nature and Man Museum (integrated by the Tenerife Archaeological Museum, Tenerife Museum of Natural Sciences and the Canarian Institute of Bio-Anthropology) and the Tenerife Museum of History.

## 8.d Official web address

Website of Teide National Park:
http://www.mma.es/parques/lared/teide/index.htm
Contact name: Manuel Durbán Villalonga, Director-Conservador of Teide National Park.
E-mail: mdurban@oapn.mma.es



*Chordate lava flows*

# 9. Signature on behalf of the State Party

The nomination concludes with the signature of the official empowered to sign it on behalf of the State Party:

Santa Cruz de Tenerife, 18 January 2006

GENERAL DIRECTOR OF ART AND
CULTURAL PROPERTIES

Julián Martínez García



ANNEX DOCUMENTATION











# PROPOSAL TO INSCRIBE TEIDE NATIONAL PARK ON THE WORLD HERITAGE LIST

## Santa Cruz de Tenerife, january 18, 2006

MINISTERIO
DE MEDIO AMBIENTE

Gobierno de Canarias

# PROPOSAL TO INSCRIBE TEIDE NATIONAL PARK ON THE WORLD HERITAGE LIST






## ANNEX DOCUMENTATION

MINISTERIO
DE MEDIO AMBIENTE

TEIDE
PARQUE NACIONAL

Gobierno de Canarias

This document has been prepared by:

**Coordination**
Manuel Durbán Villalonga
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# Introduction

The information contained in this document complements the data presented in the *Proposal to Inscribe Teide National Park on the World Heritage List*.

The sections on geology and geomorphology, landscape, flora and vegetation, fauna, ecological value, the sky, archaeology and history support the content of section 3 of this proposal referring to the justification of the inscription based on criteria (vii) and (viii). In addition, a report that endorses the outstanding universal value of Teide National Park has been provided that also serves to support the "Comparative Study" and the criteria mentioned above.

The "Public Use" section provides statistics on visitors, including the number of people who used the El Portillo and Cañada Blanca Visitor Centres, and the number of people who used the Emilio Fernández Muñoz Nature Activities Centre from 2000-2004. In addition, it breaks down the number of people who take part in activities in the Park by using the public use service. This information supports section 5.h of the proposal, Visitor Facilities and Statistics.

The "Legislation" section provides the text of the Reclassification Law, the Management and Usage Administration Plan and an extract of the Insular Planning of Tenerife Decree (PIOT), all of which refer to this protected natural space, just as section 7.b of the inscription proposal ordains.

The "Other Documents" section incorporates information on the implementation of an Eco-management System in Teide National Park and information about the institutions, associations and individuals who advocate the Proposal to Inscribe Teide National Park on the World Heritage List.

The European Diploma Annual Report and Teide National Park's 2004 report are attached in support of section 6.c of the inscription proposal.

Finally, a section on cartography is attached that includes maps with themes related to the texts found in the inscription proposal and posters with photographs and illustrations of geological, structural and landscape elements representative of the Park. The audiovisual material epigraph includes a comented relation of the slides, photographs, CD-ROM and DVD about the Teide National Park, that is annexed to the textual and cartopgraphic documentation.

# Geology and geomorphology

## Geological report for Teide National Park

### *Introduction*

Teide National Park is located in the Canary Islands, a chain of intra-plate volcanoes located only 100 kilometres from the edge of the African continent that was created by a low-intensity hot spot located under a slow-moving lithospheric plate.

The age (around 180 million years) and rigidity of the ocean crust on which the Canarian Archipelago sits and its proximity to a passive continental margin create a unique geodynamic setting which may be the reason why there has been no significant subsidence of these islands. This fact distinguishes them from the majority of ocean intra-plate islands that generally rest on much more flexible ocean crust in the interior of the oceans, causing them to sink into the sea in a relatively short period of time (several million years, less than six million in the Hawaiian Islands) once the deep magmatic plume ceases to provide them with dynamic sustenance.

One consequence of this special geological environment is that the Canary Islands display the complete evolutionary cycle of this kind of volcanic island and, correlatively, the entire magmatic series of this class of volcanism, as well as its products, formations and structures only partially found in similar islands that are limited to the juvenile-evolution volcanism and to the more primitive magmas of this magmatic series.

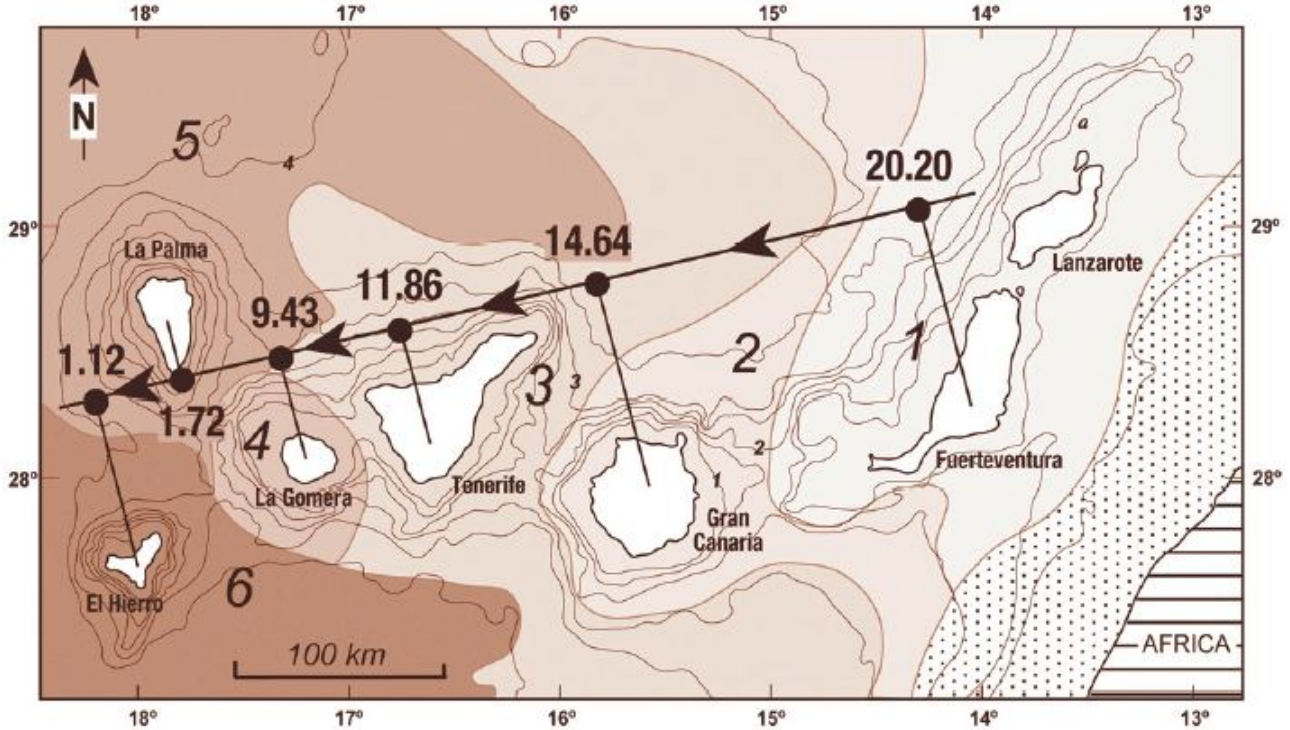
Moreover, Teide National Park is located in Tenerife, the central island of the archipelago that is currently in its maximum point of development, while the western islands are still in an incomplete stage of development and the eastern islands have already surpassed their prime and are now immersed in the post-erosional stage of volcanism and intense erosional dismantling. Teide National Park also encompasses the most significant part of the eruptions corresponding to the final volcanic stage of Tenerife, during which a complex combination of unique geological processes was produced, including: 1. the culmination of the explosive central volcano (Las Cañadas edifice); 2. its destruction due to a gravitational collapse, thereby creating a spectacular caldera (Las Cañadas Caldera); 3. its subsequent filling by eruptions originating in active rifts whose magma was modified by magmatic differentiation towards the extremes of the magmatic series, creating two stratovolcanoes nested in the bowl of the collapse.

These special geological circumstances have led to a concentration of distinctive and extraordinary geological elements in Teide National Park that is unique among intra-plate ocean islands on the planet, at least at the superior level of representation and integrity found in the Park. These geological elements, corresponding to the intermediate and final stages of the evolution of the magmatic series of inter-plate ocean islands, are incomparable and have no equal among similar volcanic areas. Indeed, this Park is the perfect complement to the equally spectacular Hawaii Volcanoes National Park which encompasses part of the Mauna Loa and Kilauea volcanoes, two stratovolcanoes in a

juvenile stage of development spectacular volcanoes where only magmas corresponding to the initial evolutionary stages of the magmatic series are represented.

Finally, Teide National Park is easy to reach and extraordinarily visited (more than 4.5 million visits a year) due to the fact that the economy of Tenerife, an island with a population of around one million, is based on a well developed tourism sector. Teide National Park would provide the entire evolution of inter-plate volcanism to the universal patrimony of the World Heritage Sites, since geological elements from the intermediate and late stages of the magmatic series of these kinds of islands are currently not represented. Teide National Park could signify to the European Union what Hawaii Volcanoes National Park currently signifies to the United States and Japan.

The unique and extraordinary value of the geological elements that are found in Teide National Park has been sustained by scientific observations carried out in the Canary Islands by numerous researchers from all over the world since the very dawn of geology and volcanology. From the point of view of geology, these islands can be considered among the best studied and scientifically observed.

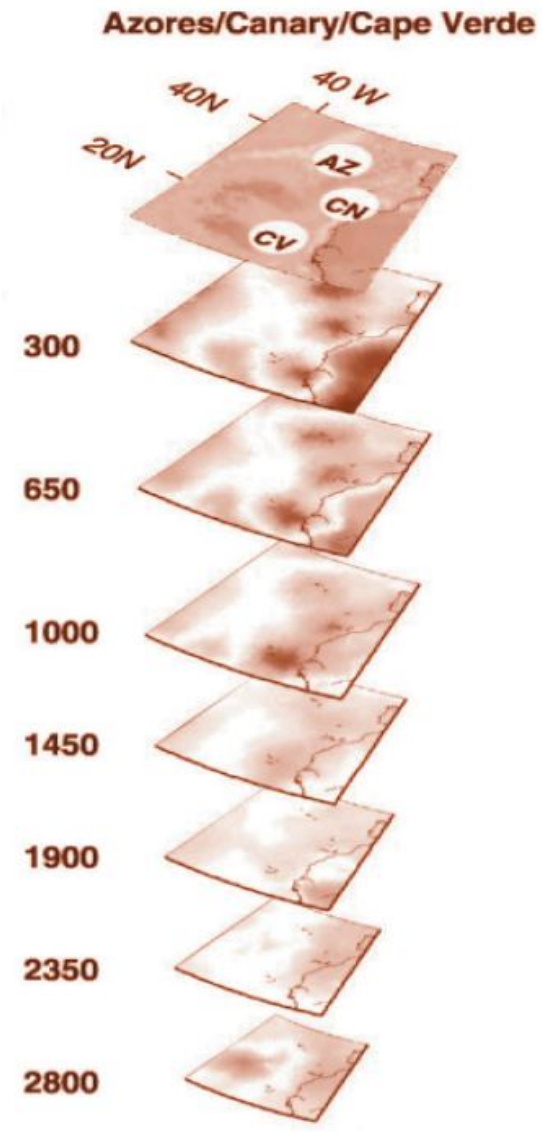



**Continuous age progression of the oldest subaerial formations of the different islands of the Canarian Archipelago corresponding to its generation by a hot spot or fixed magmatic plume underlying the African plate moving northeast. Note that the age relationship corresponds with the overlapping insular edifices (1 to 6). The two youngest islands, La Palma and El Hierro, are currently located over the hot spot.**

Building upon the pioneering work of important naturalists like Charles Lyell, Alexander Von Humboldt and Leopold von Buch, researchers who created the foundation of these scientific fields in the Canary Islands, the geological study of the islands has progressed, especially in the last few decades, to such an extent that all of the principle questions regarding the geological genesis and evolution of the archipelago can be considered resolved. Within this body of scientific observations and conclusions lies the

basis for the argument that Teide National Park contains unique and universally relevant geological examples that are the consequence of the special geodynamic and evolutionary circumstances of the Canary Islands compared with similar ocean islands on the planet.

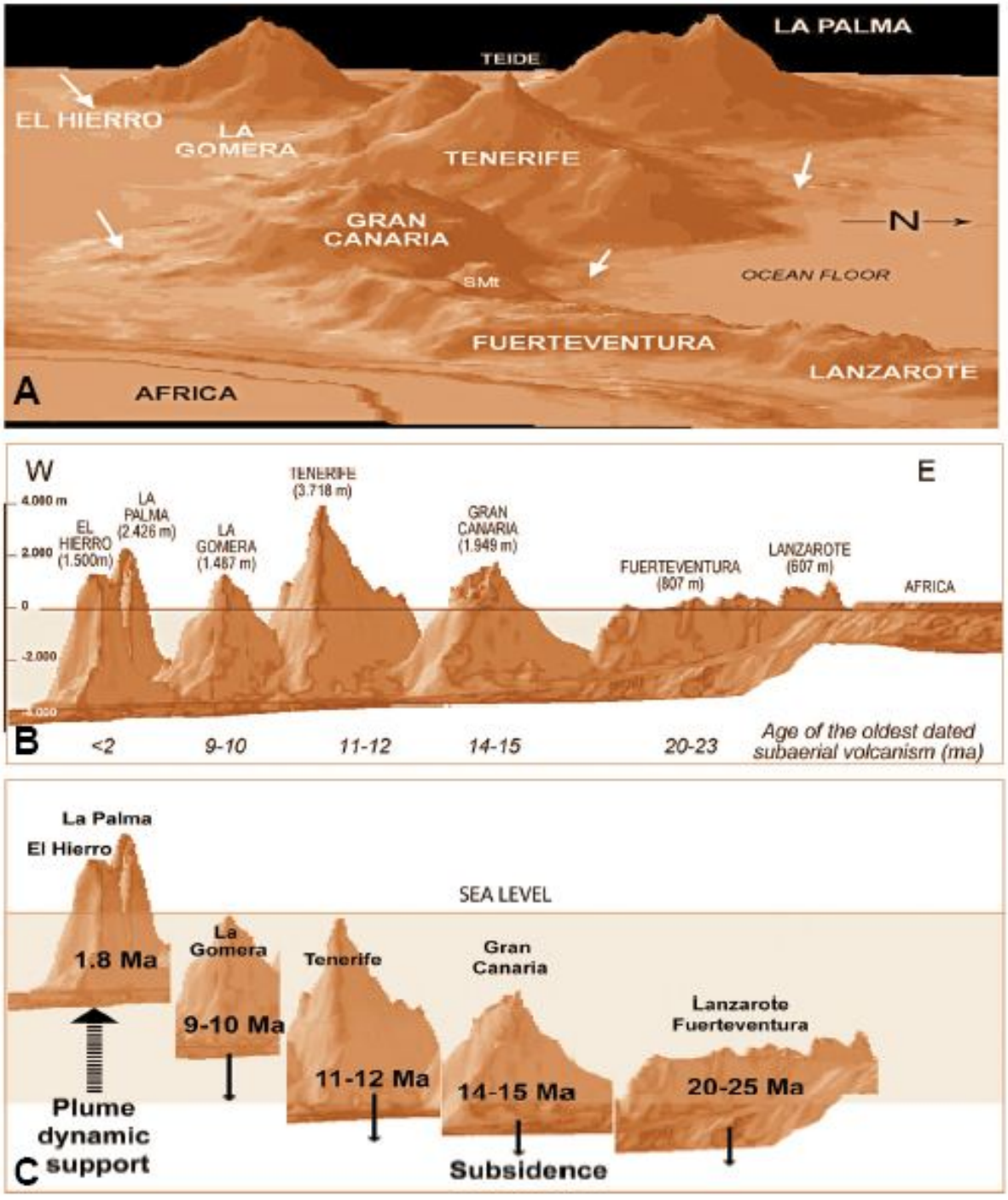
## Tenerife within the geological context of the Canary Islands




**The magmatic plume that created the Canary Islands starts at a depth of more than 2000 km, as has been recently determined using seismic tomography (De Paolo et al., 2003; Montelli et al., 2004).**

The Canary Islands form a chain of volcanic islands located in the interior of the African plate very close (around 100 km) to the edge of the African continent near Cape Juby. The archipelago, which sits on a Jurassic continental crust (around 180 million years old), shows a clear progression in the age of the oldest submerged volcanic formations from just over 20 million years in the island of Fuerteventura to little over 1 million years in El Hierro.

The creation model of the Canary Islands is still subject to debate between those who defend that these islands are associated with a deep magmatic plume or low-intensity hot spot acting on a slow-moving lithospheric plate and those who believe that Canarian magmatism is directly related to a fracture in the ocean crust that would be the extension of the Atlas African plate extended out to the Canary Islands. While this is a purely academic debate, it is also transcendentally important because the archipelagos resulting from the different models would have developed and evolved in completely different ways and the resulting structures, their most characteristic geological elements, would also be completely different. The unique and extraordinary elements of the island of Tenerife that are found in Teide National Park can only be explained if the archipelago was created by a hot spot similar to the hot spots that are generally accepted to have created the rest of the intra-plate ocean volcanic islands, such as the Hawaii Islands.




**A) Reconstruction (shaded relief image) of the ocean bathymetry in the area of the Canary Islands. Note the proximity of the islands to the continental margin. B) Cross-section that shows that Tenerife is the most developed island in the archipelago; the western islands are still incomplete and the eastern islands, far from the magmatic source, have comparatively scarce residual volcanism and are progressively being mass wasted by erosion. C) Reconstruction showing what would happen if the Canary Islands behaved like the Hawaiian Islands, where the last island to emerge is Kauai (less than 6 million years old). If the Canary Islands had subsided at the same rate, only La Palma and El Hierro would remain emerged after only 6 million years.**

Details on this debate can be found in Anguita and Hernán (1975, 2000), Carracedo et al. (1998, 2002) and Guillou et al. (2004). The only point that will be mentioned here is that, despite intense marine research in the area during the last few years related to oil prospecting, no evidence has been found to support the presence of a fracture near the archipelago or between the islands and the Atlas. Moreover, if this fracture existed along with a magmatic plume (Anguita and Hernán, 2000) the resulting islands would have a very different configuration: they would not necessarily be limited to a single alignment, they would be narrowly stretched along the fracture or fractures (like the Azore Islands, for example) and the islands would not have a defined pattern of age distribution. On the other hand, in the hot spot model -in whose favour evidence of a magmatic plume deeply rooted in the mantle has recently been found (Montelli et al., 2004; De Paolo et al., 2003)- deep magmatic activity creates islands that separate and disconnect from the magmatic source due to the movement of the lithospheric plate, thereby creating a constant age progression in the islands, with the islands farthest from the hot spot being oldest. In reality, this model suggests the repetition of the same kind of island whose only observable difference is in age, leading to different stages of development and erosional dismantling.

Currently the Canary Islands archipelago is made up of islands at different stages of evolution: Tenerife, the central island of the archipelago, is at a maximum point of development; the islands west of Tenerife have not reached that level of development because they are still in a juvenile stage (shield) of evolution while the eastern islands have already passed that point and are now in a stage of dismantling due to erosion. This explains why Tenerife has the highest altitude of the archipelago and why it developed a unique and extraordinary volcanic system on its summit -the complex formed by the rifts and Teide-Pico Viejo stratovolcanoes- the only one that currently exists in the archipelago, either because similar systems have not yet been formed in the western islands or because they have already disappeared in the eastern islands, as in the case of the Roque Nublo in Gran Canaria, a volcanic entity similar to the Teide that has already been totally dismantled.

These observations explain the geological reasons for the singular and amazing geological elements that exist in Teide National Park, but not their astonishing uniqueness when compared with the geological elements that exist in all intra-plate ocean islands, at least at the superior degree of representation and integrity found in Tenerife and its National Park.

The difference between the Canary Islands and other intra-plate ocean islands can be explained by the peculiar geodynamic setting in which these islands were generated and have developed. First of all, the vast majority of intra-plate ocean volcanic islands were formed in the interior of the oceans over flexible ocean crust and associated with faster-moving lithospheric plates and much more intense magmatic plumes. These geological conditions lead islands being formed very quickly, with high rates of fusion generating magma with uniform compositions, generally corresponding to the initial phases (tholeiitic, basaltic) of the magmatic series pertaining to this kind of volcanism, known as OIB (Ocean Island Basalts). Before the magmas can differentiate themselves into a large volume of more evolved products (trachybasalts, phonolites, trachytes) -a process that requiring the magma to remain during long residence periods before it

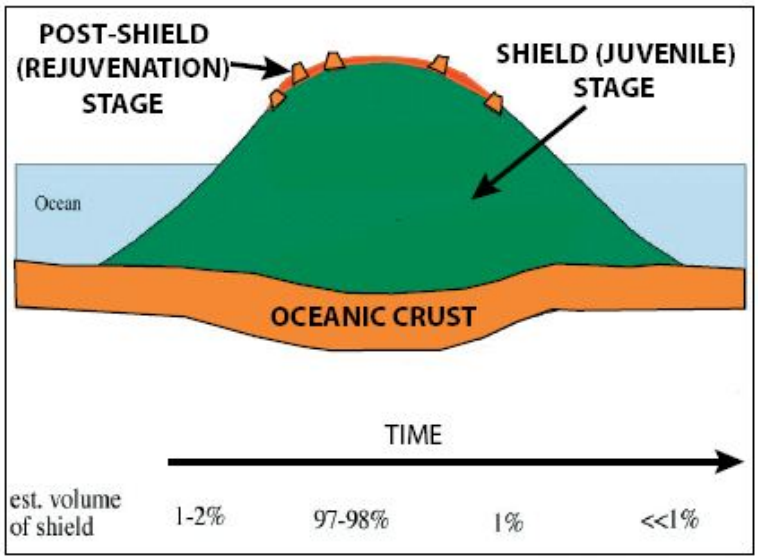
emerges to the surface in a volcanic eruption- the majority of intra-plate ocean volcanic islands usually are re-submerged by subduction resulting from the growing weight of the insular structures flexing the substrate of the ocean crust. Another factor contributing to the collapse is when the dynamic support provided by the ascending gush of magma ceases when the island separates from the mantle plume. This pattern -underwater growth/emersion/collapse (subsidence)- is typical of this island class (Walter, 1990). In the prototypical Hawaii Archipelago, a chain of islands that is extended by hundreds of underwater mountains, only the islands younger than 6 million years old (from Hawaii to Kauai) remain emerged.

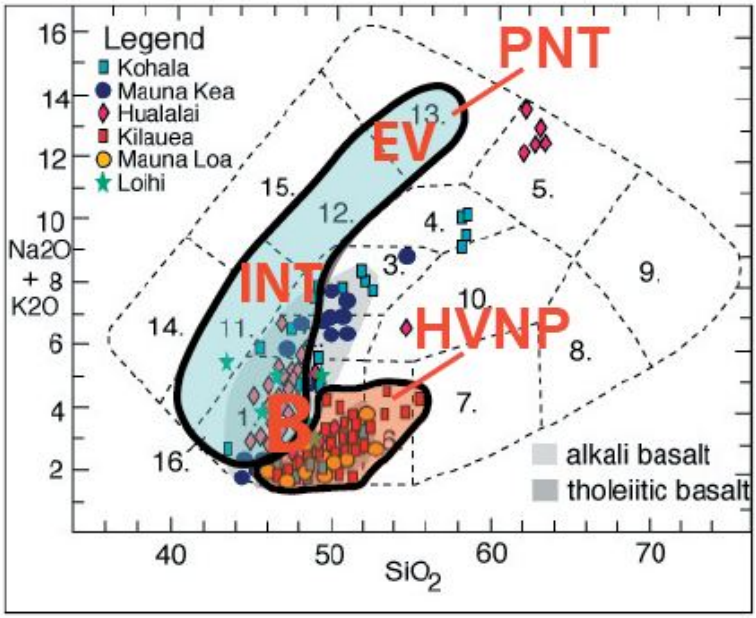
On the other hand, the Canary Islands -located over an old crust very close to the passive continental margin- presents a radically different geological panorama where little subsidence occurs and the islands remain emerged for long periods of time (more than 20 million years in the case of Fuerteventura), possibly until erosion totally dismantles them. Therefore, the conditions of these islands allow large volumes of magma to differentiate, leading to processes that explain the presence of unique and extraordinary geological elements in the island of Tenerife and Teide National Park.

| Type of magma (OIB magmatic series) | Volcanic rocks | Volcanic features | | Parque Nacional del Teide | Hawai'i Volcanoes National Park |
|---|---|---|---|---|---|
| INITIAL TERMS | Tholeiites Basanites Basalts | Lava flows and related features | "aa" type | very common | very common |
| | | | "puhoe-hoe" | common | very common |
| | | | lava tubes and channels | common | very common |
| | | | lava lakes | common | very common |
| | | Pyroclasts | lapilli and scoria beds | very common | very common |
| | | Volcanic cones | Lapilli and scoria (strombolian) cones | very common | very common |
| | | | Phreatomagmatic tuff- rings and maars | common | common |
| INTERMEDIATE AND MAGMA MIXING | Trachybasalts Tephrites Hawaiites, etc. | Lava flows and related features | Lava flows, lava lakes, lava tubes, etc. | common | rare |
| | | Pyroclasts | Lapilli and scoria beds | common | rare |
| | | Volcanic cones | Lapilli and scoria (strombolian) cones | common | rare |
| | | Magma mixing | Intermediate and evolved lavas in a single eruption | common | rare |
| EVOLVED TERMS | Phonolites Benmoreites Trachytes | Lava flows and related features | Lava flows, lava lakes, lava tubes, etc | common | very rare or none |
| | | Pyroclasts | Pumice and phonolitic scoria beds | common | very rare or none |
| | | | Alternating basaltic lapilli and pumice layers | common | very rare or none |
| | | Volcanic cones | Pumice and phonolitic scoria (strombolian) cones | common | very rare or none |
| | | | Domes and lava domes | common | very rare or none |
| | | | Strato-volcanoes (differentiated lavas) | common | none |

**Volcanic products and structures of the magmatic series of volcanic islands (OIB) in Hawaii Volcanoes National Park and Teide National Park.**

The volcanism corresponding to the initial period of the magmatic series of intra-plate ocean islands is excellently represented by the Hawaii Islands, particularly in Hawaii Volcanoes National Park, already declared a World Heritage Site. The volcanism corresponding to the intermediate and evolved periods of this magmatic series is equally displayed in a spectacular way in Tenerife, specifically in Teide National Park.

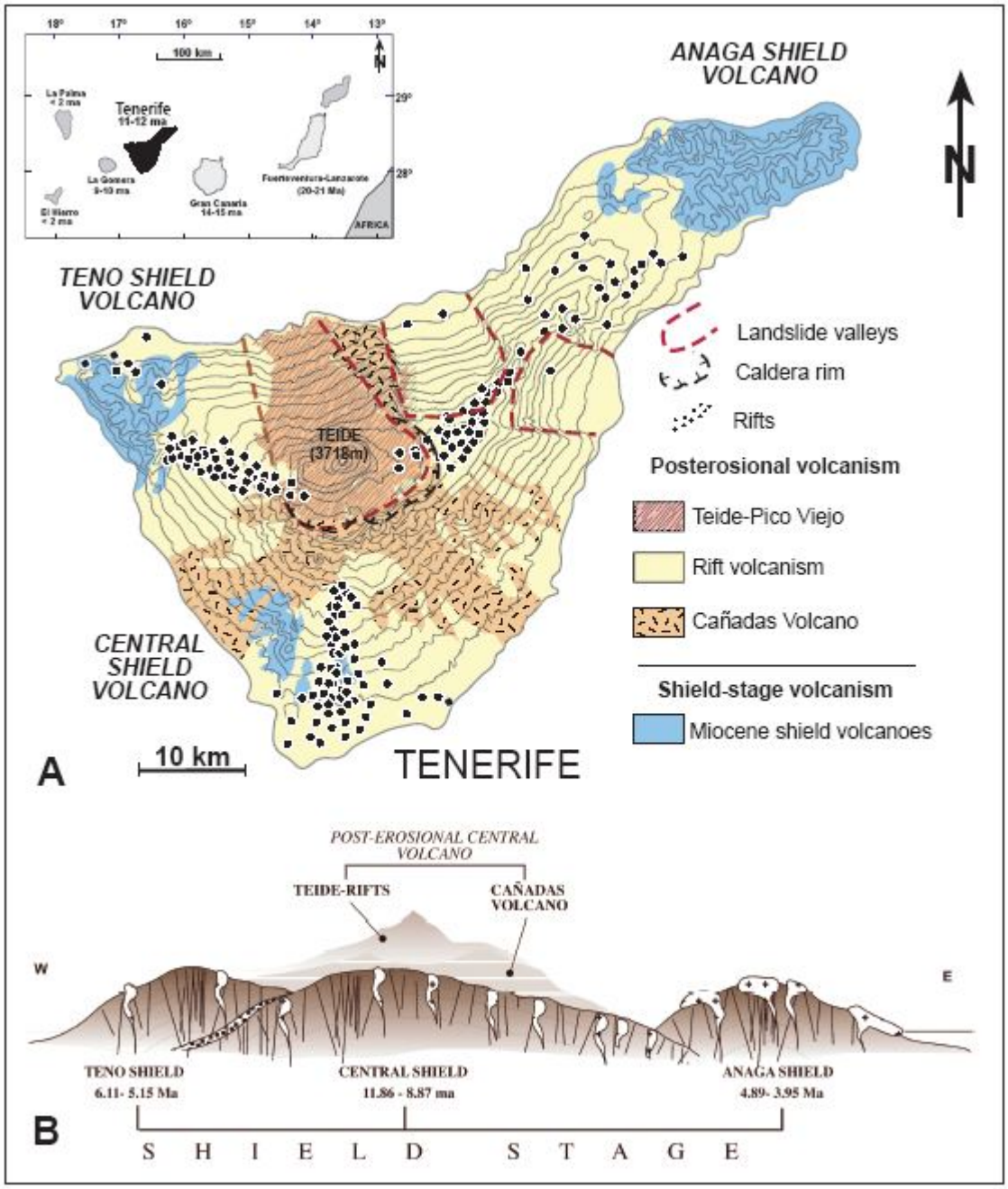



**Compared to the abundant post-shield volcanism in Tenerife, which includes the entire Las Cañadas volcano and the last volcanic phase that formed the geological elements of the Teide National Park, the same volcanism in the Hawaiian Islands is minimal, barely 1-2% as indicated in the upper sketch (modified from Clague, 1987). The lower graphic also illustrates that the Mauna Loa and Kilauea volcanoes located in Hawaii Volcanoes National Park (HVNP) are still in the juvenile shield-stage of volcanism, their magmas mainly corresponding to the less evolved terms -only basalts (B)- of the magmatic series of these intraplate oceanic islands: In contrast, the eruptions of Teide National Park span the entire series: basalts (B), intermediate rocks (INT), and more evolved rocks (EV). Combined, both sites represent the entire series on a large scale and with integrity, as well as the corresponding volcanic rocks, features and processes.**

## Teide National Park within the geological context of the island of Tenerife

The manner in which the island of Tenerife was produced is similar to the way other intra-plate ocean islands are created and developed: the growth of three large volcanic structures with shield-like profiles -the Central Structure, Teno and Anaga- created the majority of the island's volume in a relatively short period of time (less than 3 million years), which is known as the juvenile or shield stage of volcanism.




**A) A very simplified geological map of the island of Tenerife (Guillou et al., 2004). B) Cross-section indicating the construction of the island of Tenerife by the accretion of three large shield volcanoes (Teno, Central and Anaga) over which the Las Cañadas volcano is erected after a long period of volcanic repose and erosion. The post-Caldera de Las Cañadas complex, corresponding to the last eruptive phase of the island, includes the most important elements of Teide National Park: the NW and NE rifts and the Teide-Pico Viejo stratovolcanoes.**

Although no clear evidence exists, it is possible and even probable that a large part of the total mass emitted (1,000-2,000 $km^3$ emerged mass and another 10,000-20,000 $km^3$ submerged) was dismantled by massive gravitational landslides, particularly in the Central Structure. This Miocene shield is now almost completely covered by subsequent emissions, except for the peak of the Roque del Conde mountain mass, but its extension on the northern face of the island can be seen in the numerous galleries that have been excavated in search of subterranean water sources (Coello, 1973). The small extension of these Miocene formations can be explained by the loss of mass caused by these giant landslides.

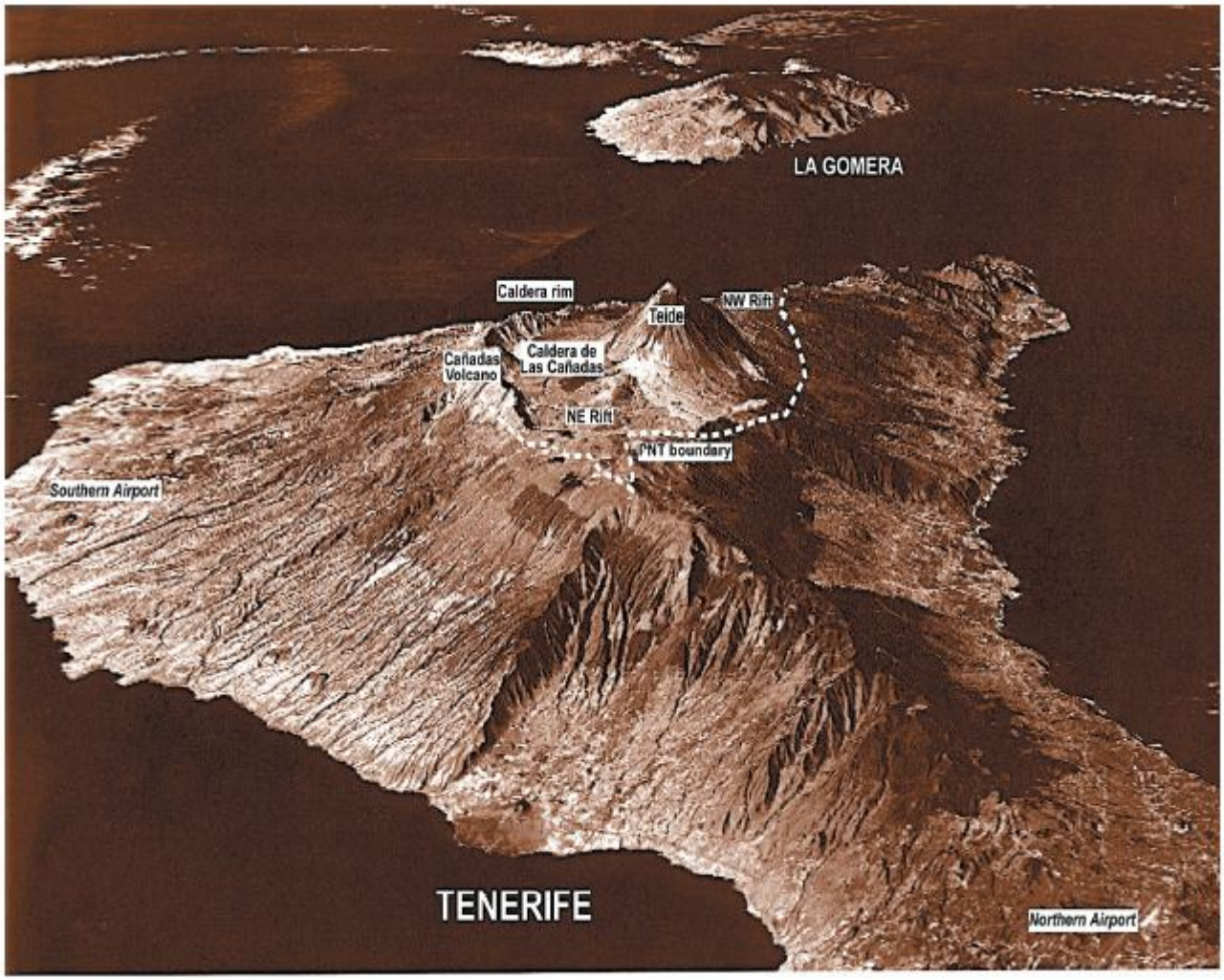
During this juvenile stage, deep, primitive magmas, the least evolved of the OIB series, totally predominate, similar to magmas in Hawaii and in the majority of intra-plate ocean islands. In the end, these volcanoes grow progressively taller it becomes difficult for the magmas to continue to feed them and the magma is emplaced in shallower chambers. At the same time, eruptions occur less frequently, giving the magmas the residence time necessary to differentiate through fractional crystallisation to more evolved products (phonlites, trachytes). These more viscous magmas generally inject themselves in the shape of intrusions (domes), although they also emit very thick phonolitic flows that now appear as tables and knives by inverting the relief. Details of this stage of Tenerife's growth can be found in Fúster et al. (1968), Ancochea et al. (1990) and Guillou et al. (2004).

After the initial juvenile stage there was a long period of repose (2-3 million years) where there are no eruptions, which is typical of these islands (La Gomera is currently in this phase). The volcanic eruptions began again during the second and definitive period of volcanic renovation (also called post-erosional because the eruptions occur over an erosion relief). In this second pulse a large volcanic structure, the Las Cañadas edifice, was raised over the island's central shield. Three convergent rifts (in the Canaries they are called dorsals, a term whose origin and meaning will be explained later) controlled the growth of this new volcanic apparatus whose emissions once again covered the central part of the island all the way to the Teno and Anaga shields.

Once again, as the Las Cañadas edifice grew it became more and more difficult for the magma to reach the surface, especially in the rift-convergence zone where eruptions accumulated and the volcanic edifice was taller. As a consequence, the magmas were emplaced in superficial chambers where they resided for tens of millions of years and they differentiated to more evolved products that were richer in gasses.

In the far ends of the rifts eruptions involving primitive magmas from deeper in the Earth continued (basalts and basanites) progressively concentrated the eruptive centres along the length of the rift axis, thereby creating topographic ridges in the shape of a peaked roof (dorsals) that led to giant lateral landslides (La Orotava and Güímar Valleys). In contrast, various superimposed stratovolcanoes were erected in the central zone with very explosive eruptions (plinian eruptions) that once again covered the flanks of the volcanic structure with pyroclastic flows and airborne pumice mantles, principally to the south. Some authors believe that these explosive eruptions were of great magnitude and volume, generating one or various vertical collapse calderas in the summit of the Ancochea et al. (1990, 1999) and Martí et al. (1994).

Around 200,000 years ago a collapse shortened the summit of the Las Cañadas edifice creating the Las Cañadas Caldera and setting the stage for the island's last volcanic stage. This final stage, along with the caldera, is what gave the island the geological elements that comprise the natural legacy of Teide National Park and that will be analysed in detail in the following section.




**Shaded relief image of Tenerife with Teide National Park in the highest part of the island.**

### *Teide National Park: geological elements and landscape*

Teide National Park, which is only an administrative entity without a geographical or geological connotation, is located on the summit of Tenerife. From a geographical point of view, it includes the summit of the Las Cañadas edifice. This edifice has a 16 x 9 km elliptical caldera at its centre and vertical walls 600 m high (the Las Cañadas Caldera); inside the caldera a stratovolcano complex has been erected (Teide-Pico Viejo) that reaches 3,718 m above sea level (the highest point of Spain), around 7,500 m above the ocean floor (which makes it the third highest structure on the planet after the Mauna Loa and Kilauea volcanoes on the island of Hawaii). The wall of the Las Cañadas Caldera is only visible from the northeast and sough since the northern and north-western sections were dismantled or covered by subsequent emissions. Teide National Park encompasses the entire caldera and the stratovolcanoes nestled within it as well as a significant part of the associated volcanic edifices like the north-western and north-eastern dorsals (rifts).

From a geological point of view, Teide National Park includes the highest and final part of the Las Cañadas edifice as well as the volcanic formations, structures and products generated in complex geological processes corresponding to the final volcanic stage of the island which began with the formation of the Las Cañadas Caldera around 200,000 years ago. The geological elements included in Teide National Park that are the foundation of the proposal to have it inscribed on the World Heritage List are:

- The Las Cañadas edifice that rises above the exterior edge and cliff of the Las Cañadas Caldera.
- The Las Cañadas Caldera that is entirely included within the Park limits.
- The active north-western and north-eastern rifts.
- The Teide and Pico Viejo stratovolcanoes nestled within the caldera, as well as their adventitious eruptive apparatuses.

**Las Cañadas edifice**

The Las Cañadas edifice rises up within Teide National Park on the edge of the caldera and in its scarp and on the northern (Tigaiga mountain mass) and southern flanks of the centre of the island. The caldera's cliff shows a cross-section of its internal structure and the successive volcanic formations that shaped it.

At one point the Las Cañadas edifice may have reached a diameter of 40 km and a height of 2,500 m and today constitutes the main part of the post-erosional stage of Tenerife when, after a long period of repose, this volcanic edifice was created on top of the Miocene shield that forms the centre of the island. In its final stages, the ones that emerged in Teide National Park, large volumes of magma were emplaced in superficial chambers leading to its differentiation that promoted the creation of evolved magmas (fundamentally phonolithic) rich in dissolved gasses. At this point a series of explosive eruptions (plinians) occurred, producing large volumes of phonolitic ignimbrites and extensive and powerful airborne pumice mantles.

**Las Cañadas Caldera**

This spectacular semi-elliptical structure opens towards the north, with a 16 Km diameter, a scarp with an average height of 600 m that can be seen in its entirety from its edge and from the summit of the Teide, has been studied by the first naturalists who visited the island. Leopold von Buch (1829) used this caldera to confirm his (now completely debunked) theory of "elevation craters".

In reality, every possible theory has been used to explain the origin of this depression. Some authors, like Charles Lyell (1835), believed that it was created purely through erosion. Subsequently, Bravo (1962) defended the existence of a plastic layer in the subsoil in the valleys of La Orotava and Güimar to explain the genesis of these depressions and that of the Las Cañadas Caldera on erosion accented by slippage of huge blocks on the plastic layer. Other authors believed in an explosive genesis similar to that of Krakatoa in 1883 (Gagel, 1910) or a collapse like that of the Kilauea (Webb y

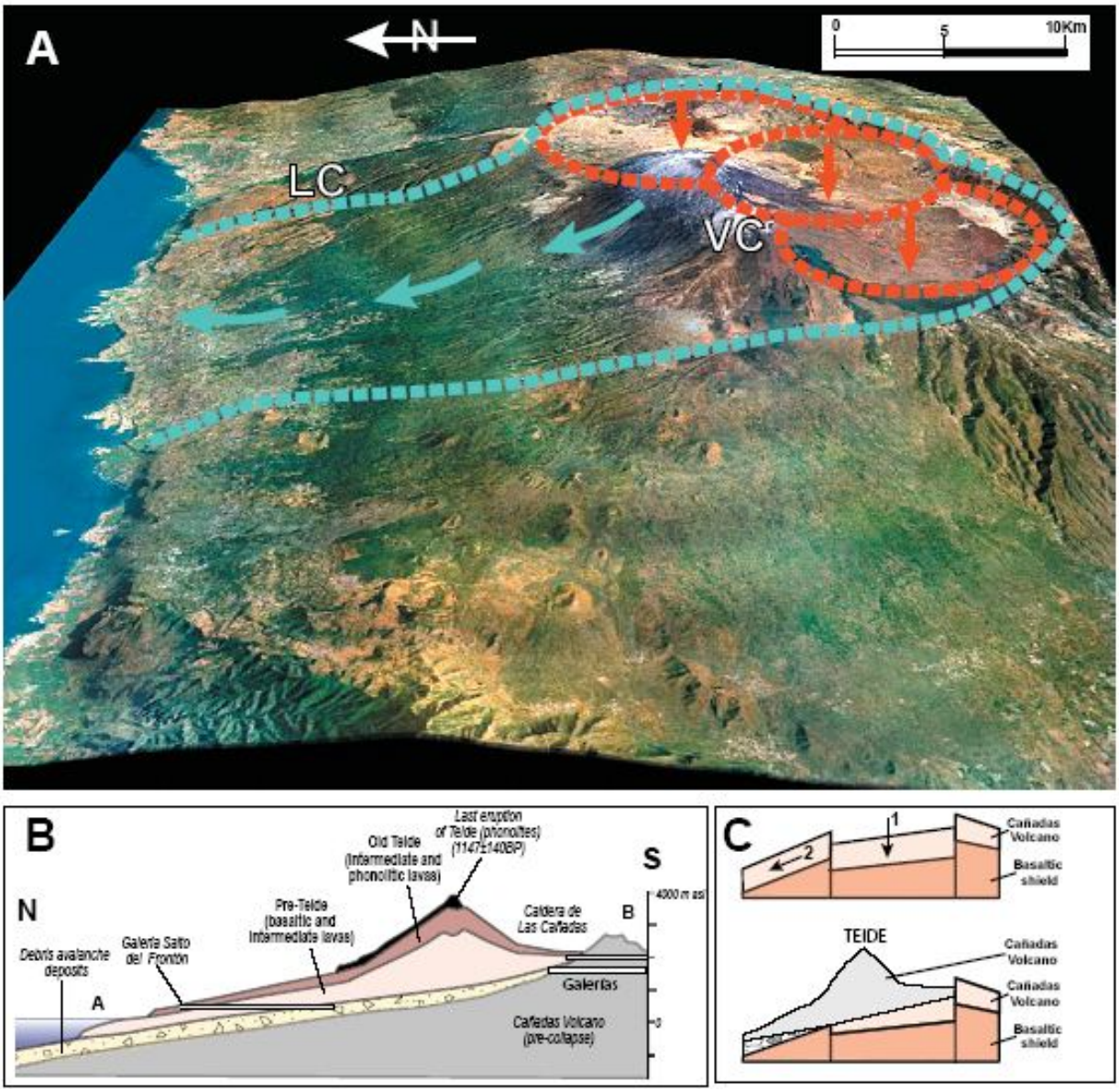
Berthelot, 1939). Finally, some authors, such as Hausen (1956), advocated a complex model that included all of the earlier models, with initial explosive stages, collapse and finally, erosion.



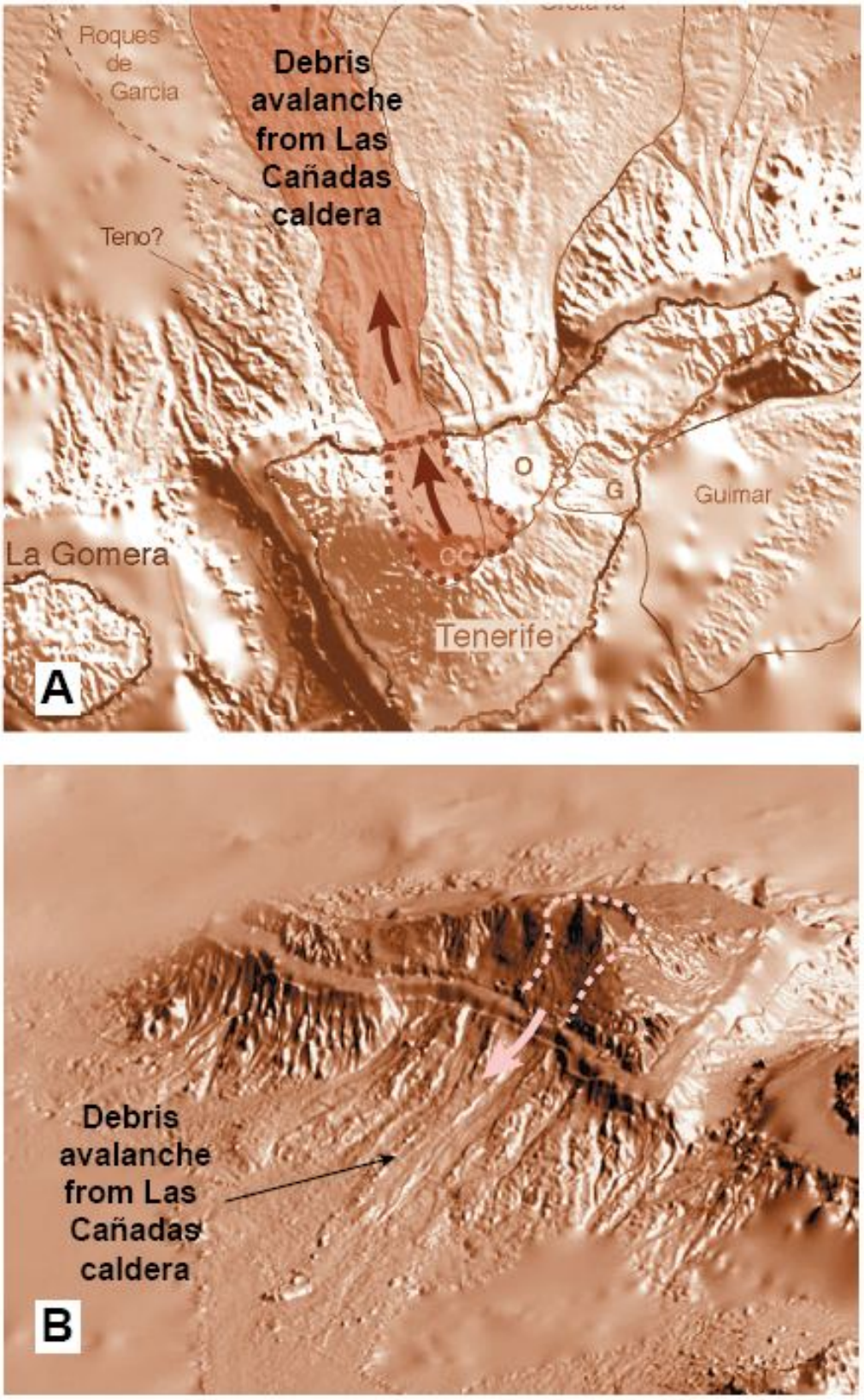

**Orthophoto of the Las Cañadas caldera (image from GRAFCAN). Note the absence of the north and northeast border of the caldera, mass wasted and occupied by the stratovolcanoes and the north-west rift.**

More recently, the scientific debate on the creation of the Las Cañadas Caldera has been polarised in two models: 1. A vertical collapse associated with the emptying of the superficial magmatic chambers of the Las Cañadas edifice after explosive eruptions of large volume (caldera forming); and 2. Lateral gravitational collapses, similar to those described in Hawaii (Moore, 1964) and observed for the first time in the eruption of Mount St. Helens in 1980.

Araña (1971) was the first author to describe the full details of the latter model and the presence of a large volume of materials emitted from large-scale eruptions (Booth, 1973) is an apparent point in its favour because it is difficult to explain its existence without vertical collapses. Subsequent studies (Martí et al., 1994) complete this hypothesis by defining various episodes of caldera-forming explosive eruptions followed by vertical collapses and the cyclical formation of calderas. Later, the existence of lateral collapses associated with the formation of caldera-shaped depressions in the Canary Islands was proven beyond doubt by the studies both in the ocean environment of the archipelago (Watts and Masson, 1955; Urgelés et al., 1997, 1999; Masson et al., 2002) as well as in the interior of the islands (Carracedo, 1994, 1999; Guillou et al., 1996; Carracedo et al., 1998, 2001, 2002), Stillman (1999).

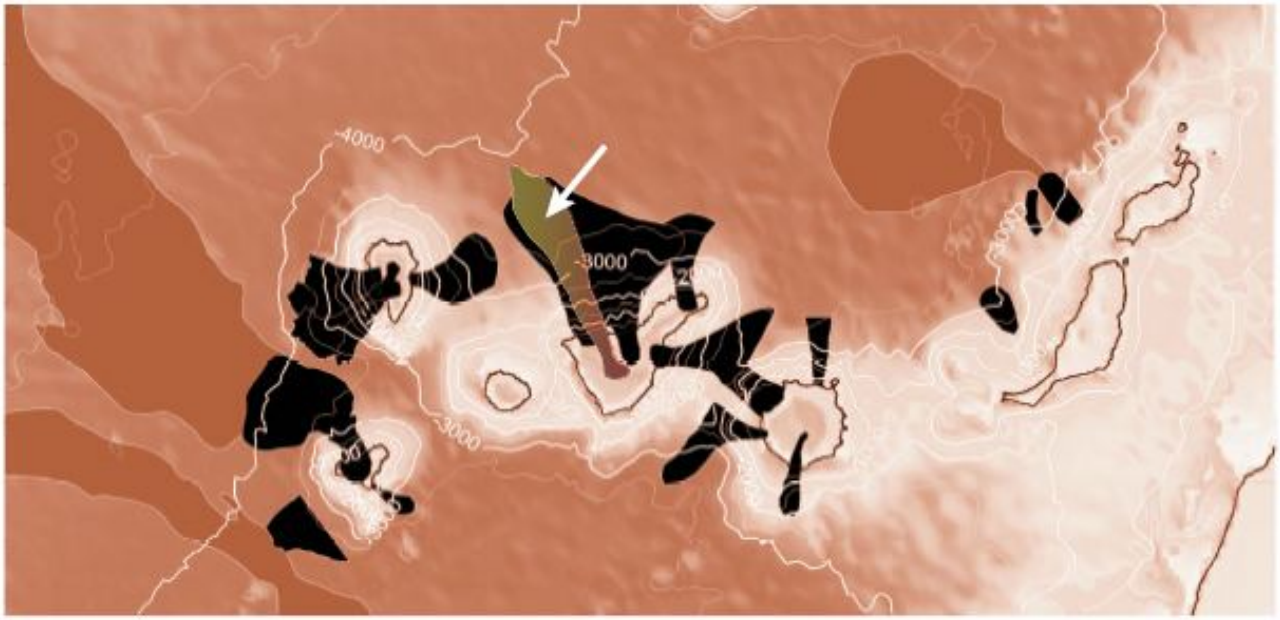



**A) Diagram that shows the disposition of the multiple vertical collapse calderas (VC), postulated by some authors as being the origin of the Las Cañadas caldera. For other authors, this depression, that continues towards the north coast forming the La Guancha-Icod valley, is the result of a gravitational lateral collapse (LC). B) Simplified diagram that shows the disposition in the subsoil of the volcanic formations that partially filled the depression, as observed in numerous water tunnels (galerías). These observations clearly favour the latter model. C) The vertical collapse caldera model requires an unrealistic subsequent lateral landslide, as indicated in the diagram from Martí et al. (1997).**




**Sonar images from oceanographic studies of the submarine northern flank of Tenerife (Watts and Masson, 1995), provided incontrovertible evidence of the presence of debris avalanche deposits related to the lateral collapse that created the Las Cañadas caldera around 200 Ka ago.**

In Tenerife, the studies of Watts and Masson (1995) have provided unquestionable evidence (sonar images) of the presence of slippage deposits in the marine flank to the north of the island), with a volume compatible with the cavity of the Las Cañadas Caldera and the Icod-La Guancha valley. These deposits link with the breach that appears in the subsoil under the lava that filled in the depression which proves that the caldera was part of the zone affected by the lateral slippage. Faced with this incontrovertible evidence, the authors who defend the existence of vertical collapse calderas have conveniently modified their initial model to combine initial vertical collapses that create successive calderas, followed by lateral collapses), in order to explain both the underwater slippage breaches as well as the absence of caldera's edge to the north and northwest.




**Giant landslides documented in the Canary Islands (Urgelés et al., 1999). The landslide that created the Las Cañadas caldera is indicated with an arrow.**

The theory that the Las Cañadas Caldera was created by lateral gravitational landslides) has been proposed by various authors (Navarro y Coello, 1989; Ancochea et al., 1990, 1999). Carracedo (1994) proposed a theory that related the activity of the rifts with the unleashing of massive lateral landslides. In this model, the rifts shape the growth of the volcanic edifices until they reach unstable heights at which moment the force of gravity is added coherently to distensive forces (wedge) created by the intense intrusion of dikes (supply channels) in the axis of the rift zone, thereby provoking collapses.

Geo-chronological and structural studies that have been done on the complex formed by the rifts and the stratovolcanoes in Tenerife have revealed that the depression began to be filled by the landslide 199,000 years ago (age not published) and has never stopped since. Observations on galleries that cross the entire filling of this depression until reaching the deposits of the avalanche show that the first stage had a high emission rate and magmas that were not very evolved (basalts, basanites) the same magmas that were feeding the eruptions in the rifts before the collapse. Subsequently, around 115,000 (age not published) years ago, the frequency of emissions decreased and the same magmas differentiated to more evolved products in shallower reservoirs. This pattern coincides with the stages indicated by Martí et al. (1997) in that the three main units or cycles in the Las

Cañadas Edifice's final stage of development initiated with mafic or intermediate emissions that evolved into phonolitic products.

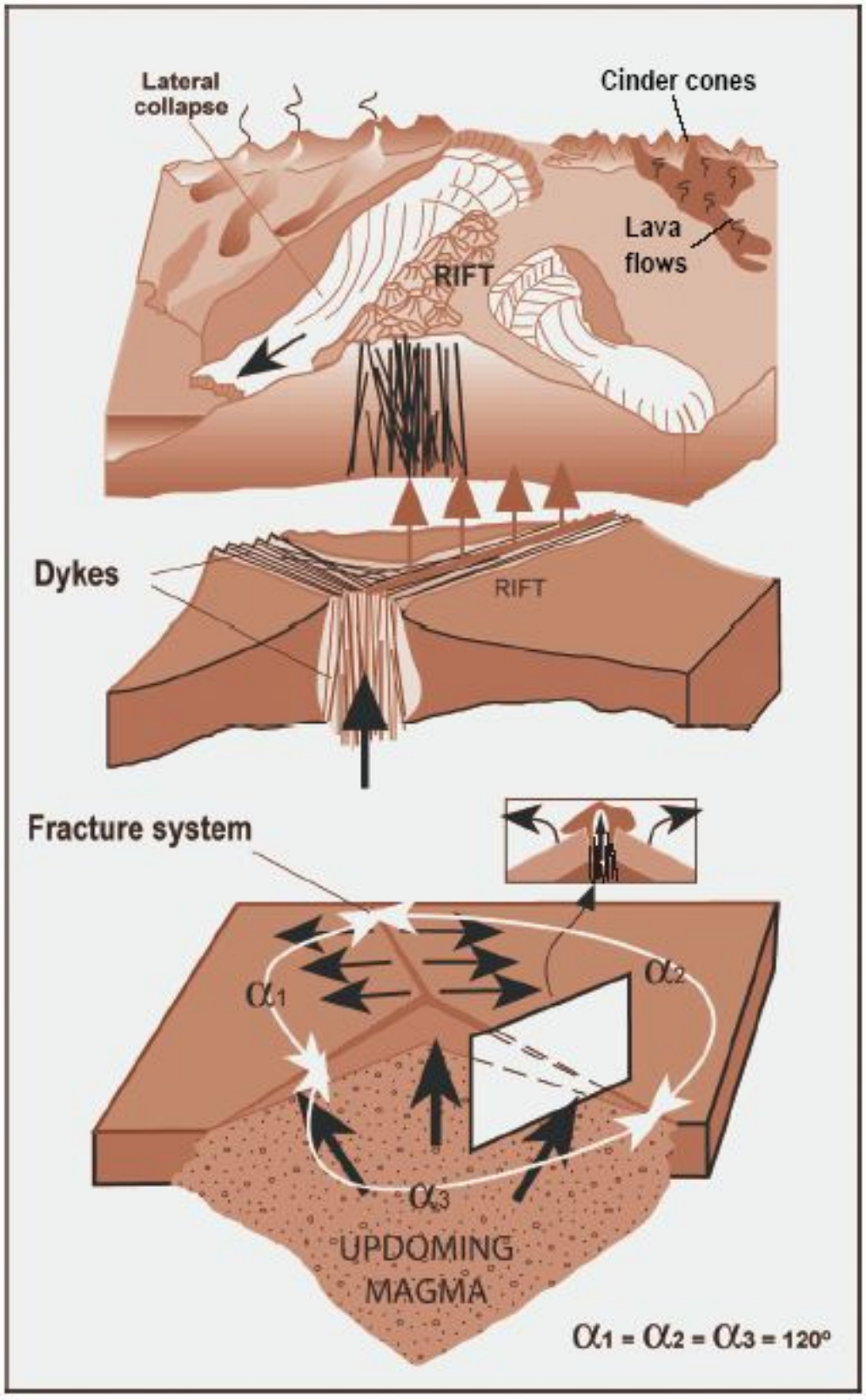
Therefore it is possible that activity cycles of the rift were repeated with the same pattern: Primitive magma eruptions (basaltic) in the rifts → growth and growing instability of the volcanic edifice → gravitational landslide → the depression is filled with primitive magmas (basaltic) → the magmas evolve into felsic products→ construction of nested phonolitic stratovolcanoes.

It is also possible that these cycles occur repeatedly with similar characteristics and affecting very similar areas (Siebert, 1984). However, since they occur in a post-erosional island (Tenerife) with much less force than in the rifts located in islands in a juvenile stage (La Palma, El Hierro, Mauna Loa, Kilauea, etc.), their intensity is decreasing, although this does not necessarily mean that this will be the last cycle in the island of Tenerife.

The advantage of the landslide model is that it explains the principle observations - such as the absence of northern and north-western ledge of the caldera and the presence of a large volume of landslide deposits north of Tenerife, in a straightforward way. It also associates the activity of the rifts with landslides and the subsequent filling of the depression and differentiation of the magmas to create nested stratovolcanoes, as shall be discussed later. It is also would explain the relative abundance of lateral landslides in the Canary Islands, while vertical collapse structures are rare (the Tejeda caldera in Gran Canaria) and have unmistakable geological characteristics.

On the other hand, the vertical collapse theory requires a complex and implausible process that involves collapse followed by lateral landslides. It is difficult to comprehend how a stress system that has reached equilibrium after a vertical collapse can continue a lateral push. The other question is why did the slide only occur towards the north?. But this is easily explained by the fact that the two most active rifts (NW and NE) produced the distensive stress while the largely inactive third rift (in the south) acted as a buttress thereby forcing the landslide toward the north.

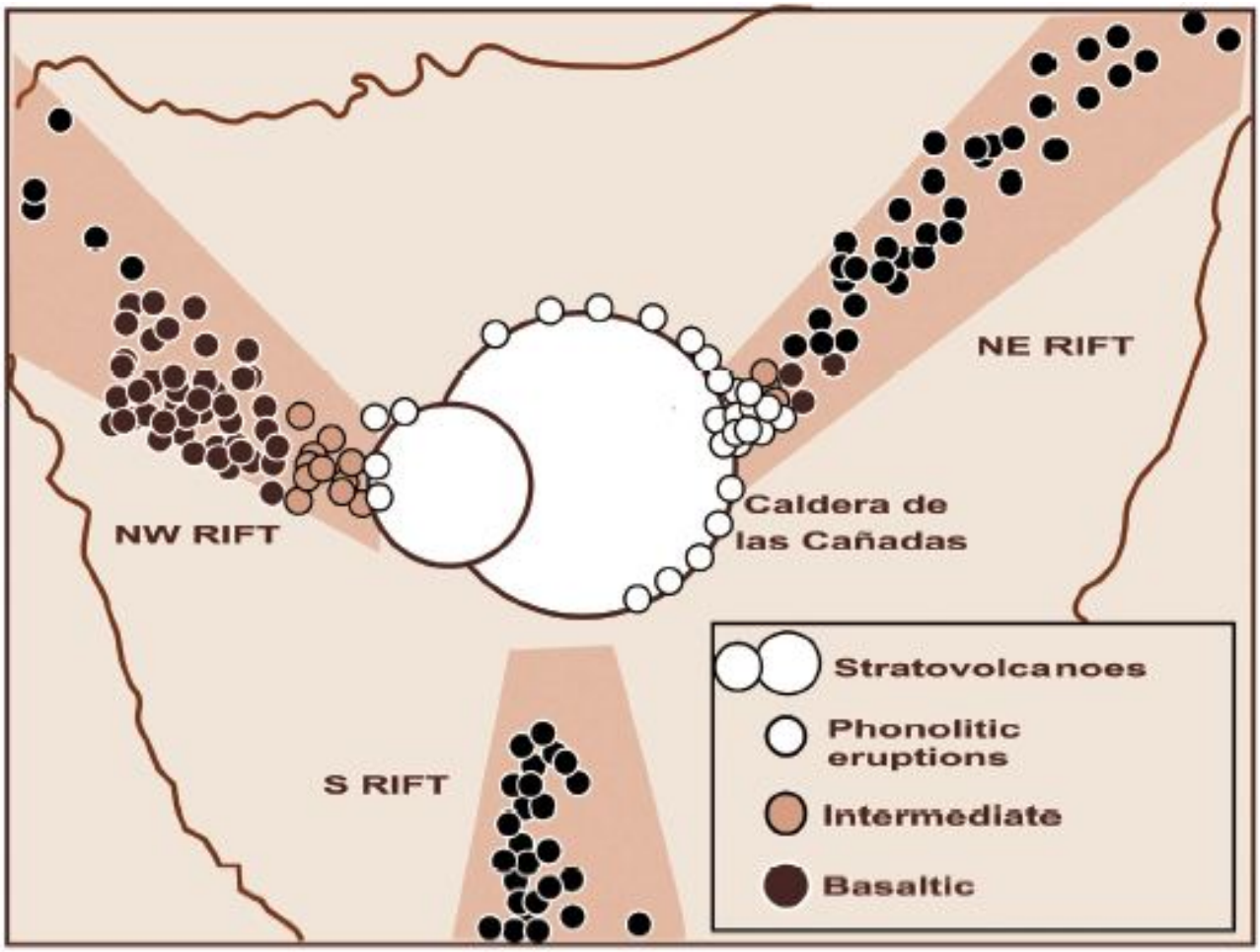
In any case, although this debate is important for the scientific explanation of how these types of volcanic islands evolve, the existence or non-existence of a collapse is irrelevant to the explanation and evaluation of the current geological elements of Teide National Park since the effects of a collapse would have been totally erased by the ensuing lateral landslides, erosion of the depression wall and the filling of the depression by subsequent eruptive activity. That said, it is still clear that along with the geological importance of this caldera, one of the best displayed calderas on the planet, and its spectacular landscape, the scientific explanation of its origin is equally compelling since the process was quite different than the ones that created the calderas located in Hawaii Volcanoes National Park, which were definitely caused by vertical collapse.




**Model explaining the formation of the rifts and the role that they play in controlling the growth and mass destruction of the islands by generating giant lateral landslides in the most unstable volcanoes (Carracedo, 1994).**

## The rifts or dorsals

The east and west ends of Teide National Park are occupied by rifts, one heading northwest and the other northeast, that converge on the central area occupied by the two large stratovolcanoes. The complex formed by these rifts and the stratovolcanoes, which constitute the final eruptive stage of Tenerife, have partially filled the caldera and covered nearly the entire Park with lavas and pyroclasts emitted in the last 30,000 years.



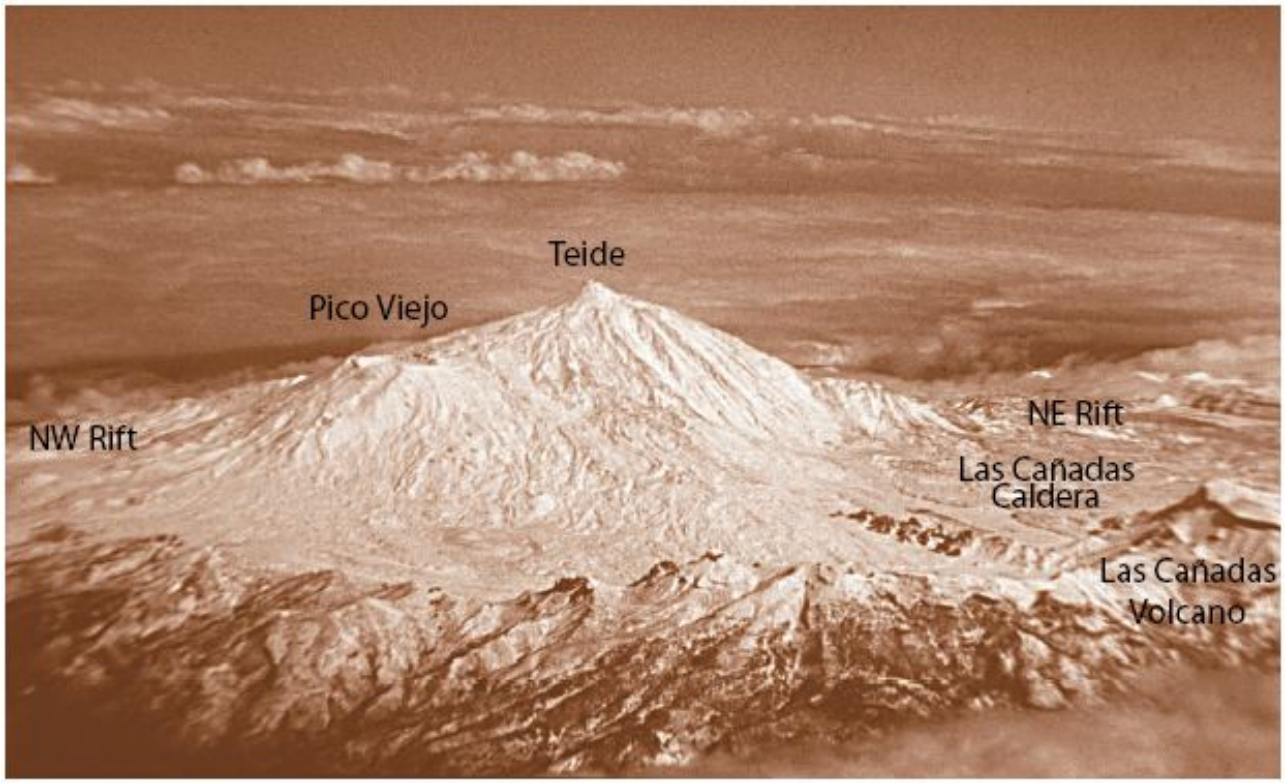

**Distribution of the composition of lavas in eruptions produced along the active NW and NE rifts. The greatest concentration of highly evolved eruptions (phonolites) occurs in the area where the rifts converge, where the Teide-Pico Viejo stratovolcanoes and their peripheral domes formed. In contrast, less evolved magmas (basaltic, basanitic) erupted at the distal ends of the rifts. Intermediate composition lavas and magma mixing (basaltic-phonolitic) occur at the centre of the rifts.**

The rifts (called dorsals locally) have been described as areas where fissure eruptions concentrate, thereby creating a massive amount of dikes in the subsoil related to the accumulation of eruptive centres on the surface.

The progressive accumulation of these centres along the rift axis lead to a peaked roof structure (dorsal) with a predomination of volcanic cones on the summit, defiles on the flanks and platforms on the slopes. The rifts may have been started during the early stages of the island's creation and could be associated with deep fractures. Because of

this they are extremely long-lasting structures that must have fuelled the growth of the island and configured its triangular-pyramid shape. From the beginning, the rifts produced a feedback effect that increased the anisotropy in their axis across the vertical planes of the two supply channels (dikes), leading to an ever-increasing accumulation in a constricted area. As the accumulation of dikes parallel to the large rift became denser the new dikes began to inject themselves among the already existing dikes, creating a network that grew increasingly compact. As a consequence, the rifts progressively concentrated the eruptive activity and the peaked-roof formation mentioned earlier grew in height.

Tenerife's current rifts have unique characteristics. Although emissions are produced along the length of the rifts without a defined age distribution, a clear spatial ordination in the level of volcanic eruption's magmatic evolution can be observed: the basalites are emplaced in the farthest end, the intermediate (with obvious mixtures of magma) in the middle section and the most evolved (phonolitic) in the area where the rifts converge. This layout provides an extensive variety of rock types in the entire range of basalts-phonolites and the corresponding eruptive mechanisms and volcanic formations and structures that make these rifts unique laboratories for petrology and volcanic morphology.




**Oblique (viewed from the south) aerial photo of the Teide and Pico Viejo stratovolcanoes. The rim of the Las Cañadas caldera is seen in the foreground.**

The frequency and volume of the eruptions also progressively increases the nearer they draw to the confluence of the rifts, thus explaining why the tallest and most voluminous edifices, including the central stratovolcanoes, are located in this area.

Although the type of volcanism in both rifts seems to have remained similar, around 12-15 thousand years ago a distinct change occurred. From that time period on, the emissions are almost exclusively phonolitic in the North-Eastern Rift, while in the North-

Western rift the activity continues to be basaltic and intermediate, including three historic eruptions (in 1706, 1798 and 1909) and the spectacular Montaña Reventada eruption (990 years ago), where basaltic and phonolitic lavas were emitted simultaneously and mixed together.

These characteristics of the rifts make them completely different than the rifts in the majority of the intra-plate ocean islands. The characteristics of the Hawaii Volcanoes National Park rifts are similar but their eruptions were exclusively of magmas with little differentiation, lacking intermediate or felsic volcanic products and formations, much less separate stratovolcanoes like the Teide and Pico Viejo and its totally unique domes and phonolitic flow-domes.

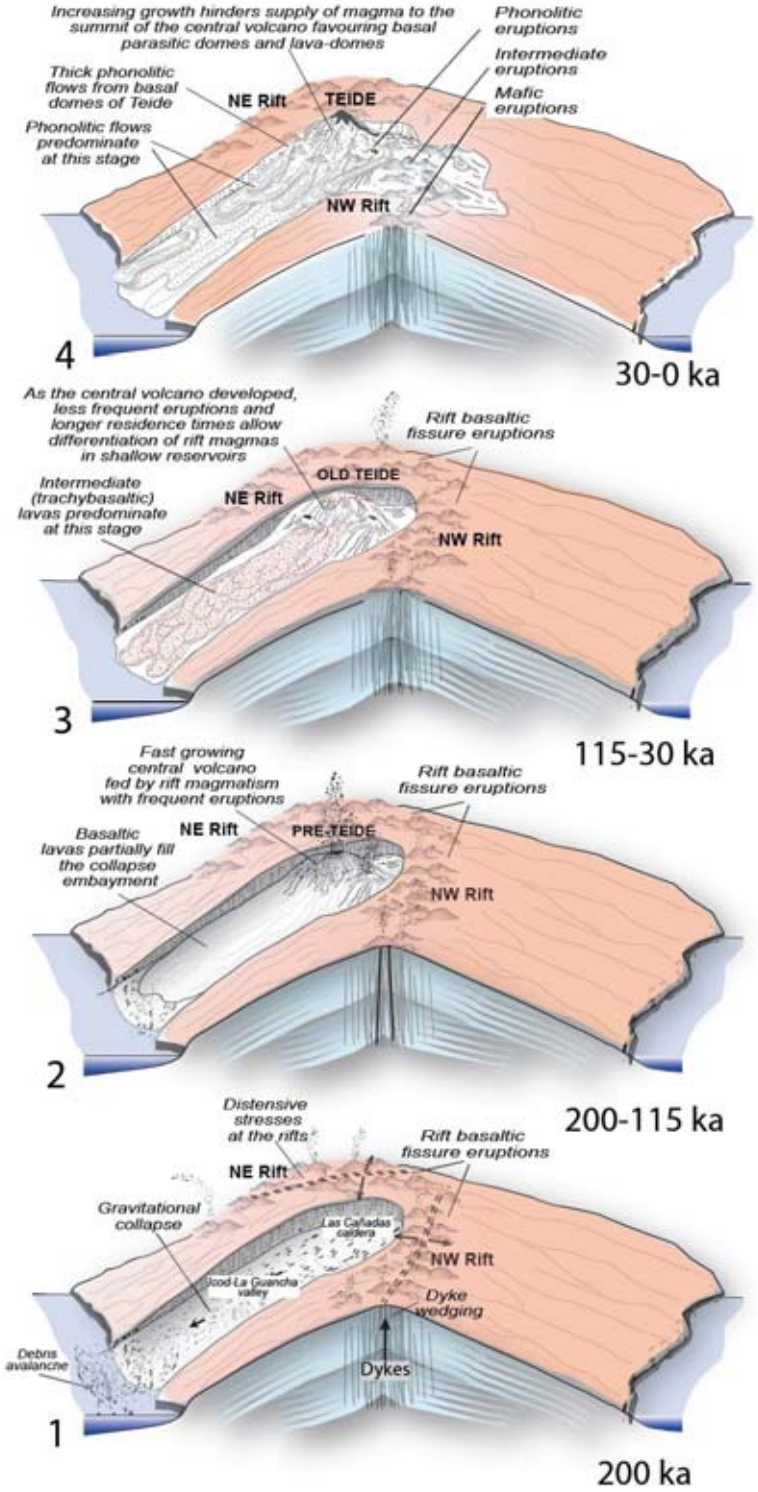
**The Teide and Pico Viejo nested volcanoes**

Two large stratovolcanoes, known as the Pico Viejo and the Teide, are located in the centre of Teide National Park. The Teide rises 3,718 m above sea level and around 7,500 m above the ocean floor, making it the third highest volcano in the world after the Mauna Loa and Mauna Kea volcanoes located on the island of Hawaii.

The construction of these stratovolcanoes is so closely tied to the activity of the rifts described in the last section that it is difficult to mark the boundary between the two volcanic systems, both spatially and between the processes that created them. The construction of these volcanoes started immediately after the gravitational landslide that created the Las Cañadas Caldera and the Icod-La Guancha valley, starting with the filling-in of the depression, placing the first lavas (dated at 200, 000 years) on top of the deposits of the debris avalanche as can be observed in the numerous galleries excavated on the north face of Tenerife.

In the early stages large quantities of basaltic lavas were emitted with high rates of eruption, possibly due to the depressurisation that occurred after the landslide. This material caused the depression to be filled in relatively quickly, with a larger contribution from the confluence of the rifts which produced the erection of the central edifice nested within the landslide bowl.

As the edifice grew taller, it became more difficult for the magma to reach the exit canal. As a consequence, the frequency of the eruptions declined and the magma started to accumulate under and inside of the volcanic structure, generating a large superficial reservoir where, due to the longer residence periods, fractional crystallisation began to take place, a process that generates large volumes of progressively differentiated magmas. This process can be observed in the galleries located in the northern face of the Teide, where the lavas mark a progressive change from 115,000 years ago to intermediate and phonolitic products.




**In this model (Carracedo et al., 2004), the rifts are given a more relevant role in the creation of the different geological and volcanological elements of the Teide National Park. As explained in the cartoon, the NW and NE rifts created a pre-caldera volcano until it became steep and unstable, subsequently triggering a landslide that formed a large depression (the Las Cañadas caldera and the La Guancha-Icod valley), later partially filled with two differentiated (felsic) stratovolcanoes (Teide and Pico Viejo) nested within the depression.**

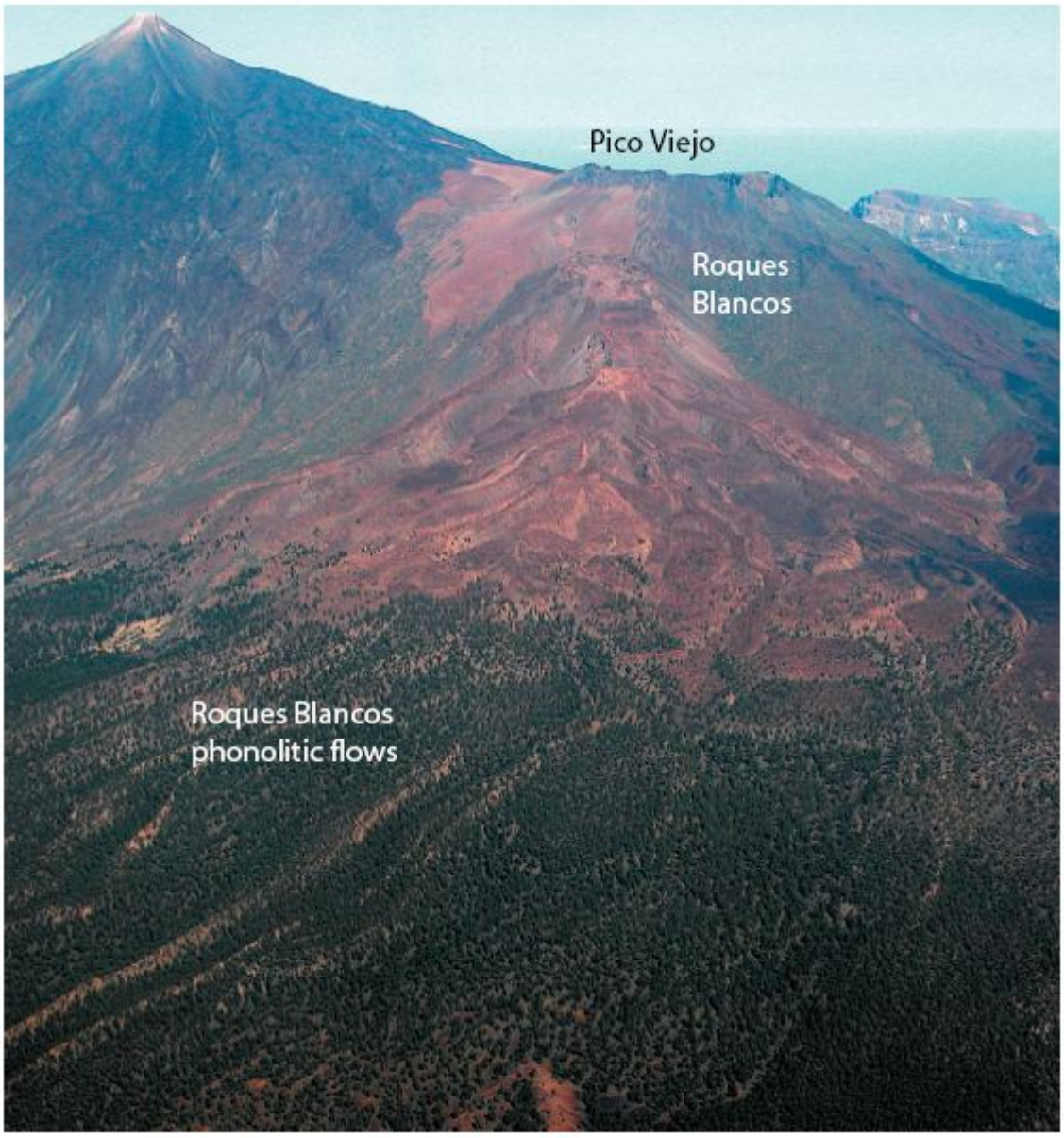
The construction of the Teide culminated with phonolitic lavas around 30,000 years ago, that left it as a 3,500 m high volcanic structure with a large crater open towards the northeast. Since then the Teide only had one summit eruption 1,147 years ago (Carracedo et al., 2004) that created the terminal cone and emitted black lavas (obsidian phonolites) that gave the volcano its current height and configuration.

The great height of the Teide 30,000 years ago favoured the emigration of the eruptive channels to a non-central position near the north-eastern rift, thereby initiating the construction of a new stratovolcano, the Pico Viejo. The lavas of this new volcano (also initially basaltic and later intermediate and phonolitic) are always found above those of the Teide (except for the sub-historic lavas), and the oldest flowering flows (basalts) have been dated at 26,400 years (Carracedo et al., 2004). This new stratovolcano rapidly separated from the first, finishing its principle construction around 14,600 years ago with phonolitic lavas and freatomagmatic eruptive episodes that created a large explosive crater.

The height reached by the Pico Viejo edifice also made it difficult for the magma to pass through the summit crater, so the emissions began to create domes and flow-dome formations in the perimeter at the base of both volcanoes with the exception of the Teide's sub-historic lavas mentioned earlier and a few small emissions on the lip and interior of the Pico Viejo crater.

The cluster of domes and dome-flows is spectacular and it's possible that there is nothing like it in any other intra-plate ocean island. The ones located on the flat area between the stratovolcanoes and the edge of the caldera shaped like domes, some of them spectacular and exogenous, like Montaña Rajada. Its phonolitic lavas were very thick and travelled little but left remarkable push arcs. When they are located on the steep slopes on the north face of Tenerife they have taken on the shape of flow-domes, with extremely thick lava flows and deep channels that generally reach the sea 10-13 km away.

The geological singularity of this stratovolcano complex, unique in this kind of ocean island, is even greater if we consider that they may have been created by the activity of the rifts. It is possible that the rifts and their continued contribution of deep magmas 1. built up the earlier volcanic structure to unstable heights (the Las Cañadas edifice), 2. caused the lateral collapse that created the landslide depression, 3. filled the depression with basaltic lavas, that were differentiated when the rift-convergence zone structure was erected and emplaced the magma in superficial chambers in the interior and beneath this volcanic apparatus, 4. created the definitive and separate Teide and Pico Viejo stratovolcanoes nested within the caldera, as well as the cluster of domes and flow-domes that surround them, while the activity at the far ends of the rifts continued to be basaltic.

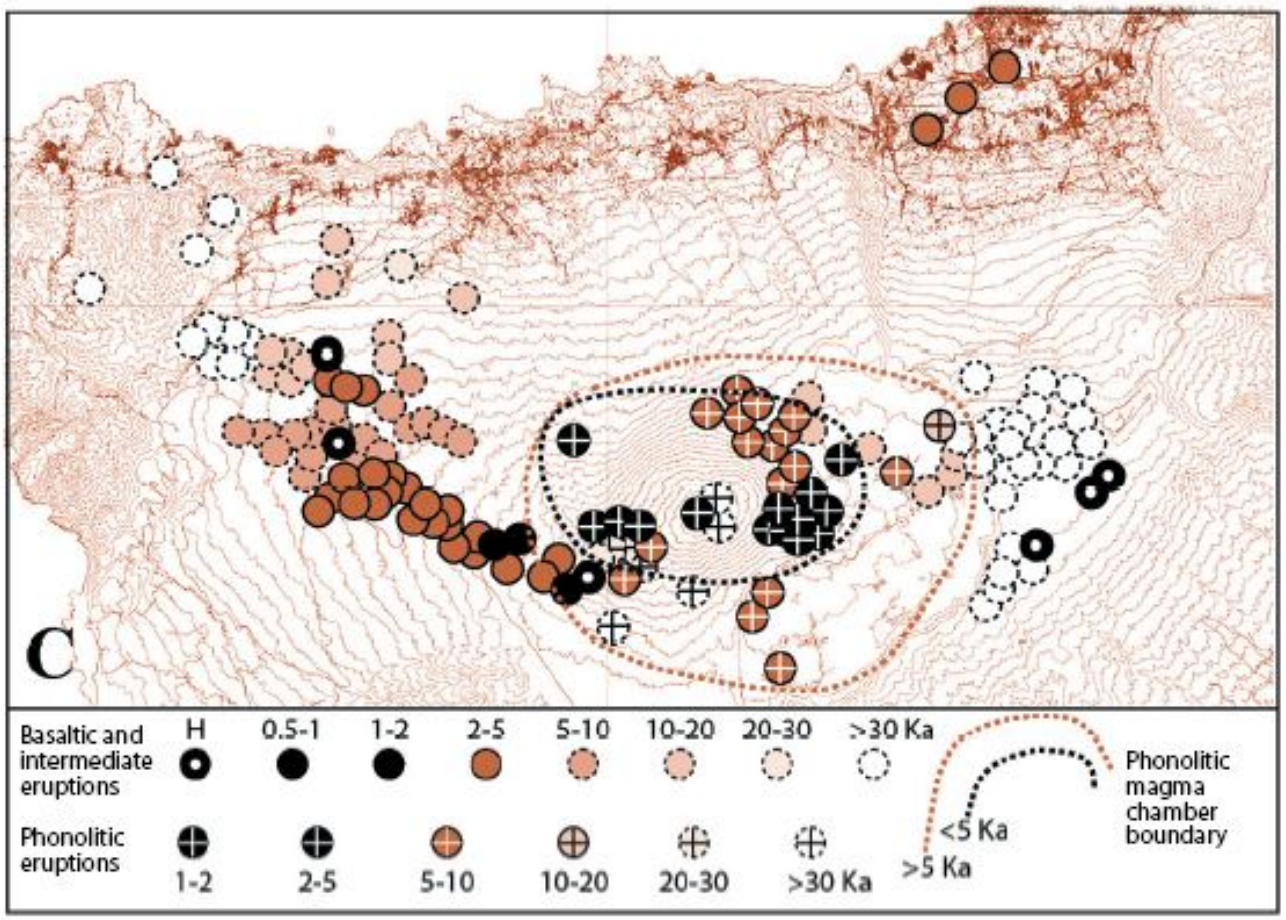



**Oblique aerial view of Roques Blancos, one of the peripheral phonolitic lava domes of the Teide-Pico Viejo volcanic complex. These lava domes are very rare in intraplate volcanic oceanic islands, at least with lavas flows running over such long distances, and spectacular lava channels.**

The process that produced the separate central structures nested in landslide bowls created by rift activity (the real motor behind the process) is unique among intra-plate ocean islands (Carracedo et al, 2004a,b).

The central edifices have also been fundamentally effusive; in the galleries that have been observed lavas over fragmented material predominates. Therefore their eruptive style has been totally different than that of the earlier volcanic stages of the Las Cañadas edifice, with much higher gas content and frequent explosive eruptions, including plinian eruptions. The Teide's periphery domes and flow-domes have given somewhat more explosive eruptions than the basaltic strombolian eruptions of the intermediate and furthest-away sections of the rifts, some of them recent in geological terms, such as Montaña Blanca around 2,000 BP (Ablay et al., 1995) or Roques Blancos, 1,712 BP (Carracedo et al., 2004). But although this volcanic setting is active it is not very

dangerous. For one thing, the basaltic and intermediate eruptions of the rifts, which are the most probable (60-80% probability), are low risk, as the absence of victims during the last historic eruptions illustrates (Garachico 1705, Siete Fuentes 1706, Chahorra 1798, Chinyero 1909). Furthermore, the separate magmatic chamber that created the Teide's peripheral domes and flow-domes seems to be in rapid regression, perhaps indicating this volcanic complex's last cycle.




**Age and composition of the volcanic eruptions of the NW and NE rifts and the Teide-Pico Viejo complex. Note that the area of distribution of the most evolved eruptive centres (the last phonolitic emissions of the stratovolcanoes and the lava domes) decreased considerably in the last 10 Ka, revealing a contraction in the phonolitic magma chamber. This may indicate that the volcanic system is already in its terminal phase.**

It can be observed that the eruptions at the far end of the rifts are exclusively basaltic, while the eruptions in sections near to or in the conjunction of the rifts are all phonolitic, with a mixture of both in the midway sections. This clearly suggests the presence of a superficial differentiation chamber in the central zone -possibly replenished by primitive magmas that have maintained the activity of the rifts over time- where those magmas are mixed and transformed to create phonolitic volcanism.

Until very recently, the most recent activity of the Teide (in Montaña Blanca) was measured to have occurred 2,000 years ago (Ablay et al., 1995), already dated earlier by Navarro at 2470±110 years (personal statement). The absence of a precise geo-chronological examination like the one that exists in Hawaii Volcanoes National Park has made it difficult to comprehend the volcanic history of Tenerife's last eruptive stage, highlighting the need for radiometric dating. This lack of precise data has led researchers

to cite references made by navigators in the 14th and 15th centuries as possible eruptions, such as the mention made during Recco's voyage in 1341 (Santiago, 1948) that "smoke came out of the Peak"; or the one made by Andalusian navigators in 1393 (or 1399), cited by Webb and Berhelot (1939), that relates: "while approaching the island they saw flames and smoke come out of the summit"; that of Cadamosto dated sometime during the 15th Century: "…the mountain of Tenerife burned continually…" (Viera y Clavijo, 1766); or the extract from Christopher Columbus' captain's log upon returning from his first voyage to America that, according to Ferdinand Columbus' version in his History of the Admiral (1571), related how "they passed near to Tenerife, from whose mountain they saw enormous flames rising… comparing it to Etna in Sicily and many other mountains were the same thing was seen" (Cioranescu, 1978).

**Radiometric age ($^{14}$C y K/Ar) of the active rifts and the Teide-Pico Viejo stratovolcano**

| NW RIFT | | DOMES | | TEIDE-PICO VIEJO | | NE RIFT | |
|---|---|---|---|---|---|---|---|
| Volcanit unit | Age BP | Volcanit unit | Age BP | Volcanit unit | Age BP | Volcanit unit | Age BP |
| Mña. Reventada[2] | 990 | Roques Blancos | 1712 | Pre-historic forest fire[1] | 551 | Volcán del Portillo Upper Unit[1] | 13005 |
| Volcán Los Hornitos[1] | 1748 | Early Roques Blancos criptodome[1] | 1971 | Last eruption of Teide[1] stratovolcano | 1147 | Volcán del Portillo Lower Unit[1] | 13888 |
| Volcán El Ciego[1] | 2378 | Early Roques Blancos criptodome or Mña. Blanca pumice fall[1] | 1985 | Pico Viejo southern flank phonolitic flows[2] | 17525 | Mña. Cerrillar[2] | 31000 |
| Volcán El Ciego[1] | 2790 | Mña. Blanca[3] | 2000 | Pico Viejo northern flank phonolites[1] | 25405 | Mña. Cerrillar[1] | >33000 |
| Mña. de Chío[1] | 3932 | El Boquerón[1] | 2527 | Pico Viejo northern flank pahoe-hoe[1] | 27030 | Montaña de Enmedio[2] | 33000 |
| Mña. Cueva del Ratón[1] | 6140 | La Abejera Baja[1] | 5486 | Old Teide (Orotava valley flows)[1] | 32360 | Mña. Guamasa[1] | >33000 |
| Mña. Liferfe[1] | 8245 | La Abejera Alta[1] | 5924 | Old Teide phonolites (Playa San Marcos, Icod)[2] | 32000 | Montaña Guamasa[2] | 37000 |
| Mña. del Banco[1] | 15065 | Montaña Las Lajas[1] | 9171 | Old Teide trachybasalts (Playa San Marcos, Icod)[2] | 86000 | El Caletón[2] | 694000 |
| Volcán La Buzanada[2] | 95000 | | | Galería Salto del Frontón[2] 1100 m | 118000 | Montaña Birmagen[2] | 790000 |
| Mña. Gorda[2] | 322000 | | | Galería Salto del Frontón[2] 1500 m | 110000 | | |
| Mña. de Guaza[2] | 926000 | | | Old Teide basalts (Playa Santo Domingo)[2] | 123000 | | |
| | | | | Galería Salto del Frontón[2] 2700 m | 199000 | | |

The recent $^{14}$C and K/Ar radiometric dating, indicated in the above table (Carracedo et al., 2004) shows that all of these references must be related either to forest fires, the fumarole activity of the Teide's summit crater or to meteorological phenomena since the last eruption of the Teide was dated at 1240±60 years BP, and the eruption before the oldest historical eruptions of Siete Fuentes (1705) and Garachico (1706) is the Montaña Reventada eruption, Carbon-14 dated at 900 years BP. Placing the date of the last eruption in the pre-Hispanic period seems more consistent since in 1492 the neighbouring islands of Gran Canaria and La Gomera were already colonised and this type of eruption could hardly have gone unnoticed.

***Synthesis of the evolution of the scientific knowledge of the geology of Teide National Park***

From the beginning of the 19th Century the Teide and the Las Cañadas caldera was already a working laboratory where the great naturalists (L. von ßuch, C. Lyell) developed some of the basic concepts of Volcanology. The first descriptions and theories on the Las Cañadas caldera (along with the caldera in the Taburiente in La Palma, for which this kind of structure was named) were made by Leopold von Buch, who linked it to his elevation-craters model, and Charles Lyell who believed it was a typical erosional caldera.

Later, and in no particular order of prevalence, creation models for the caldera were cited involving collapse, explosion and erosion or a varied combination of all three (Bravo, 1964; Fúster et al., 1968.

Araña (1971) defended a model where the pre-caldera structure (the Las Cañadas edifice) suffers a vertical collapse that was later supported by Martí et al. (1994, 1997) Martí and Gudmundsson (1997) and Brown et al. (2003), fundamentally based on the volume of pyroclasts and pyroclastic flows emitted in large plinian eruptions in the stages before the formation of the caldera. An alternative model proposes that the caldera was created by the lateral collapse of the north flank of the Las Cañadas edifice (Navarro y Coello, 1989; Ancochea et al., 1989, 1999; Carracedo, 1994, 1999; Cantagrel et al., 1999), a model that explains the absence of the north edge of the caldera and the arrangement of the formations that fill this depression.

This last explanation has been reinforced by the discovery of 1000 $km^3$ of avalanche material on the northern coast of the island (Watts y Masson, 1995; Masson et al., 2002). The role of the rifts in the development of unstable edifices that collapsed in giant lateral landslides, thereby giving way to these structures was explained by Carracedo (1994, 1996).

The study of the last eruptive stage that created the most relevant geological elements of Teide National Park has been surprisingly sparse during the last few years, especially in terms of dating the different eruptions. The work done on this stage has produced the (fundamentally lithologic) cartography and stratigraphy of the Teide-Pico Viejo complex (Fúster et al., 1968; Navarro, 1974; Ablay et al., 1998; Ablay and Martí, 2000, IGME, 1981).

A recent study (Carracedo et al., 2003a,b, 2004a,b) has provided cartography of the geographical detail of the north-western and north-eastern rifts and the Teide-Pico Viejo complex, including 35 radiometric dates that have permitted the individualisation of the majority of the eruptive stages and events. This decisive geo-chronological examination, along with the observation of the internal structure of the Teide in galleries and the filling of the landslide bowl point to a model of the evolution of the complex where the primary motor of the process is the rifts: generating an overgrown and unstable structure that eventually collapsed on one flank due to the dilation stress caused by the dikes, filling the bowl, differentiating the magmas and finally erecting separate nested volcanoes in the landslide depression (Carracedo et al., 2004a,b).

Schmincke (1976, 1982) and Carracedo et al. (1998, 2002) offer a synthesis of the geology of the Canary Islands and Carracedo (1999) of their similarities and differences with other volcanic ocean islands such as the Hawaii Islands. The evolution of Tenerife Island framed by this last phase is described by Guillou et al. (2004).

Because so many researchers from all over the world have studied its geology and volcanism, the Canary Islands, along with the Hawaii Islands, are considered to be the best studied and understood on the planet.

## The Cañadas Edifice

### *Introduction*

One of the most important landscapes in Teide National Park is the wall of the Las Cañadas caldera, both for its scarped topography and the contrast of colours and relief caused by the great diversity of deposits that it displays. The wall of the Las Cañadas caldera is an exceptional three-dimensional display that allows us to directly study the stratigraphy, the structure and the sub-volcanic system of the Cañadas Edifice.

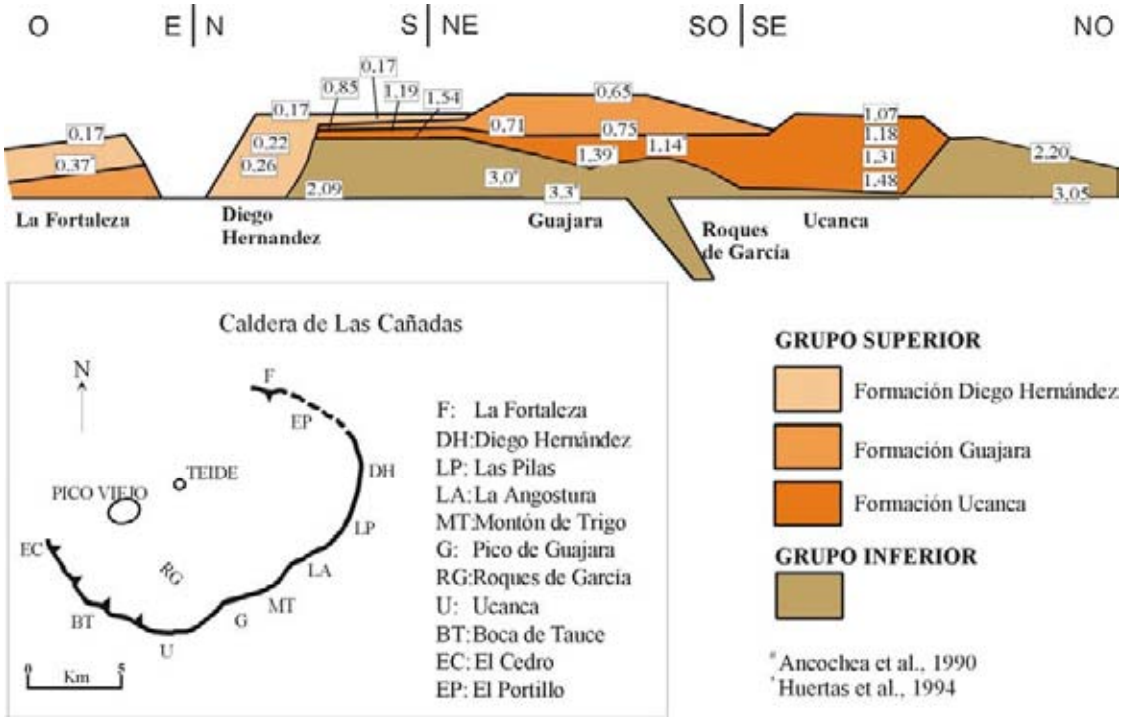


**Panoramic vista of the wall of the Las Cañadas caldera**

The morphological reconstruction of the Cañadas Edifice suggests that it was an edifice stretched NNE-SSW and that it reached a height of 2,700-3,000 m (Araña, 1971). The evolution of this great central edifice culminated with the formation of the Las Cañadas caldera, a 130 $km^2$ oval-shaped depression that stretched NE-SW. The Cañadas Edifice is characterised by the development of a central volcanism in which basaltic magmas evolved in superficial magmatic chambers causing explosive eruptions of phonolitic magmas (Wolff, 1987; Mitjavila and Villa, 1993; Martí et al., 1994; Bryan et al., 1998; Martí and Gudmundsson, 2000; Wolff et al., 2000; Edgar, 2003). On various occasions the products emitted during the Cañadas Edifice's explosive eruptions covered a large part of the island (Bryan et al., 1998; Edgar, 2003). Various basaltic-phonolitic cycles have been described, each of which ended with a vertical collapse (ej. Martí et al., 1994; Martí y Gudmundsson, 2000).

### *Stratigraphy of the Cañadas Edifice*

More than 3.3 million years ago, the Cañadas Edifice began to grow haphazardly in the central area of Tenerife on top of the material left by the Old Basaltic Shield (Coello, 1973; Ancochea et al., 1990), and its activity continued until 196,000 years ago (Huertas et al., 1994; Edgar et al., 2005). Martí et al. (1994) divide the deposits of the Cañadas Edifice in a Lower Group and an Upper Group. The Lower Group grew irregularly along the length of the caldera wall and on its external slopes: on the western flank and in the deep gorges of the south-eastern flank. The oldest deposits of the Lower Group have been dated at 3.3 million years (Huertas et al., 1994) and the most recent at 2.1 million years (Martí et al., 1994). The deposits of the Lower Group are divided into six sequences based on the existence of paleosoils and angular irregularities. Moving from west to east, the El Cedro, Boca de Tauce, Roques de García, Montaña de Trigo, Las Angosturas and Las Pilas sequences grow on the caldera wall. The rocks that constitute the Lower Group are principally basaltic and phonolitic lavas alternating with pyroclastic rocks. The stratigraphic complexity of this group has been attributed to the existence of numerous overlapping eruptive centres (Martí et al., 1994).




**Simplified diagram of the Las Cañadas caldera's wall, according to Martí et al. (1994).**

The Upper Group is characterised by explosive volcanism cycles and the partial destruction of the edifice (Martí et al., 1994). This group grows irregularly on the caldera wall on top of the deposits of the Lower Group and have been dated between 1.54 million years and 196,000 years (Martí et al, 1994; Edgar et al., 2005). They are divided into three units: the Ucanca, Guajara and Diego Hernández formations. These three formations are made up mostly of phonolitic rocks, with some interleaving of basaltic flows, and are related to the three different cycles of explosive phonolitic volcanism (Martí et al., 1994).

The Ucanca formation's rocks are the oldest of the Upper Group growing on the caldera wall, with a range of between 1.54 and 1.07 million years (Martí et al., 1994). The nearest deposits grow principally in the western sector of the caldera wall and the furthest ends of the south-eastern flank, south and north of the island (Martí et al., 1994; Fúster et al., 1994; Huertas et al., 2002; Edgar, 2003). The Ucanca formation is principally constituted of lava flows and soldered and non-soldered pyroclastic rocks (Martí et al., 1994).



**Pycroclastic collapse deposit. Note how the level of soldering increases toward the roof of the deposit.**

The deposits of the Guajara formation have been dated at between 0.85 and 0.57 million years (Martí et al., 1994). They extend along the south-eastern sector of the caldera wall on top of rocks of the Ucanca formation, also growing on the south-eastern flank of the island and in the Tigaiga mountain mass (Ibarrola et al., 1993; Martí et al., 1994; Bryan et al., 1998). The type of deposits is similar to those of the Ucanca formation, where soldered pyroclastic deposits predominate (Martí et al., 1994).

The age of the Diego Hernández formation deposits range from 370,000 years (Ancochea et al., 1990) to 196,000 years (Edgar et al., 2005). Its growth on the caldera wall is restricted to the extreme eastern end of the caldera, but its distal deposits cover a large part of the island. The lithology of this formation mainly consists of non-soldered ignimbrites and collapse debris (Martí et al., 1990, 1994; Edgar et al., 2005).

### *Structural elements of the Cañadas Edifice*

The wall of the Las Cañadas caldera is an exceptional place to study the sub-volcanic system of a stratovolcano complex like the Cañadas Edifice. The preferential erosion and the greater resistance to erosion in the surrounding deposits have allowed dikes and pythons to grow with their original morphology well preserved. Even the channels through which the magma climbed to the emission centres (where they were expulsed) can be seen within the wall of the caldera. The dikes that grow on the Las Cañadas caldera wall display a broad range of directions and angles and are principally phonolitic, although in the Diego Hernández area of the wall there are basaltic dikes related to monogenetic emission centres of the north-eastern rift.



**Phonolitic dikes in the wall of the Las Cañadas caldera**

The faults in the caldera's rocks are mainly concentrated in the Ucanca and Los Roques de García area. There are some faults in the rest of the wall as well that have metres-long displacement and others that are smaller. However, the largest tectonic structure that has been seen in the caldera wall is a graben at least 1 km wide and 2.5 km long formed by normal faults with vertical displacements of up to 100 m. The origin of the "Graben de Los Azulejos" may be related to the extension of the north-eastern rift of the island (Galindo et al., 2004). However, during the evolution of the Cañadas Edifice and in relation with the deformation associated with the swelling and diminishment of the superficial magmatic chambers, the graben faults were reactivated, displacing themselves normally and/or inversely (Galindo et al., 2004).

# Flora and Vegetation

## General questions and comparative analysis

### *General questions*

The flora and vegetation currently living in Teide National Park is an important part of the biological history of a series of colonisation and destruction processes that have occurred throughout the volcanological history of a territory whose unique and grandiose landscapes dominate the summits of Tenerife.

In general, this flora follows an adaptive radiation model that starts from the lower and older altitudes of the island and expands upward until reaching the highest and newest altitudes. Diversification and adaptation have created unique and remarkable endemic species that have had to adapt in order to live with three phenomena: external erosion, endogenous or constructive erosion and human usage during the last 2,000 years that has been almost devastating at times.

The most significant external erosion has been caused by the different climatic crises that have occurred since these islands emerged (from east to west) between the Miocene and Pleistocene, combined with adverse environmental conditions that include periods of extremely low temperatures, heavy rains or prolonged droughts that are responsible for the morphology of the territory's relief.

Among the endogenous or constructive factors are alterations of the territory due to eruptions, some of them immense, which have modified the landscape. The most recent volcanic episode (in 1798) flooded a large area that had been covered in vegetation with lava flows and volcanic material. A little more than 200 years later this region is still practically not colonised.

In addition to the continuous volcanic activity that has occurred during the millennium, other important and colossal processes that have modified the landscape of Mt. Teide include the pre-caldera volcanic edifice landslides that created the La Orotava Valley and the Icod de los Vinos Valley.

Furthermore, the aboriginal tradition of pasturing animals on the mountain decimated the vegetation for centuries. The destruction of the vegetation increased alarmingly during the last 500 years because in addition to traditional seasonal pasturing, the vegetation was exploited for different reasons, especially for fuel, pushing many species endemic to Teide to the edge of extinction.

These climatic crises, which were quite different than the current climate, lead to the belief that the flora and landscape were very different in the past.

Pierre Quézel, one of the foremost authorities on Mediterranean and North African flora, has indicated that the Canary Archipelago is a botanical conservatory of taxons that disappeared during the successive desertifications and glaciations that have occurred in the Mediterranean and Africa since the Miocene. These climatic perturbations have not been as intense in the Canaries (thanks to its insularity, climate and micro-climates) and therefore many taxons that have disappeared in North Africa and especially the Mediterranean can be found on the islands.

Recently emerged (in geological time) volcanic islands serve as evolution and diversification centres for some taxons. Well known examples of this are the Hawaiian, Mascarena and Galapagos islands. A series of taxons with a large number of endemic species are found in the Canaries and, more specifically, on Mt. Teide, including *Descurainia*, *Aeonium*, *Echium*, *Micromeria*, *Sideritis*, *Pterocephalus* and *Tolpis.* The two species of the endemic genus *Spartocytisus* have evolved from a Mediterranean line. The most representative plants in Teide National Park (biomass and distribution) are the leguminosae *Spartocytisus supranubius* and *Adenocarpus viscosus* which probably arrived in the islands during the first cold stages of the Pleistocene.

Another paleo-endemic species is *Pinus canariensis*, a species that belongs to the archaic Mesogenic group of flora. Some authors consider it to be a variation of *Pinus roxburgii* which is very common in the meridian slopes of the Himalayas. The age of the Canarian pine has been validated by fossils found in France, North Africa and Turkey. Other typically Mediterranean species like the Canarian cedar *Juniperus cedrus*, a variant of *Juniperus oxycedrus*, the “escaramujo”, *Rosa canina,* and the “peralito de cumbre”, *Sorbus aria,* consolidate the Mediterranean origins of the vegetation that has colonised Teide National Park.

One of the most emblematic species of the Park deserves a special mention: the Teide violet or “violeta del Pico”, *Viola cheiranthifolia*, a variant of *Viola palmensis*, which is endemic of the summits of La Palma. According to Quézel both are closely related to *Viola dyris* an endemic species of the Moroccan Atlas Mountains.

When entering the Park during the spring using the La Esperanza road, the *Pinus canariensis* pine forest ends at La Crucita (1,940 m) and the impressive spectacle of the *retamar* extended across the volcanic materials of the summit begins. This entire landscape is covered with the green of the Teide white broom or “retama blanca del Teide”, (*Spartocytisus supranubius*) bursting with white and pink flowers and the intense yellow of the “hierba pajonera” (*Descurainia lemsii*) begins at the Park’s entrance and gradually disappears in the proximity of the “tarta”. From there the space is almost exclusively covered by *Descurainia bourgeauana*, until passing Montaña de la Mostaza (in whose crater the last important population of this species can be found). From this spot very little “hierba pajonera” is found. This remarkable plant community defines what we call the moist and colder Cañadas facing north. This area is frequently covered by the “sea of clouds” that usually disperses toward the south.

The second most populous species in terms of biomass is the “rosalillo de la cumbre” *Pterocephalus lasiospermus*, a plant that was an endangered species before the declaration of the National Park but that has rebounded strongly after the exploitation of the mountain’s resources was regulated in the 1950s. In some populations its purple flowers are pale or even totally white. The progression of this flower’s colonisation of the

Llano de Ucanca is notable and at this rate the area will soon be totally covered by a dense scrub dominated by these two species.

The third most important species is the "codeso del pico" (*Adenocarpus viscosus* subsp. *Viscosus)* which is found from the pine forests that surround the area up to altitudes of 3,250 m on the northern face of Teide. While this species is less common in the Park that the other two, it is the only species found in some areas because its scrubby form adapts to extreme blizzards, and even sometimes protects Teide (*Viola cheiranthifolia*) violets in its interior.

Other remarkable plant species are the two "taginastes" that are endemic to the Park. The "taginaste rojo" (*Echium wildpretii*) has red-purple flowers generally located in a giant pyramid-shaped inflorescence taller than one metre in height. This plant grows preferentially in the rocky areas of the pre-caldera wall where hundreds of specimens can be found among the primo-colonising *retamars*. This species is often planted as an ornament in areas where there are many visitors and therefore have spread in the proximity of these areas. This can be seen in the Tabonal lookout point.

The other species, the "taginaste picante" (*Echium auberianum*) has blue flowers sitting on an inflorescence that is less dense than that of the first species but equally spectacular although less abundant. It lives preferably on lapilli pumice substrates (the "sahorra") and is established on Montaña Blance in the areas surrounding the volcanic bombs that exist there. A hybrid between these two species is one of the new botanic discoveries that has incremented the Park's biodiversity.

A new plant has been recently discovered called "cerrillar-crespar". It is a primo-colonising grass established on recent-landslide substrates that appeared due to freezing the material. This community is characterised by two species of grass, "cerrillo de la cumbre" *Arrhenatherum calderae* and *Melica canariensis* as well as the "crespa" *Plantago webbii* and is distributed in an arc that coincides with the oldest substrates in the national Park.

A series of less abundant endemic species, but not less important, is also found in this landscape. This includes the "alhelí del Teide" (*Erysimum scoparius)*, the medicinal "tonática" (*Nepeta teydea)*, the "magarza" or "margarita del Teide" (*Argyranthemum tenerifae)*, the "hierba fistulera" (*Scrophularia glabrata)*, that is very common on the sides of the road, the late-blooming "cabezón" (*Cheirolophus teydis)*, very abundant on the sides of the road just before the entrance at Boca de Tauce and currently expanding throughout the Park, and the "malpica" (*Carlina xeranthemoides*), whose distribution goes beyond the lower limits of the Park. The "chahorras" *Sideritis oroteneriffae*, *Sideritis eriocephala* and the less common *Sideritis soluta* along with the "perejil de la cumbre" (*Pimpinella cumbrae)* are species that should be mentioned in this abbreviated list of summit plants.

Some rocky environments like crevices and fissures, areas like Las Cañadas and some badlands hold some species that are unique to these habitats as well as the more common species. The "moralito", (*Rhamnus integrifolia)* is a shrub that has descended from higher altitudes to establish itself in these places where they are usually associated with "turgayte" (*Senecio palmensis)* another late-blooming species. Endemic crassulaceae like *Aeonium spathulatum*, *Aeonium smithii* or the diminutive *Monanthes niphophila* and the ferns *Cheilanthes guanchica*, *Asplenium adiantum-nigrum*, are common in the cracks

of rocks. Less frequent endemic species include *Silene berthelotiana*, *Cerastium sventenii* and *Micromeria lasiophylla.*

The recuperation of the Canarian cedar or "cedro canario" on the edges and within the Park is remarkable since before the declaration of the National Park they were quite scarce. Today there are more than 2,000 specimens. Along with the Canarian pine (*Pinus canariensis)* and the "escobón" (*Chamaecytisus proliferus*), this forest band of the Park defines a new series of vegetation potential of the island of Tenerife. Small populations of "brezo" (*Erica arborea* subsp*. Canariensis*) and "poleo de monte" (*Bystropogon origanifolius*) have surprisingly been found in the interior of the Park at 2,000 m.

Two endemic species that belong to the Cistaceae family are unique elements of the Park's plant heritage: the "jara de las Cañadas" (*Cistus osbaeckiaefolius)* with two large populations in La Fortaleza and the "jarilla de las Cañadas" (*Helianthemum juliae*) one of the most infrequent plants on Teide.

A spectacular Asteraceae, the "cardo de plata" (*Stemmacantha cynaroides*), is another one of the most emblematic plants of the Teide flora due to its rarity; it is also one of the plants most affected by the voracity of the colony of mouflons that was introduced into the Park. It was dislocated from its traditional spot on the Llano de Maja in the 1970s and today other populations of this species have been discovered on the slopes of Mt. Teide; individual specimens have also been found in different parts of the region that were outside of the Park before the most recent expansion of its borders. The *ex situ* cultivation of specimens in the nurseries of the Teide National Park Botanic Garden for the purpose of reintroducing them into the Park and the protection of some natural specimens with fences to stave off the depredations of introduced species like the mouflon are some of the measures that have been taken to make sure that this unique and beautiful Teide flora does not go extinct.

The limited moist terrain in Las Cañadas is produced by different springs and by a small, constantly flowing stream. They are stand out in the landscape because they are especially green and have large populations of the endemic carex (*Carex paniculata* subsp. *calderae*) and a mint (*Mentha longifolia*), a melliferous aromatic plant that gives character to this hygrophytic community enriched by the presence of the fern *Cystopteris fragilis* that is very common in caves, as well as mosses, hepaticas and other species typical of these permanently pooled environments. In the cracks of the clay floor of the large lakes inundated for a large part of the winter, a curious population of *Mentha longifolia* described as *M. longifolia* var. *teydea* develops*.*

In the upper part of Teide, in the Rambleta and the Pilón de Azucar, there are special hot and moist soil micro-environments that cover small areas around the exits of fumaroles. In these small spaces affected by the constant escape of water vapour small musculin communities typical of these extreme habitats develop. On the least hot but constantly moist edge of this micro-space a curious endemic species *Laphangium teydeum* grows that for its similarity to the alpine *Edelweiss* has been dubbed the "Teide Edelweiss". Recently a new plant community has appeared in warm earth close to the border of the crater constituted by moss and *Sagina procumbens*.

Finally, in the unstable rocky environment made up of pumice from the cone the Teide violet stands out. Another endemic species emblematic of the Park, *Silene nocteolens,* is also found in this habitat.

It is estimated that there are around 220 vascular plant taxons, 100 species of lichens and another 100 of bryophytes currently found in the National Park. The vascular plant catalogue includes all of the taxons that are considered endemic, autochthonous and the majority that are considered adventitious and naturalised, whose incorporation into the natural space intentionally or passively occurred in recent times. The endemic richness of the flora of this territory is illustrated by thee following statistics: of the 220 vascular plant taxons, 73 are endemic to the Canary Islands, 18 are found in various islands (more than two), 19 are endemic to two islands, and 36 are endemic to Tenerife and of these 36, 16 are endemic to Teide National Park. Few insular spaces on the planet located between 2,000 and 3,718 m possess in only 18,990 hectares a phytodioversity as rich as that of Mt. Teide.

***Comparative analysis***

As comparative elements we have taken two active volcanic islands, Big Island, Hawaii in the Pacific Ocean (World Heritage Site) and Reunion Island, the largest island of the Macarena Archipelago in the Indian Ocean. This set of islands emerged from eruptions that took place on the dorsal of the Indian Ocean located around 800 km east of the island of Madagascar between the 19º 45' and 21º 10' parallels of the south latitude. Reunion is an island of around 2,500 $km^2$ with two volcanoes separated by a plateau: the 2,361 m Pitón de la Fournaise and the 3,068 m Pitón des Neiges, considered the highest point of the Indian Ocean. Both are Hawaiian-type volcanoes. The Pitón de la Fournaise is almost permanently active. The tropical vascular flora of Reunion Island is also rich in endemic species, many of them in seriously endangered due to the deterioration of the island caused by human transformation of the insular territory.

Relatively few species have reached the high mountain, the majority of them endemic. In the plateau that separates the two volcanoes there is a type of wild-land scrub that is characterised by the abundance of the endemic ericaceae *Phillipia montana*, that along with the endemic species *Hubertia tomentosa* and *Hypericum lanceolatum* have colonised the most evolved soils. Above 2,200 m the pillowy endemic asteraceae *Soebe passerinoide* begins to dominate. These ericaceae are similar to high-mountian scrub found in Kilimanjaro and Mount Kenya.

In Hawaii, the highest altitudes are found in the two big volcanoes, Mauna Kea 4,205 m and Mauna Loa, the most voluminous mountain on the planet, whose climates include strong winds, cold temperatures and recent lavic substrate -ot ideal environments for rapid colonisation by vascular plants. That is why they are rocky high-mountain deserts where only a few lichens and bryophytes prosper, as well as the endemic species *Argyroxiphium sandwicense,* a species similar to the Teide "taginastes" in a significant eco-convergence process.

This comparison demonstrates the remarkable difference between the flora in volcanic island summits located in oceanic spots that border the African continent and those in the central Pacific. They all have a common denominator: the high level of

endemic species in their respective ecosystems and the level of plant colonisation according to the age of the volcanic substrate. However, the composition of their respective flora situates them in distinct biogeographic kingdoms. Each island has a markedly different biological profile and landscape, making them unique not only for the aesthetic value of the territory but also for cultural and scientific reasons. Nature has converted these island ecosystems into isolated natural laboratories with immense research possibilities for all of fields of science.

***Summary***

The biological diversity that has evolved for millennium on the impressive substrate of Teide National Park is a spectacular example of adaptation to very adverse edaphic and climatic conditions. The destruction and re-colonisation of the communities of living beings throughout the history of the territory after the numerous volcanic episodes that have configured the volcanic landscapes of Teide during more than 1,000,000 years should be highlighted. The phytodiversity of the flora and ecosystem of Teide National Park located between 2,000 and 3,700 m is probably one of the richest among the volcanic islands on Earth.

Although it has been known and explored for the last 300 years by numerous renowned scientists like Abbot Feuillé, Humboldt and Bonpland, Webb and Berthelot, Haeckel, Leopold von Buch, Ceballos and Ortuño, Sventenius and many others, this island is only partially studied. This extraordinary Laboratory of Life has experienced a surprising recuperation ever since it was declared a National Park. Without a doubt, a large part of the territory is recovering year by year. This noticeable improvement is due to the restricted use of many spaces and the success of the conservation measures regulated by the management and usage plans and carried out by the administration of Teide National Park.

## Spatial analysis of the landscape through aerial footage


### *Summary*

From the aerial footage taken in 1964, 1985, and 1996, and from a global perspective, we can observe a slow evolution of the vegetation coverage of Teide National Park principally due to the territorial stability, motivated not only because of its particular geo-climatic conditions but also due to a strict control of human activity. When we analysed five specific areas with the most potential scrubland coverage, we observed that, except for a few exceptions, the flora diversity had increased in almost all of the areas that were studied.

In conclusion, there is no doubt that the declaration of Teide National Park was a positive measure for the progressive evolution of the flora and vegetation found in the Tenerife peak. Even though some threats exist (mouflons, rabbits, an excessive number of human visitors, etc.) the Park is probably in the best conditions since man came to the island.


### *Introduction*

### *Background*

In Autumn of 2001 a campaign to obtain field data in the Canary Islands for the SISPARES project was carried out for the purpose of developing a Monitoring System of the Spanish rural lands. Among the network of landscapes in the SISPARES project, 9 landscapes were included from the Canary Islands. One of these landscapes was located in Teide National Park.

When the field work was being done for this landscape, Teide National Park became interested in deepening their knowledge regarding the dynamic evolution of the vegetation landscape in other areas of the National Park. This interest motivated the Park to formally petition the work in which The Surface Analysis of the Landscape through Aerial Footage, is based on.

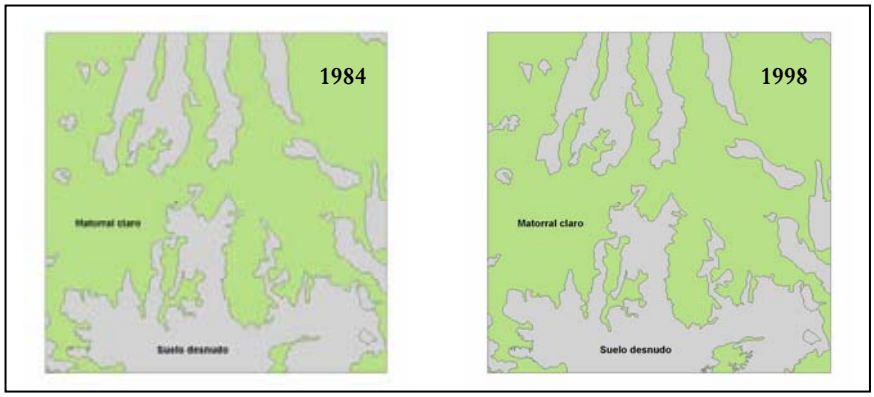
The methodology used for the SISPARES project interested the Park so it decided to propose applying it in a study that had already begun with the participation of the University of La Laguna via the agricultural transformation company TRAGSA.

### Teide landscapes

The landscape of the Mt. Teide used as a sample in the SISPARES project (Elena-Rosselló, 2003) covered the Canarian Summits, that is, vegetation known as Orocanario (A vegetation bio-climate native of Mt. Teide).

The landscape has a surface of 1600 acres that is found in the lower foothills of Teide's volcanic cone, including the plains of Ucanca found in the caldera. Its altitude is between 2,010 m and 2,760 m above sea level, with an average altitude of 2,270 m.

In the Canarian SISPARES project, the structure of the landscape was studied at two different dates; 1984 and 1998. The analysis of the landscape in Mt. Teide was based on the plant coverage. The distribution and pattern of the area of land covered is reflected in the referenced dates.




**ArcINFO coverage which reflects the landscape structure in SISPARES located in the Teide caldera, in the referenced dates of 1984 and 1998.**

From the point of view of its composition, the SISPARES landscape of Mt. Teide in both dates is a matrix scrub landscape, scrubs being the dominating factor in more than 60% of its territory, with lithic formations being the only type of accompanying coverage. During the 14 years analysed, very little variations were observed, changing the percentage of scrubland from 60.87 to 61.17%.

In regards to the analysis of the structure rate of the landscape, from the composition and configuration, to the combination of both corresponding aspects in both dates of the study, interesting conclusions can be made. The composition rate shows sharp poorness with only two types of elements in the landscape, scrubs, and volcanic flows, and also an absence of any mosaic pattern at the level of scale that the study was carried out. Therefore this is the poorest landscape of the Canary Islands, given the absence of wild elements as well as agricultural elements which do appear in other less elevated territories. In reference to its diversity, despite its poorness, the Shannon Index (1) shows values of 0.61, which is not the lowest of all the islands.

In regards to the configuration, 26 tesselar elements with an average size of 61.5 acres, a tesselar density of 0.016 tessers/ha, and a density of tesselar borders of 85 to 90 m/acre are identified. These values show us a high tesselar complexity, measured by a Tesselar Index higher than 2,1. These values are the highest in all the Canary landscapes, directly relating to the level of nature attributed to the Teide landscape.

The fragmentation of the Teide landscape measured by the tesselar density, has the lowest values of all of the Canary landscapes included in the SISPARES network, while the connectivity of the landscape reaches its maximum value.

In regards to the combined index in composition and configuration, the Teide landscape has the lowest value in mixture (19.19 to 19.97). In consequence, the lowest rate in fragility and vulnerability among the Canary landscapes.

When we analysed the comparisons of the Teide landscape of 1984 and 1998, we found great stability, observing minimal changes in all of the rates of composition and configuration. At a landscape scale, we can affirm that 14 years is too short a period to produce any identifiable natural changes in the landscape with the bio-geoclimatic characteristics of Mt. Teide (Araña and Coello, 1989). If we add to this the controlled management of human activity regulated by the National Park, we can easily understand the Park's recent stability.

To complete the description of the SISPARES landscape from the perspective of the Canary Islands as a whole, we must point out that given its stability during the period of 1984-1998, Mt. Teide does not follow the evolutionary tendencies of the rest of the landscapes studied.

Since its declaration as a National Park, human interaction with the Park has radically changed and this is reflected in the state of its vegetation. One of the most important changes has been the elimination of pasturing inside the Park, changing the herbivorous pressure, which is now attributed to the abundance of rabbits and mouflons.

At the same time, firewood is no longer foraged from the area, a practice which traditionally conditioned the development of Teide white broom.

In summary, despite the fact that no changes have been detected in the overall landscape of Mt. Teide, there have been changes to certain elements within the landscape, especially in the formation of scrublands. It is at this scale where the study of its evolution has been focused during the last forty years.

The general objective of the study is the evolution of the vegetation landscape of Teide National Park obtained through aerial footage. More specifically, the objective is to study the dynamics of the scrubland in five sectors of the National Park (Cañada Blanca, Cañada de los Guancheros, Diego Hernández, Llano de Maja and Llano de Ucanca), both quantitatively and qualitatively using three dates for analysis: 1964, 1985 and 1996.

The special characteristics of Teide's climate and soil have slowed down ecological processes, thereby causing the natural landscape to evolve slowly. This evolution contrasts with the temporary smaller scale work used frequently in these types of studies and has obligated us to increase the scale and scope of this work.

At first the idea was to study an extensive territory with historical photographic data at a scale of 1:30.000, but it had to be zoomed into individual specimens or small patches of vegetation in order to be able to identify the slow evolution. This obliged us to use a territorial stratification strategy in order to get samples of defined stratus with enough intensity to be representative of the whole.

One of the main difficulties was the lack of aerial photographs near the date of the declaration of the National Park. The oldest photographs date back to 1964.

### *Material and methods*

This study was carried out using the same general framework and methodology established in SISPARES but adapted to the specific characteristics of the National Park. Two circumstances that were especially given in Las Cañadas prompted the modification of the methodology:

- The unique characteristics of Teide landscapes in which its geomorphological components are the principal and almost exclusive elements of its landscapes.

- The need to measure the effects left behind from the presence of man during the years after the declaration of the National Park.

Conditioned by these two circumstances, a methodology was proposed which will be explained below, together with the corresponding materials used.

### Design of the compilation of diachronic information

The study focused on the areas of the Park where the most recent changes due to human presence had the most influence in the vegetation landscape, leaving an identifiable mark in the aerial footage.

Once the area to be studied was selected, we located the photographs that were taken in aerial shots starting from 1954 on.

### Locating the areas to be studied

The specific areas earmarked for the study of the evolution of the landscape are: Cañada Blanca, Cañada de los Guancheros, Diego Hernández, Llano de Maja and Llano de Uncanca.

The five areas selected for this study had the following characteristics:

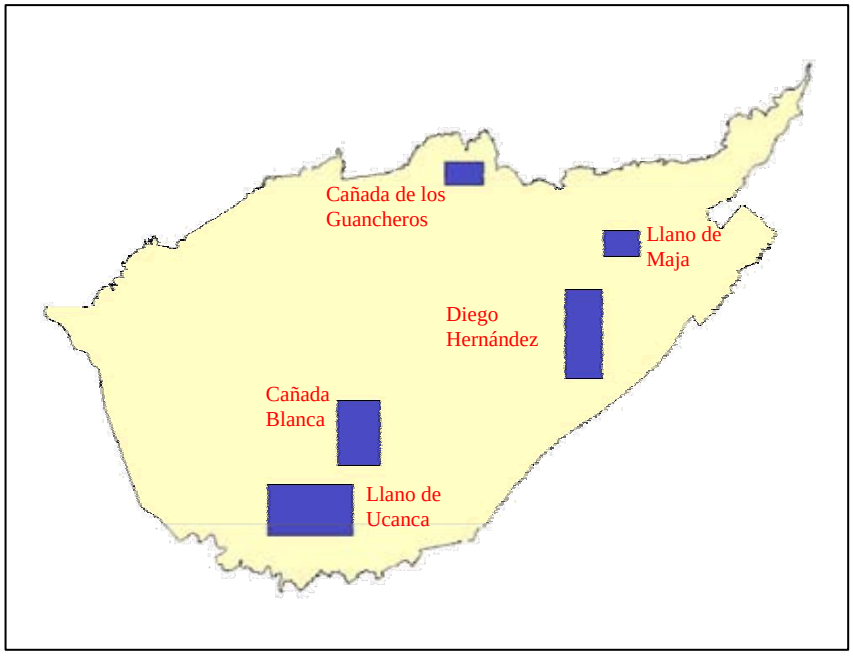
- Cañada Blanca, located in the municipality of La Orotava at an altitude between 2,144 and 2,379 m contains a vegetation of Teide white broom, and a community of malpica, rosalito, pajonera, and cedar (types of plants, grass, and trees).

- Cañada de los Guancheros, located in the municipality of Los Realejos at an altitude between 2,027 and 2,168 m contains a vegetation of peak Teide white broom.

- Diego Hernández, located in the municipality of La Orotava at an altitude between 2,052 and 2,324 m, contains a vegetation of Teide white broom and communities of malpica, rosalito, pajonera, and cedar.

- Llano de Maja, located in the municipality of La Orotava at an altitude between 2,254 and 2,365 m contains a vegetation of Teide white broom and communities of malpica, rosalito, pajonera, and cedar.

- Llano de Ucanca, located in the municipality of La Orotava at an altitude between 2,010 and 2,196 m, contains a vegetation of Teide white broom and communities of malpica, rosalito, pajonera, and cedar.




**Identification and attainment of aerial footage**

In order to use the different aerial photographs in diachronic studies the following requisites must be met: a) flights must cover all of the areas being studied, b) the scales have to be similar in all of them and c) the temporal distribution has to be homogeneous.

In summary, the following flights were selected:

- 1964 flight, at a nominal scale of 1:30.000, black and white photograph acquired by GEOCART, S.A.
- 1983-85 national flight, at a nominal scale of 1:30.000, black and white photograph acquired by the Instituto Geográfico Nacional. (National Geographic Institute).
- Orthophotography at a scale of 1:18.000, made in 1996, panchromatic, acquired by the National Park.

In the above mentioned flights, the necessary photographs of the areas selected were identified. To achieve this, the areas of study were changed to 1:50.000 topographic cartography and we cross-referenced this information with each flight plan. For the orthophotography, the change was automatic due to its geo-referencing.

### First phase of laboratory work

Before starting any field work, the following operations were carried out:

- Digitalisation and re-touching of the aerial images.
- Geo-referencing, construction, and recovering of the scanned images.
- Preliminary interpretation of the digital images.

### Field work

The interpretation of the images is not definite without the corresponding field work to verify the first photo-interpretation of the laboratory. The following objectives are achieved by carrying out the field work:

- Verification of the previous coverage, obtained in the laboratory from the current images.
- To section out samples to obtain the present density and part of the coverage capacity, useful to evaluate the interpretation of the aerial images.
- Obtain ground shots that will complement the aerial footage.
- Obtain information from National Park personnel regarding the different aspects of the vegetation landscape, making it possible to interpret the results in terms of evolution.

### Second phase of laboratory work

After the field work was done, the following operations were carried out:

- Preliminary analysis of the evolution of the vegetation: locating the changes. All of the information was incorporated into a Geographic Information System.
- Selection of the samples of territories for the study of their vegetation. Once we identified and located the circumference of each area to be studied, a sample of the territory was selected within this circumference taking care to select a representative sample of this area.
- Digitalisation of the scrub coverage.
- Quantitative analysis of the vegetation dynamics.
- Qualitative analysis of the vegetation dynamics.
- Obtain change matrixes.

With the resulting coverage, matrixes of changes were generated in the period that was analysed. These matrixes are numeric tables that reflect the quantitative variations experienced by the vegetation.

***Results***

Through the construction and treatment of the aerial the corresponding images from each date analysed was obtained. Sample territories are selected from these images as well as the coverage or layers of thematic information for each date making the diachronic analysis possible.

The diachronic analysis covers the periods between 1964-1985 and 1985-1996. The results of this analysis were materialized in a series of landscape indexes and matrix change tables, making it possible to reach conclusions on the areas studied.

**General conclusions for Cañada de los Guancheros**

In the first part of the interval studied, 1964-1985, there was a significant loss of the surface occupied by scrubland with a consequent loss of eco-tonalities and structural complexity. This tendency changed in the following period with the appearance of a great quantity of young plants, especially in the lava zones but not so much in the plains. Therefore we can reason that there has been a substitution of older individual specimens, probably due to the end of their life-cycle, for a younger specimen generation. However, during this substitution zones stripped of vegetation appeared.

**General conclusions for Llano de Maja**

In this area we can summarise that the north-east quadrant has been very stable, not only in structure but also in coverage capacity of scrubland, and also an important increase in scrubland in the rest of the lava zones growing not only in number but also in the extension of continuous patches of larger sized specimens. The east side of the area studied is an exception: there has been a loss of older plants and quality specimens. This process has been inverted due to the colonisation of young plants in 1996.

Lastly, we should mention that the plains have been colonised by a large number of scattered groups of specimens. This colonisation is not homogenous throughout the whole surface, but rather very concentrated in the areas where they do appear.

**General conclusions for Diego Hernández-Cañada de Las Pilas**

Three different processes have been found in different parts of the sample area:

- Northern part of the plain, some stability was detected in the lower parts around the lava slopes, with consistent spots of scrubland, with perhaps a light regression or loss of vegetation in the upper part of the slope, at the same time a timid colonisation has started in the plains.

- Central part of the plain, although there was a loss of mature vegetation found in the first period, we found that young plants substituted them in the second period.
- Southern part of the plain, represented by the last two sample territories, where a rejuvenation of scrubland could be observed, while at the same time the most dense area has moved toward the part of the plain that is most covered by the lava slopes.

**General conclusions for Cañada Blanca**

In general, in the whole area studied there is a significant increase of the surface occupied by scrubland as a consequence not only in growth of the plants that were already there in the first date studied, but also in the appearance of new plants, which in some areas are very abundant. Only in the southeast quadrant, on top of thin materials that periodically create pools, we can see no increase in the number of plants, but that there is a growth that already existed from the beginning. It should be pointed out that there has been an increase in laburnum in the areas previously occupied by the re-population of pine trees.

**General conclusions for Llano de Ucanca**

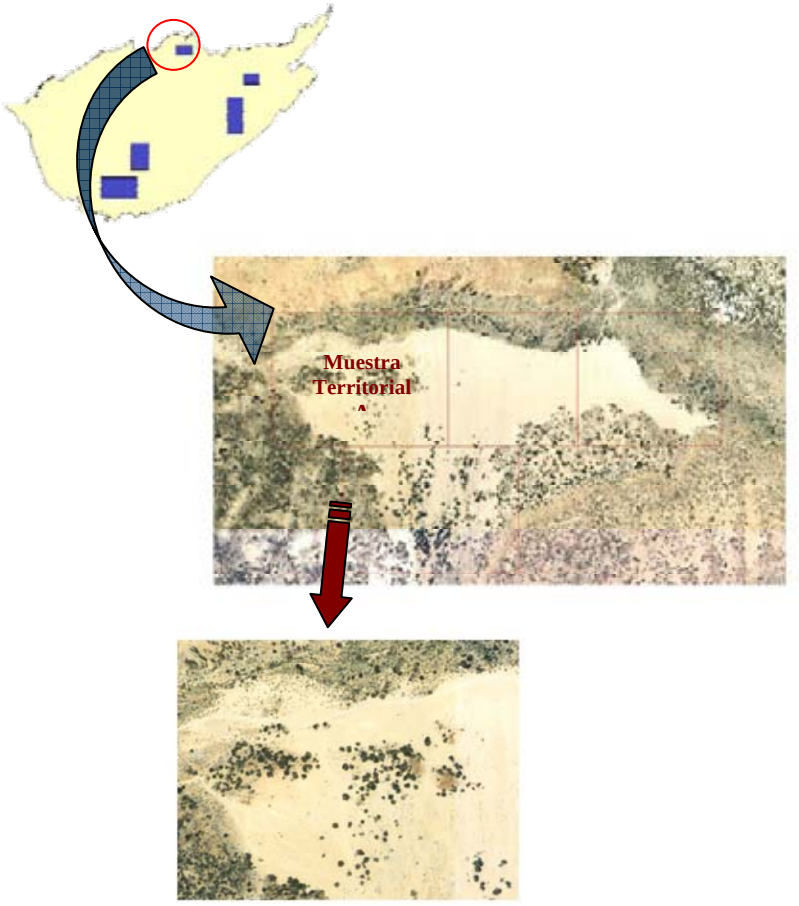
Young plants were observed in the process of colonising in the plain, which became more evident in the second period. In this period some more extensive patches have started to form, although the isolated specimens still dominate the vegetation landscape. The roadway has always been a vector which has facilitated the dispersion of individual specimens. It has also been observed that when an element happens to create a barrier effect, the northern part experiments a higher progression in vegetation. Above all, a notably higher production of eco-tonalities is produced, not so much in the complexity in the distribution of forms of scrubland since in their index calculation there are more numerous individual specimens that are not touching any others.

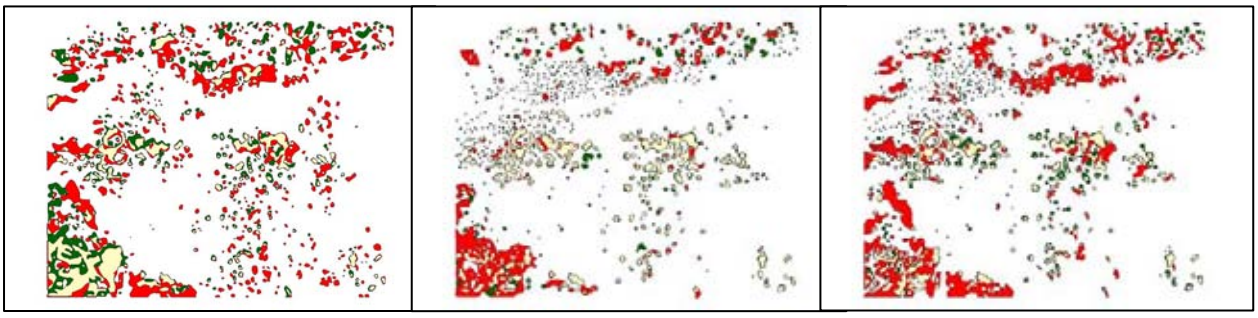
**Graphic representation of the dynamics of the scrubland**

The use of the Geographical Information Systems (S.I.G.) shows us the representation of the dynamics of vegetation by superimposing the layers of information that are represented in the spatial distribution of the vegetation in the referenced dates. This was carried out for both groups of dates that make up the two periods that are analysed in this work, thus achieving a diachronic representation of what happened in each period. First, the dates that defined the two partial periods were compared (1964-1985) and (1985-1996), and then the two dates that mark the beginning and the end of the whole interval studied, (1964-1996) resulting in the diachronic representations.

To illustrate this graphic analysis procedure, below is an example that shows the dynamics found in one of the territorial samples.

**Study area of Cañada de los Guancheros, territorial sample A**



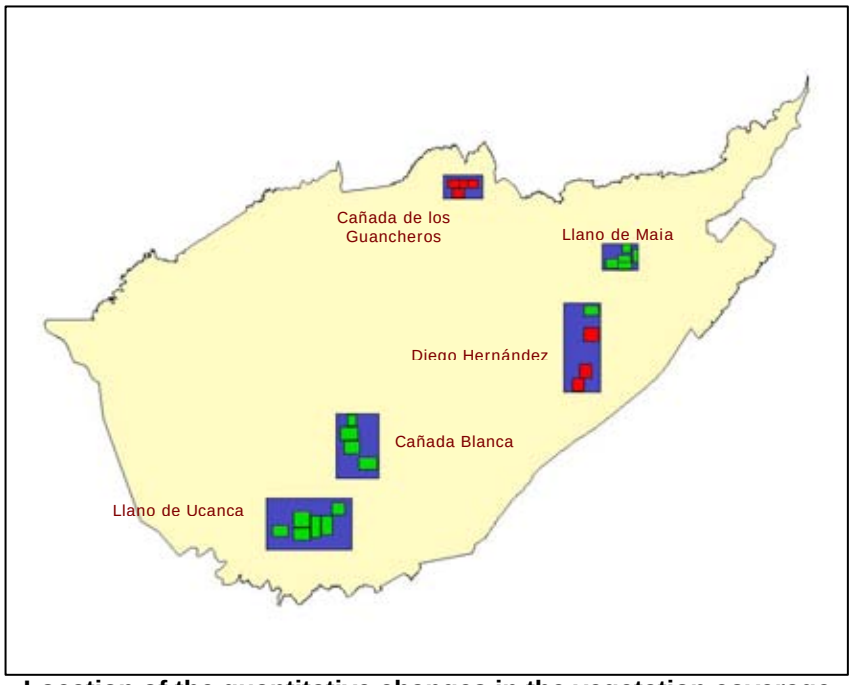
64-85 85-96 64-96

Colour red: vegetation present only in the first date.
Colour cream: vegetation present in both dates.
Colour green: vegetation present only in the second date.

### *Summary of the results*

### *Quantitative summary of the changes found*

To summarise the changes in a fraction of the area covered, a simple cartography was elaborated in which you can see the quantitative evolution of the different samples that were studied. The changes in surface coverage of the scrubland are located for the entire period studied (1964-1996). The increases are represented in green, and the decreases in red. Seeing that only one quantitative value is given, these decreases do not directly imply a degradation of the eco-system but do however indicate in absolute terms the decrease in the fraction of the area covered by scrubland.




**Location of the quantitative changes in the vegetation coverage.**

It can be observed that in the three areas studied, there is an increase in the surface coverage of scrubland in all of the sample territories, therefore it is safe to generalise the results in all of the areas. Regarding the interpretation of the dynamics of the vegetation, it should be pointed out that in the three areas studied, Llano de Maja, Cañada Blanca and Llano de Ucanca, the scrubland has gained ground not only in growth of the existing specimens or by the increased extension of patches that were identified from the beginning, but also because of the appearance of a very significant number of new plants in areas where no vegetation existed at the beginning of the period studied.

In the other two areas of the study, the decrease in the surface occupied by scrub is the dominant tendency in almost all of the sample territories, except for the northern part of the Diego Hernández area, where an increase in the fraction of the area covered by scrub can be seen. The changes in these places are probably provoked by a reduction in the continuous flow of scrub patches, a process that can be seen in some of the sample territories of the group of areas studied that increase the coverage surface, but this time it is not accompanied by the colonisation of areas that had no vegetation at the beginning.

The evolution of the use of this territory, which appears to be closely related to the increase of the surface coverage, is determined by the end of pasturing in the National Park grounds since its declaration into a National Park. This use did not end immediately when the Park was declared in 1954, but by the beginning of the 1960s it had completely ended, thus we can consider the first referenced date the starting point of a period without the pressure of livestock, which brings us to the present day.

The livestock tradition greatly affected the survival of some scrub plant specimens that were very appetizing to the goats that freely pastured throughout the plains and glens. This made it difficult for the sexual reproduction of scrub and favoured the asexual reproduction of specimens like the Teide white broom, which have a higher capacity of re-sprouting. In consequence, an absolute dominance of white broom in the summit scrublands has been registered since the beginning of the 20th Century, and this same specimen is still dominant in the majority of the sample territories studied.

However, the limiting effect that the herds had on vegetation is to a certain degree counteracted by the important amount of organic material left on the grounds by the constant presence of livestock. The continual presence of organic material had been valuable for soils where the extreme climate conditions made its incorporation into the soil very slow. In consequence, while there were goats, these animals made sure that new plants grew on bare grounds, thereby continuing the expansion of continuous patches of scrubland.

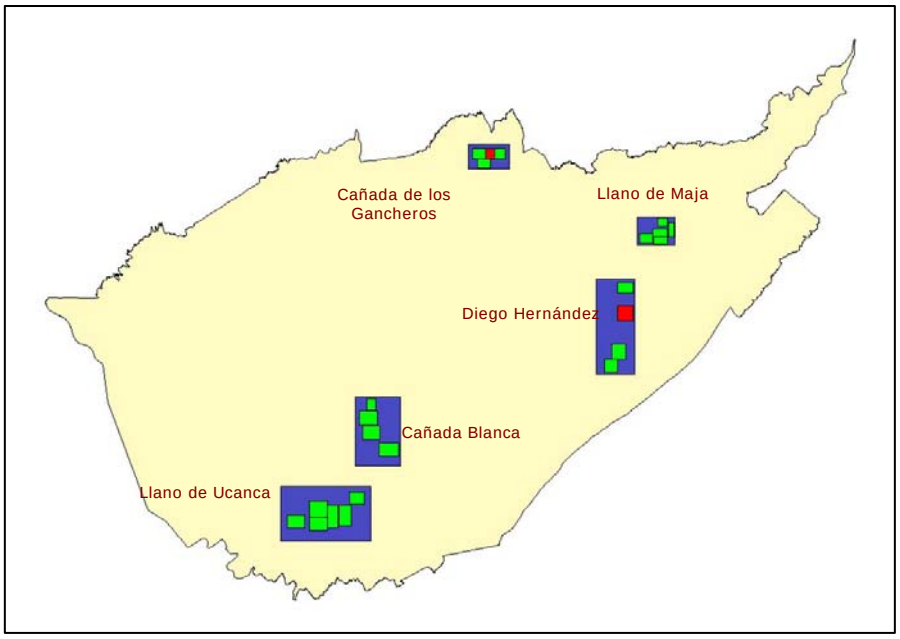
Once the pressure of the herds disappeared, the slow and constant de-composition and incorporation of the accumulated organic material on the surface of the ground became the key factor in its edaphic development. This process, which was not slowed down by other factors, has indeed had a lot to do with the increase of the surface coverage by scrubland species that were produced in the majority of the sample territories during the first reference date of our work.

Gathering firewood was another traditional activity that affected the formation of scrubland vegetation. This activity disappeared at the same time the National Park was declared. This practice favoured species that used asexual reproduction. To a certain degree, the continual pruning of these species increased their vegetation growth in detriment of its sexual reproduction. On the other hand, the extraction of firewood decreased the amount of organic material that could be acquired by some leptus which were in dire need of it. As a consequence of the exploitation of firewood, the expansion of vegetation was limited to the growth of just a few scrub patches formed by larger and stronger samples which had a favourable growth or re-sprouting or were capable of protecting plants of their own species as well as others.

**Qualitative summary of the changes that have occurred**

The qualitative evaluation was made after verifying how the scrub-rejuvenation process worked in our study. The scrubland rejuvenates in two phases: (1) an initial phase that drastically diminishes the surface covered by scrubland, (2) the following stage where the number of young plants increases, in sufficiently large numbers to assume that these new plants will be able to recover the lost surfaces. This second phase was verified in the second period that was studied.

Based on the scrub-rejuvenation process, the qualitative changes were located, denominating them “progressive” when they meant a step forward in the dynamics of the vegetation (without other factors that could impair it) and “regressive” when the opposite happened.




**Location of the qualitative changes in the vegetation coverage. The green colour represents a progressive evolution. The red colour represents a regressive evolution.**

To denominate the dynamics as regressive, we have distinguished between the mere loss of surface coverage and the loss accompanied by a clear increase in the number of new isolated individual specimens, many times in areas that were at first totally bare.

In many cases it was detected that very large specimens would disappear and even a large part of the continuous patches that were integrated by large individual specimens. The disappearance of a good number of large specimens has been detected not only in the sample territories that increased their surface coverage but also in others where it decreased, being much more evident in the latter of the two.

There are two species that are sufficiently abundant to reach a larger size and are very recognisable in the aerial photographs: the Teide white broom (Spartocytisus supranybius), and Labornum (Adenocarpus viscosus). These species are the principal components of the scrubland not only in the past but also in the present according to the documentation available. The Teide white broom is the most predominant species found in almost all of the sample territories that were studied, except for the two central zones of Cañada Blanca where Labornum has a slightly superior presence, although both species are abundant. An interesting observation was made: in the zones where Labornum is more abundant than white broom, it coincided with the space that was occupied by the repopulation of Pinus radiate found in Cañada Blanca. It would be interesting to verify if this domination was existed before the repopulation, or if it is a consequence of it.

The processes that point to the disappearance of the very large adult individuals take place almost exclusively in Teide White broom, whose base appears dry both individually and in groups in the most recent aerial photographs. This process also affects the Labornum situated in the sample territories of Cañada Blanca, where, along with White broom, adult individual specimens have died prematurely. This may be explained by the fact that for many years they were subjected to conditions that did not allow their sexual re-production and that only favoured the regeneration of its vegetation. During long periods of time these populations were regulated, and are now more homogeneous in their ages. As a consequence, the majority of the specimens in these populations reached old age simultaneously, at a time that the factors that conditioned their reproduction changed.

This variation in reproductive conditions also interacts with another aspect that also influences the qualitative analysis of the dynamics observed: the evolution over time of the specific composition of the scrubs. Analysis of the photographs verified that sexual reproduction has been very present in the last two dates of the diachronic analysis, which would mean to imply beforehand the stability of the future specific composition, once the herding activity was controlled. However, in the field samples recently collected we have observed that a specific composition is different when the scrubs are young than when they are adult. Indeed, it has been observed that the amount of plants belonging to a smaller-sized species is very high in those areas where they are colonising the spaces left by the death of the continuous patches and practically mono-specific to White broom. As a consequence, we should think that the future scrub formations will not maintain the same specific composition when those young specimens develop that have been detected in the more recent aerial images.

All of this makes us think that in general, the richness of species that are located in newly colonised areas or that occupy spaces left behind by dead or decrepit adult vegetation is much higher than the richness specific to the dense adult scrubs observed in the older images. With these observations we can affirm that today a larger number of specimens of rosalillo de cumbres (*Pterocephalus lasiospermus*), hierba pajonera (or Teide flixweed: *Descurainea bourgeauana*), and alhelí (or Canary Island wall flower: *Erysimum scoparium*) appear than supposedly appeared before. In summary, we can confirm that since its declaration, Teide National Park has incremented its floristic vascular bio-diversity.

# Fauna

## Vertebrate Fauna

Vertebrate fauna in Teide National Park is quite limited and not very striking. Beyond insects, which are abundant during the summer, visitors hardly see other animal life besides lizards and a few birds. It's the lack of large animals that is most surprising. But this is nothing new really; the modest vertebrate fauna in the Park is only a reflection of the general lack of fauna in Tenerife and in the Canary Archipelago in general. This is due its insularity and the way the islands were created.

The Canary Islands emerged from the depths of the Atlantic as the result of hundreds of thousands of eruptions piling volcanic material on top of volcanic material. Each island is an immense, mostly submerged edifice that is separate from its neighbour without there ever having been a connection between them (except for Lanzarote and Fuerteventura that share the same dado) or with the African continent, whose coast is only 110 km from the archipelago. This stretch of ocean is a significant barrier for the dispersion of animal species that do not fly, swim or that can't stand saltwater. Obviously birds and bats can reach such close islands without any problems, but for other land vertebrates it is much more difficult. It is supposed that the reptiles, shrews and giant rats (they are known only as fossils) that naturally populated the island millions of years ago must have arrived by sea, like stowaways on pieces of wood or other types of floating material. Snakes, for example, never overcame this barrier and the rest of the vertebrates that inhabit the island today (cats, hedgehogs, frogs, squirrels, rabbits, mouflons, etc.) have been introduced by man or involuntarily imported among the disorder of commodities. In fact, several of these species have settled in the Park and cause problems, as will be explained later.

Man has had a negative affect on the natural populations of certain species, especially large birds such as the black kite or "milano negro" (*Milvus milvus*) and the Egyptian vulture or "alimoche" (*Neophron percnopterus*), species that have disappeared from the insular fauna as consequence of the reduction in free range livestock and the use of pesticides in the last few decades. Despite this, the vertebrate fauna in the Park is well conserved. Only two bats, the "orejudo canario" and the Madeira bat are considered "vulnerable" species, but this situation is true of the entire archipelago and not particularly tied to the natural conditions of the Park that, although extreme, are well conserved.

The climatic regime of the island above 2,000 m is characterised by dryness, high ultraviolet radiation, sharp thermal changes during the day and low temperatures and snow throughout the winter. In addition, the substrate is very hard, there is almost a total lack of developed soil and the vegetation is simple and relatively uniform (for example, there are no forests). Between the climatic stress and the inhospitality of the terrain it is understandable that the vertebrate fauna of the Park is a relatively meagre sample of that of the rest of the island. Furthermore, there are hardly any aquatic environments in the Park, only small streams, which explains why there are no frogs or fish. Three of the five

reptiles that live on the island can be found in the Park, but only one of them is common. Of the 50 birds that nest in Tenerife, approximately 15 do so in the Park and not all of them regularly. Finally, among the native mammals there is only a timid presence of five bats since the rest of them (rabbit, mouflon, etc.) are all introduced species.

The total inventory of vertebrate fauna in the Park barely reaches 29 species, although it should be emphasised that several of them are endemic to the Canaries at the level of species (3) or subspecies (10). This particularity represents a special attraction for those interested in animals that are (to a certain degree) "exclusive".

### *Reptiles*

Reptiles are the most interesting group of vertebrates in the Canary Islands because the majority of them are endemic species and often exclusive to a single island. Lizard fossils have been measured at 1.6 m and in the last few years residual populations of some of these giant lizards (approximately 40 cm long) have been found in El Hierro, La Gomera and Tenerife that were thought to be extinct. As mentioned earlier, none of the frogs introduced to the Canaries are found in the Park, but its herpetological fauna includes a species of lizard, salamander and Tenerife skink. All three are endemic species.

The Canary lizard or "largato tizón" (*Gallotia galloti*), is probably the most emblematic animal of the Park due to its abundance and because it is unafraid to take advantage of food scraps left behind or offered to them by visitors (although feeding them is not recommended). It is found throughout the Park up to 3,300 m. The Park is chiefly populated by the Galloti sub-species, which is less colourful than the Eisentrauti sub-species found on the Anaga peninsula and meridian coast of the island, although some specimens have been found in the meridian margins of the Park. The males are much more robust than the females (up to 30-40 cm long), with bigger and darker heads, and the jowl is a flamboyant blue-violet if they are dominant or in heat. The females have bands of clear colours along the lengths of their bodies and are more slender.

The "perenquén" *Tarentola delalandii*, is an endemic gekkonid found in Tenerife and La Palma, where it is well known by the rural population because it usually enters into houses to hunt moths and other flying insects. It is not very common in Teide National Park. During the day it takes refuge under rocks, often holding onto the rock (upside down) thanks to its dilated toes that are adapted to climbing. Adults reach 15 cm and can weigh up to 10 gr and are distinguished by their greyish, rough and creased skin and large eyes (typical of nocturnal predators) with vertical pupils. The female lays an egg (sometimes two) that she buries in the soil.

The skink *Chalcides viridanus viridanus* is quite scarce in the Park compared with the rest of the island, but it can be seen occasionally sunning itself on rocks or among vegetation. Specimens have been found at altitudes as high as 2,800 m. Adults measure about 15 cm and they have a lustrous black colour with a brassy back mottled with clear spots and metallic-green tones in the tail; it's quite flashy. Its legs are short and it tucks them in when quickly slithering through the vegetation. They have 2-5 offspring that mainly feed on small insects. It obtains water from its prey and by licking the dew off of vegetation.

### *Birds*

Tenerife has more than 50 species of nesting birds and a large group of migratory birds (that spend the winter or just pass through) that arrive with greater or lesser regularity. The ornitho-fauna of Teide National Park has more than 20 species but only half of them habitually nest there and at least four species are only occasional. The sparrow-hawk or "gavilan" (*Accipiter nisus granti*) is a woodland predator that occasionally is found in the Park (for example, in the La Fortaleza area) the same as the common ratter or "aguililla" *Buteo buteo insularum*, whose territory is very extensive. Small groups of common turtle-doves or "tortola" (*Streptopelia turtur turtur*) have also been seen sporadically, as well as some hoopoes or "abubilla" (*Upupa epops*), whose insular population is reinforced by the arrival of winter migrants.

The most common species have been marked with asterisks in the following list. Obviously, this inventory doesn't include the Egyptian vulture (called "guirre" locally) or the black kite which have recently disappeared, as mentioned earlier.

The kestrel* or "cernícalo" (*Falco tinnunculus canariensis*) is the most common bird of prey on the island and habitual resident of the Park where it mates in the cornices of rocks or walls at a certain altitude. The white blotches on its excrement indicates the presence of its nests and it is easy to find the spindle-shaped waste (up to 5 cm) that it regurgitates with the remains of its prey that it could not digest at the foot of these places. Its diet consists of lizards, beetles and grasshoppers. The males are distinguished from the females because their heads and tails are a blue-grey. They lay from 2-4 eggs.

The small *Asio otus canariensis* owl is a nocturnal bird of prey common in the forests that surround the Park and some pairs regularly visit it (it is probable that they nest in the Park). During the day they sleep on tree branches (for example, El Portillo) or in cliff hollows (for example, La Fortaleza). They feed on mice, small birds and larger insects. It flies silently but lets out a sharp cry during mating season.

The crow (*Corvus corax tingitanus*) population has been drastically reduced in Tenerife. Currently only 15 pairs remain when in the past it was a common species (more free range livestock, more garbage, etc.). The remains of its large nests in some parts of the Circo and Roques de García wall prove that they once nested in its proximity; now it is seen infrequently.

The "perdiz moruno" or Barbary partridge* (*Alectoris barbara keonigi*) nests on the ground although it is not very common in the Park where it is prohibited to hunt it. This partridge is mostly brown splashed with white with a lead-grey throat and face. It walks upright and it almost always takes off to fly downwards, making a great deal of noise with the beating of its wings. This is considered to be a native species although it is possible that it was introduced.

The bravia *Columbia livia canariensis* pigeon mates in the deep fissures of the walls of the Circo de las Cañadas and of La Fortaleza, where they form more or less numerous groups. During the day it usually leaves the Park to feed in the surrounding pine forests, returning to its nests in the afternoon.

The grey shrike* or “alcaudón real” (*Lanius excubitor koenigi*) is medium-sized (24 cm) and has contrasting black and grey feathers. Its face is covered by a black mask and the beak curves to a point. It is a predator that sticks its prey (lizards, smaller birds) on thorns or sharp branches so that they can cut them to pieces at leisure. They are solitary and usually look down upon their prey from on top of rocks or retamas and the also nest in them.

The common blackbird or “mirlo” (*Turdus merula cabrerae*) is a robust bird (25 cm) that is not uncommon in the Park despite the scarcity of trees. The male is jet black with a yellow peak and ocular caruncle, while the female has a grey and splotchy abdomen. It looks for food in the ground, insects and worms, although it also eats fruit. During mating season it lets out a long and melodious call that can be heard at daybreak. They have not been seen to nest in the Park.

The blue chaffinch or “pinzón azul” (*Fringilla teydea teydea*) is a medium-sized bird (18 cm) common to the pine forests and endemic to Tenerife and Gran Canaria (ssp. *polatzeki*). The male is a beautiful lead-blue and the female brownish-grey. It has an exceptionally robust beak adapted to feeding on pine seeds. It inhabits the surrounding pine forests but is a regular visitor to the Park where it is not uncommon to see it close to water or bird drinkers.

Berthelot's Pipit* or “bisbita caminero” (*Anthus bertheloti bertheloti*) is the most common and extended bird in the Park. It has speckled feathers that are somewhat dull but not so the way it runs instead of hops like other birds. It hunts small invertebrates on the ground and it also builds its nest on the ground (sometimes next to a rock) although it is difficult to recognise. This bird lays 2-3 eggs and its nests have been detected in Pico Viejo where the retama vegetation stars to disappear due to the altitude. It is an eminently ground bird that rarely climbs plants.

The grey wagtail or “alpispa” (*Motacilla cinerea canariensis*) is found throughout the island visiting streams, springs and creeks. It has a characteristic weaving way of flying. The yellowish feathers on its abdomen and long tail (with two lateral feathers) are also characteristic. It also twitches its tails when it walks looking for insects to eat.

The unicoloured swift* or “vencejo unicolor” (*Apus unicolor unicolor*) nests in the cuts and is sedentary in the island, although there are populations that abandon the island.

The robin or “petirrojo” (*Erithacus rubecula superbus*) is easily recognised by its red breast and plump body (14 cm). When they are young their feathers are creamy brown and very blotchy. They hunt insects among the branches where they normally build their nests in the shape of a deep bowl with a narrow mouth. They lay three eggs; sometimes two.

The wild canary* or “canario silvestre” (*Serinus canaria*) is endemic to the Canary Islands, Madeira and the Azores. It has grey-green feathers that are jet black on the back and the abdomen, throat, face and aitchbone are yellowish, especially males in heat. This bird basically feeds on grains and flies in more or less numerous groups. They constantly enter and leave the Park in spring and summer but it is possible that they nest around El Portillo or at the foot of cliffs. Its long and harmonious song has made the canary one of the most famous songbirds in the world.

The Sardinian warbler or “curruca cabecinegra” (*Sylvia melanocephala leucogastra*) is distinguished from the spectacled warbler or “curruca tomillera” (*Sylvia conspicillata orbitalis*), also called “chirrera”, because its head is black instead of slate-grey, and the flashy red colour around its eyes. They are both common in the Parks retamares where they build their nests and hunt insects.

The blue tit* or “herrerillo” (*Parus caruleus teneriffae*), also called “cabistriado” for the black stripe that crosses its white face at the eyes, also has a black head, blue back and yellow abdomen. It is small (11-12 cm), very active and acrobatic when it looks for insects in the vegetation (often upside down). It builds its nests in the hollows of trees, rocks or even the stones in the wall of the Visitor Centre.

The Canary Island chiffchaff* or “mosquitero” (*Phylloscopus collybita canariensis*) is common and abundant in all of the islands as well as the Park. It is a small bird (10 cm) with an olive-brown back and cream coloured abdomen. It is found in shrubs and plants hopping continually from one branch to another in search of insects monotonously repeating “cheep”. Its nests are globular and oven-shaped, from which their local name of “hornero” (baker) is derived.

***Mammals***

Since bats are nocturnal insect hunters, mostly moths and mosquitoes, they suffer greatly from the use of pesticides as well as any change in their habitat. This is why insular bat populations decreased greatly in the 1950s and only now have shown recuperation. Five of the six species known on the island are found in Teide National Park; moreover, they are the only native mammals.

During the summer there are many nocturnal insects in the Park and the lack of wind greatly favours the hunting activities of these small flying vertebrates. There are also a number of hollows and crevices in the lava flows, volcanic tubes and caldera walls where they can find refuge. It seems that at these heights mating seasons occurs earlier, in May, and during the winter the bats hibernate or move to lower altitudes. Some species can be seen at daybreak, others hunting near the lights of the parador (hotel) or the houses in El Portillo, and nearly all of them go to the pools to drink water or hunt mosquitoes in their proximity.

The Madeira bat (*Pipistrellus maderensis*) endemic to Madeira and the Canaries, is very common on the island and it is not uncommon to see it hunting along with Leisler’s bat or “nóctulo pequeño” (Nyctalus leisleri) the most common species in the Park. This habitat is surprising for the “nóctulo”, because in other areas it lives close to forests.

The “orjejudo canario” (*Plecotus teneriffae*) is endemic to the Canary Islands and classified as a vulnerable species although its populations on the island and in the Park are in a good state. It is cave-dwelling and rarely goes near light. It mates in holes and crevices in the roof of volcanic tubes and is easy to recognise by its enormous ears.

The long-tailed bat (*Tadarida taenotis*) probably finds refuge in the large cuts that surround the Circo de Las Cañadas or en the cliffs of Guajara. It is large and its thick tail

makes up practically half its length. It is seen far less than the other species, the same as the mountain bat (*Pipistrellus savii*) who has only been captured very few times.

## Invertebrate fauna

In any natural or semi-natural area, invertebrates (measured in terms of species, individuals or biomass) are generally the most numerous group and play a fundamental role in the different facets of the ecosystem such as pollination, dispersion or trophic relationships, among others. Teide National Park is no exception: the Park has an extraordinarily rich and diverse fauna. However, traditionally the natural values of the Park that have been emphasised are its geology, landscape and botany, the richness of its entomo-fauna has rarely been acknowledged. All of Tenerife's summit scrub is found in the National Park, therefore this habitat and the invertebrates that populate it are very representative of the natural space, enhancing its value from the perspective of science and conservation.

Since the climatic conditions on the summit of the island are adverse during most of the year (dryness, irregular rainfall, sharp temperature changes, occasional snow, wind, intense radiation, etc.) the phenology of the majority of the invertebrates is seasonal. There is a demographic explosion of insects in the Park with the arrival of spring when the plants are in bloom; this growth lasts until well into the summer when resources become scarcer and meteorological conditions are no longer optimal. The reigning climatic stress forces species to develop morphological and physiological adaptations that allow them to survive in these conditions, favouring specialisation processes and giving rise to numerous species that are exclusive to the summit region.

In fact, part of the species in the Park genuinely belong to the high-mountain ecosystem and live exclusively in it. This is a result of the "double insularity" phenomenon: Tenerife's isolation as an ocean island is compounded by the ecological isolation of this bioclimatic habitat.

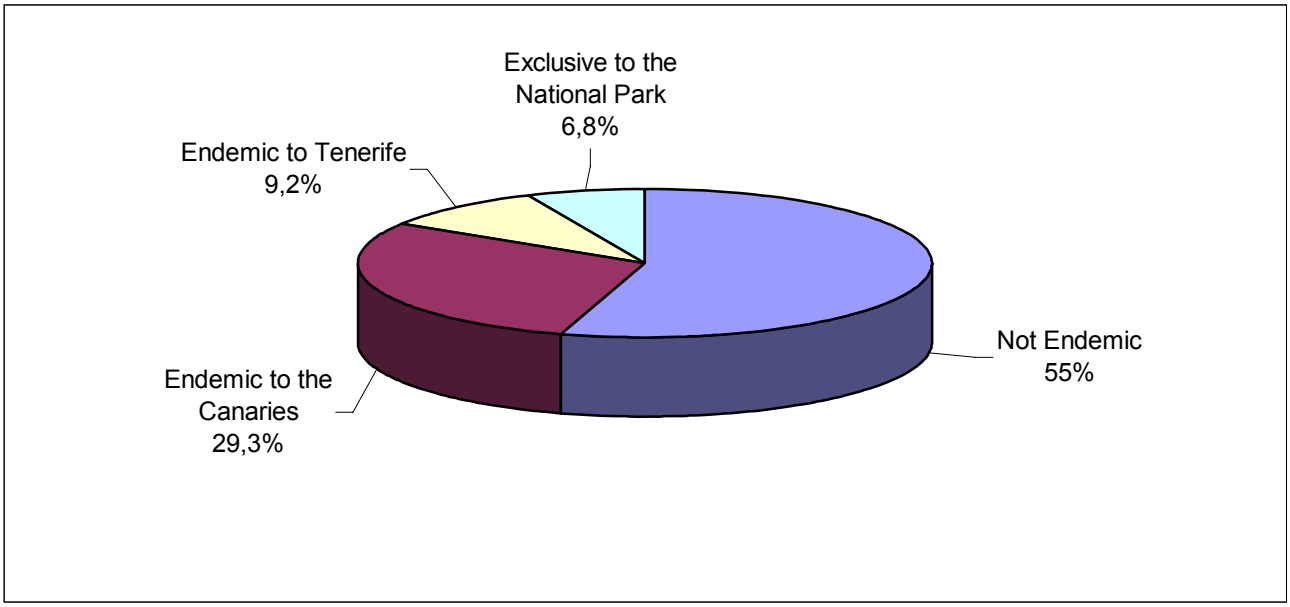
However, a large part of the invertebrates that live in the Park also extend to other areas of Tenerife. Many are seen in pine forests at high altitudes where the climatic conditions are similar to those of Las Cañadas. They are especially found in pine trees on the southern slope because they are dryer, less dense and more similar to summit scrub than those on the northern slope. A third group of invertebrates habitually live in open, sunny and dry environments, at any altitude, and are well distributed throughout Tenerife, except in woodlands and areas with more moisture. Finally, there is a group of animals that are typically found in the Park and also on the island's summits.

According to a recent study on the national Park's invertebrate fauna there are close to 1,000 species living in this natural space. But it's likely that the real number is quite a bit higher: invertebrates are very small animals often living in hidden habitats with a highly variable phenology. Moreover, identification of animal species belonging to complex taxonomies has not yet been carried out. In any case, 1,000 species is a high number if we take into consideration that there are just over 7,000 known species of invertebrates in

the entire archipelago. In other words, one out of every seven Canarian species lives in the National Park, a fantastic representation of the fauna in the islands.

| Number of invertebrate species found in Teide National Park organised by taxonomic groups | | |
|---|---|---|
| ***Oligochaeta*** | ***Earthworms*** | ***3*** |
| ***Molluscs*** | ***Snails and slugs*** | ***6*** |
| ***Crustacean*** | ***Moisture cochineals*** | ***3*** |
| | ***Others (copepods and ostracods)*** | ***4*** |
| ***Myriapods*** | ***Centipedes*** | ***13*** |
| | ***Millipedes*** | ***6*** |
| | ***Others*** | ***3*** |
| ***Arachnids*** | ***Spiders*** | ***86*** |
| | ***Acarus*** | ***5*** |
| | ***Psuedoscorpions*** | ***8*** |
| | ***Opiliones*** | ***2*** |
| | ***Solifugae*** | ***1*** |
| ***HEXAPODS*** | | |
| ***Collembolas*** | *Springtails* | *14* |
| ***Thysanuras*** | *Silverfish and similar* | *4* |
| ***Ephemerons*** | *Ephemerons* | *2* |
| ***Odonata*** | *Dragonflies* | *3* |
| ***Mantodea*** | *Mantids* | *3* |
| ***Blattodea*** | *Cockroaches* | *1* |
| ***Orthoptera*** | *Grasshoppers and crickets* | *9* |
| ***Dermoptera*** | *Earwigs* | *6* |
| ***Psocoptera*** | *Booklice and similar* | *13* |
| ***Mallophagas*** | *Bird lice* | *3* |
| ***Thysanoptera*** | *Thrips* | *19* |
| ***Hemiptera*** | *Bedbugs, whiteflies, plant lice, cochineals and similar* | *167* |
| ***Planipennia*** | *Antlions and chrysopas* | *12* |
| ***Coleoptera*** | *Beetles, lady bugs, woodworms, etc.* | *195* |
| ***Strepsiptera*** | *Twisted wing parasites* | *1* |
| ***Trichoptera*** | *Caddis flies* | *3* |
| ***Lepidoptera*** | *Day and night butterflies (moths, etc.)* | *73* |
| ***Diptera*** | *Flies, mosquitoes and similar* | *163* |
| ***Hymenoptera*** | *Wasps, bees, ants and similar* | *105* |

A large part of these invertebrates are endemic of the Canaries, that is, they live exclusively in the archipelago. The percentage of species endemic either specifically to Tenerife or to the archipelago in general is greater than 40%. This is in accordance with the large proportion of endemic species that exist in the majority of the natural and sub-natural Canarian ecosystems and also a generic characteristic of ocean-island biota.




Almost all of the groups of fauna that are found in Tenerife are represented in the Park, although not in equal proportions because the absence of certain habitats or the climatic conditions of the high mountain limit some of them. This occurs with molluscs (snails and slugs), earthworms and land crustaceans because they are less able to tolerate aridity. The percentage of endemic species differs between taxonomic groups depending on each group's intrinsic tendency to change genetically or its dispersion capacity. Therefore, certain flying insects like dragonflies, butterflies, flies, bees or wasps have a lower percentage of endemic species (especially local endemics) than other less-mobile groups.

**Invertebrate species that are exclusive to Tenerife summit scrub**

**Molluscs**
*Xerotricha nubivaga Mabille*

**Pseudoscorpions**
*Paraliochthonius tenebrarum Mahnert*
*Pseudorhacochelifer schurmanni Beier*

**Acarus**
*Ramusella translamellata Subías*

**Araneida**
*Apostenus n, sp.*
*Argema n. sp.*
*Coscinida n. sp.*
*Dysdera gollumi Ribera & Arnedo*
*Ebo tenerifensis n. sp.*
*Emblyna teideensis Wunderlich*
*Filistata teideensis Wunderlich*
*Lathys teideensis Wunderlich*
*Oecobius fortaleza Wunderlich*
*Oecobius sombrero Wunderlich*
*Pholcus roquensis Wunderlich*
*Scotognapha teideensis Wunderlich*
*Walckenaeria teideensis Wunderlich*
*Walckenaeria cavernicola Wunderlich*
*Zelotes n. sp.*
*Zelotes teydei Schmidt*
*Zimirina cineris Cooke*

**Myriapod**
*Lithobius n. sp.*

**Collembola**
*Folsomides supranubius Fjellberg*

**Orthoptera**
*Sphingonotus willemsei Mistshenko*

**Hemiptera**
*Arytainilla nubivaga (Loginova)*
*Asianidia alticola (Lindberg)*
*Compsidolon cytisi (Lindberg)*
*Compsidolon galbanus Gyllensvärd*
*Compsidolon n. sp. prope parviceps (Wagner)*
*Dictyonota teydensis Lindberg*
*Dicyphus n. sp.*
*Microtomidens n. sp.*
*Quadraspidiotus arroyoi Balachowsky*
*Tachycixius n. sp.*

**Planipennia**
*Helicoconis n. sp.*
*Parasemidalis canariensis Meinander*

**Coleoptera**
*Agathidium n. sp.*
*Anthaxia fernandezi Cobos*
*Apteranopsis canariensis Oromí & Martín*
*Atomaria fasciata pilosula Wollaston*
*Cionus griseus Lindberg*
*Corticaria alticola Lindberg*
*Cryptocephalus nubigena Franz*
*Euplectus monticola Wollaston*
*Hegeter lateralis Brullé*
*Hegeter tenuipunctatus Brullé*
*Laparocerus crassifrons Wollaston*
*Laparocerus freyi Uyttenboogaart*
*Liparthrum n. sp.*
*Malthinus minimus Palm*
*Melyrosoma hirtum Wollaston*
*Nesotes altivagans Wollaston*
*Stagetus thurepalmi Israelson*
*Trichoferus roridus Brullé*

**Lepidoptera**
*Alucita canariensis Scholz & Jackh*

**Diptera**
*Exechiopsis n. sp.*
*Stichopogon canariensis Becker*

**Hymenoptera**
*Lissonotidea ornatula Hellén*
*Omalus n. sp.*
*Temelucha tenerifensis Sedivy*

***Spatial distribution of the fauna and principal habitats***

**Scrublands**

The summit vegetation of Tenerife blooms explosively during the spring. The majority of the plants that live in the Park (especially the retama and the codeso which are particularly dominant) have very dense and numerous inflorescences that offer insects a broad spectrum of flowers with different sizes, colours and smells. This plethora of resources attracts hordes of insects that come to feed on their pollen or nectar, thereby unconsciously playing the role of pollinators. Among these are numerous thrips, small beetles, butterflies and especially many species of flies, bees and wasps.

The most common diptera are syrphids and bombycids, two fly families with larger-sized species that are found most frequently on flowers. There are fifteen species of syrphids in the Park that are found abundantly on all kinds of flowers. A characteristic of this group is that the majority of its species develop mimetic colourations to simulate bees or wasps in order to confuse predators. Good examples are Scaeva albomaculata and Eristalis tenax, two of the most common syrphids in the National Park. The bombycids are also very distinctive because their bodies are densely covered with hair and they have a long, very characteristic proboscis that allows them to reach the nectar of flowers. At least eleven species are found in the Park, among which Anastoechus latifrons, a beautiful species endemic of the Canaries, stands out. Another diptera family commonly found among the flowers are tachinids, whose larvae are, like that of other bombycids, endoparasites of grasshoppers, butterflies and other species. Other common species are Pseudogonia fasciata, Synamphicheta tricincta, Peletería ruficornia, etc., which gives an idea of the abundance of potential hosts.

There are also hymenoptera that are parasites of other insects while in their larva phase; good examples are the ichneumonides, whose larvae mature by feeding on butterfly caterpillars. Two of these are exclusive to the summits of Tenerife: Temelucha tenerifensis and Lissonotidea ornatula. Bees and wasps of other families are also abundant in the flowers of the Park, and among these there are various species that are endemic of the island or the archipelago. One of the most common species is the honey bee Apis mellifera, although its abundance isn't natural; every year during spring and summer, migrant bee-keepers (apiculturists) transport their hives to the Park, attracted by the high-quality honey that is produced from the flowers of the retama.

Small arthropod predators also go to the flowers to partake in the bounty of potential prey. Common predators are spiders from the thomisids family such as Xysticus verneaui or Thomisus onustus that wait for their victims perfectly camouflaged among the flowers. Other predators capture their prey in the air thanks to their great capacity to fly and the greater development of their vision. This is the case of the "killer flies" like Stichopogon canariensis, one of the few diptera that are exclusive to the Park or the more ubiquitous Promachus vexator, that grows up to 3 cm in length. And it is also the case of dragonflies like Anax imperator, that are able to travel great distances far from water; a feat that can be observed everywhere in the National Park, even in the summits of Mt. Teide.

In addition to the invertebrates that strictly feed on flowers, many invertebrates live on other vegetation. Leaf, stem, bulb and seed devourers as well as sapsuckers and deadwood decomposers, etc. can be found along with the endless number of small predators associated with them. The leguminous shrubs that dominate the vegetation are usually rich in entomo-fauna and in many cases there is a high specificity between insect and plant.

**Invertebrates specific to plants**

| *Taxonomic group* | *Species* | *Host plant* |
|---|---|---|
| *Psocoptera* | ***Liposcelis brunnea*** | ***Canarian cedar (Juniperus cedrus)*** |
| *Thysanoptera* | ***Odontothrips retamae*** | **Codeso de cumbre *(Adenocarpus viscosus)***<br>**Retama *(Spartocytisus supranubius)*** |
| *Hemiptera* | ***Cyphostethus tristriatus***<br>***Dyctila indígena***<br>***Eurydema lundbladi***<br>***Notochylus damryi***<br>***Oxycaremus pallens***<br>***Tingis canariensis*** | ***Canarian cedar (Juniperus cedrus)***<br>**Taginaste *(Echium spp.)***<br>**Hierba pajonera *(Descurainia bourgeauana)***<br>**Alhelí del Teide *(Erysimum scoparium)***<br>***Canarian cedar (Juniperus cedrus)***<br>**Cabezón (*Cheirolophus teydis)***<br>**Malpica *(Carlina xeranthemoides)*** |
| *Coleoptera* | ***Acmaeodrea cisti***<br>***Anthaxia fernandezi***<br>***Cionus griseus***<br>***Cyphocleonus armitagei***<br>***Dicladispa occator***<br>***Liparthrum n. sp.***<br>***Trichoferus roridus*** | **Codeso de cumbre *(Adenocarpus viscosus)***<br>**Retama (*Spartocytisus supranubius*)**<br>**Codeso de cumbre (*Adenocarpus viscosus*)**<br>**Fistulera (*Scrophularia glabrata*)**<br>**Cabezón (*Cheirolophus teydis*)**<br>**Cardo de plata (*Stemmacantha cynaroides*)**<br>**Margarita del Teide (*Argyranthemum teneriffae*)**<br>**Jaras (*Cistus spp.*)**<br>**Cañaheja (*Ferula linkii*)**<br>**Codeso de cumbre (*Adenocarpus viscosus*)** |
| *Lepidoptera* | ***Alucita canariensis***<br>***Calliteara fortunata***<br>***Cucullia canariensis***<br>***Cyclyrius webbianus***<br>***Euchloe belemia*** | **Hierba conejera (*Pterocephalus lasiospermus*)**<br>**Retama (*Spartocytisus supranubius*)**<br>***Canarian Pine (Pinus canariensis)***<br>**Fistulera (*Scrophularia glabrata*)**<br>**Codeso de cumbre (*Adenocarpus viscosus*)**<br>**Hierba pajonera (*Descurainia bourgeauana)*** |

Among the leaf and stem devourers there are butterfly caterpillars, both the larvae of day butterflies and those of moths. Up to 17 species of day butterflies have been observed although not all of them live out their entire life cycle in this area. *Cyclyrius webbianus*, a small and abundant lycaenid stands out and is particularly interesting due to its paleoendemic condition (its closest relative live in Mauritius Island). Its caterpillars live

principally on the codeso, while the adult is much less selective as is the norm among butterflies. Another interesting species is the *Euchloe belemia*: despite not being endemic (it exists on other islands), in Tenerife it lives almost exclusively on the summit, where it is relatively abundant. Its larvae feed on hierba pajonera.

Night-flying butterflies are also quite common, especially during the summer months. Some species have larvae that are very selective about the plants that they will feed on. This is the case of the locally endemic *Alucita canariensis*, whose caterpillars live basically on hierba conejera; however, it is more common that they are polyphagian. The *Macroglossum stellatarum* is common particularly during sunset or daybreak and has a well known ability to feed without alighting on flowers thanks to its long proboscis and its ability to beat its wings at a high velocity. It is common to find the "pine lizard" (*Calliteara fortunate*) on the retamas; this species is a caterpillar that is easy to recognise because of its long hairs and flamboyant colour. Although it feeds on retama, escobón and other plants, it occasionally causes plagues in the pine trees because pine needles seem to be its favourite food.

Other commonly found herbivores include grasshoppers. From the start of spring the nymphs of some species appear but summer produces a demographic explosion of adults. The most abundant are Sphingonotus willemsei, another species exclusive to the summits of Tenerife, and *Calliptamus plebeius* that is also widely distributed. A more uncommon but interesting grasshopper endemic to the Canaries is *Arminda brunneri*, which has no wings and is more apt for moist areas at lower altitudes but that penetrate some areas of the Park.

The most common sapsuckers are cochineals, whiteflies, plant lice, bedbugs and other similar species that all are encompassed by the hemiptera group. They have developed a stiletto-shaped mouth apparatus that allows them to perforate leaves and stems and suck the vegetal juices, although other species have acquired haemophilic or carnivorous habits, using this same stiletto. Among bedbugs there are some invertebrates that are more specific in the plants that they will feed on: for example, *Cyphostethus tristriatus* lives on a species of *Juniperus*, both in the Canaries and in other Palaearctic regions; *Dyctila indigena* is an endemic species of the Macaronesian region that is normally found on tajinastes; and *Tingis canariensis* has been captured exclusively on *Carlina xeranthemoides*. The abundant harlequin bedbug *Eurydema lundblandi* is found on hierba pajonera and alhelí del Teide accompanied by another common bedbug: *Brachycarenus tigrinus*.

Many of the plant lice that live in the lower reaches (some of them causing crop plagues) have been observed in Las Cañadas; they aren't resident species of this region, which gives an idea of the capacity of the wind to carry these tiny animals to the high mountain. An exception is the only aphid endemic to the Canary Islands, *Acyrtosiphon supranubius*, which lives exclusively on retama both here and on the summits of La Palma. Other frequently found homopetera from other families are *Hyalesthes angustulus* and various polyphagian species of *Cyphopterum*, *Asianidia* and *Arytainilla*.

There are also diverse predators living in the vegetation: spiders, beetles, bedbugs, etc. Among the most interesting are the endemic species *Ameles gracilis* and *Pseudoyersinia teydeana*, both of the mantid group, who capture their prey with the help of their forelegs that have been modified for this purpose.

Many invertebrates live in decomposing wood. They live exclusively in this environment and occasionally they only live in a specific plant, although this is uncommon. The most unique trophic guild is that of xylophages who feed on wood thanks to the symbiotic micro-organisms that live in their digestive system that are capable of digesting cellulose. Their larvae usually have this capacity, while after eclosion adults develop other habits. Such is the case of the *Acmaeodera cinti* and *Anthaxia fernandezi*, two endemic beetles whose larvae are xylophagous of retama, codeso, escobón and other species, but as adults they typically feed on flowers. Others live under bark, in galleries that they themselves perforate: the most common species is *Liparthrum nigrescens*, and like the previous two species it is endemic to the islands. But without a doubt the most peculiar xylophagous insect in the Park is the *Trichoferus roridus*. Its larvae are extremely abundant and bore large galleries in the deadwood of various species, principally the codeso; the adults emerge to the surface after eclosion leaving characteristic perforations in the trunks.

A particular case is the “daisy grub” *Cyphocleonus armitagei*, whose larvae feed on the dry stems of the margaza del Teide. The adult is usually found on or under flowers and is very common throughout the National Park. Although it has occasionally been observed on the cardo de plata and cabezón, its preference for the summit daisy seems clear.

Other species with different diets also live tied to wood: some eat debris; others feed on all kinds of decomposing organic material; another group of species feeds on the mould that grows on wood; and finally, there are invertebrates that live off of all of the above.

There are also many other species not exclusive to this environment but that feed on decomposing wood, attracted to the moisture or simply because it serves as a refuge.

The fauna moving through the earth is also very rich. The species change in different zones depending on the vegetation and its density, the nature of the substrate and the climatic conditions. In general, the soil fauna is richer in areas with dense and diverse vegetation, with evolved soils and in zones facing north, where the majority of the edaphic and environmental moisture of the island is found.

Like in many areas, nocturnal epedaphic invertebrates remain hidden during the day under rocks or in any place that serves as a refuge. A thick mould usually forms under codesos, retamas and other shrubs that protect many of these invertebrates and also hosts a rich moisture fauna.

The dominant soil fauna are tenebrionoidea: beetles that are totally adapted to living in arid environments. Among these the *Pimelia ascendens* stands out, another invertebrate that because of its size and abundance can be considered symbolic of Teide National Park, although it is not exclusive to the Park.

The hegeter is also omnipresent in the Park, with two species exclusively found in the summits of Tenerife: *H. laterales* and *H. tenuipunctatus.* Both coexist in a large part of the Park but the former lives in a higher range of altitudes and, in fact, it is the only beetle that lives in the Pilón and in the crater of Mt. Teide. Other particularly abundant beetles in

Las Cañadas include the following: the carabids *Calathus ascendens* and *Dicrodontus brunneus* which are typically predators; *Corticaria altic*ola, which is exclusive to the high areas; *Laparocerus canariensis*; and *Cardiophorus globulicollis* are other particularly abundant beetles in Las Cañadas.

Many non-sedentary spiders wander through the soil looking for prey. Some abundant species endemic to the islands include *Dysdera macra*, *Zodarion nesiotes* and *Haplodrassus canariensis* and others exclusive to the high zone, as is normally indicated in their names: *Filistata teideensis*, *Oecobius fortaleza* (that despite its name is found in many parts of the National Park), *Zelotes teydei*, etc.

In addition to spiders and beetles many other invertebrates live in the soil, such as endemic millipedes of the *Dolichoiulus genus*; the tiny snail *Xerotricha nubivaga*, that is found in moist areas; the endemic earwig *Guanchia uxoris*, which is easy to recognise by the uneven length of its pincers; and an endless number of small arthropods like acarus, silverfish, collembolas, centipedes, psocoptera, etc.

**Pine forests**

Pine forests are a marginal habitat of the Park since they only cover a small area on its edges. In some cases these are plantations established in area that could potentially be populated by the summit scrub, while others are very open pine forests in transition with the retamares. Both kinds are very different than the typical structure of Canarian pine forests, with a different type of underbrush.

However, this does not mean that there are no invertebrates typical of this habitat to be found. The *Brachyderes sculpturatus rugatus* grub is one of them and, like in other species, it lives closely attached to the pine; it is usually found in its branches feeding on the needles or hidden in the creases of the bark.

**Lavic communities and aeolian ecosystems**

A large part of the area of Teide National Park is made up of recent and sub-recent lavic material where there is no vegetation or sparse vegetation. Since this land is in the initial phases of ecological succession its primary productivity is quite low. A few species of invertebrates live in this apparently sterile environment, even when the vegetation doesn't generate sufficient energetic resources. What occurs is that the air continuously provides organic material to sustain the ecosystem, known as an aeolian ecosystem.

The majority of these lavic species are small carnivores or saprofages that feed on all kinds of organic material deposited by the wind, whether vegetal (pollen, seeds, small vegetal fragments, etc.) or animal (small cadavers, arthropods in dispersion phase, etc.). The invertebrates of this habitat are generally nocturnal and during the day hide in the deepest crevices, fleeing the intense radiation and the high temperatures. The spider *Aelurillus lucasi* is one of the few species found in this habitat that adventures out to look for prey during the day, although it avoids the time of day with maximum insolation.

But perhaps the most unique species in the habitat is the earwig *Anatelia canariensis.* It doesn't live exclusively in the lava flows but it does seem to prefer this environment, to which it is perfectly adapted. Occasionally it has also been captured in the interior of superficial volcanic caves that they enter through cracks in the subsoil, but its typical habitat is the most recent lava flows in early stages of colonisation. It is only known in the Narices del Teide lava flow, although it probably lives in the majority of the lava flows that cover Las Cañadas.

Lava flows aren't the only aeolian ecosystems but they drtbr as a functional model common to all sparse-vegetation colonisation ecosystems, whatever the cause for their limitations. Examples of this are river basins covered with "pumita" (cañada), the lapilli fields and even the highest summits of the peak where meteorological conditions limit the growth of vegetation. Various species live in the Pilón and the Teide's crater by feeding on small insects and arachnids that arrive there thanks to the constant rise of hot air. Among these residents some predators and opportunistic saprofages are abundant, such as the opillion *Bunochelis spinifera*, a species typical of aeolian ecosystems. At this altitude the *Hegeter laterales* beetle is also present, one of the species best adapted to low temperatures as has been revealed in controlled laboratory conditions.

**Hydrophilic communities and water beetles**

Waterway ecosystems are rare in Teide National Park given the dryness of its summits. In years when it snows intensely large pools appear in the basins located at the foot of the walls of the Circo de las Las Cañadas, but they are temporary and only a few aquatic invertebrates live around them. There are also diverse springs that generate stable aquatic animal communities. The only permanent waterway is the Riachuelo, a unique case in the islands at this altitude; in any case, its volume is partially fed by the two water galleries located in the upper part of the gorge.

In the pools of this small stream there is an abundance of larvae from numerous insects that are aquatic animals during part of their biological cycle. There are ephemeron larvae (*Baetis canariensis*, *Cloeon dipterum*, etc.) that have this name because of the short lives of the adults; also *Mesophylax aspersus*, whose larvae are very noticeable because of their size and sheathes, constructed from rocks and small particles; and diptera larvae (mosquitoes, etc.). Diverse species of aquatic bedbugs are also frequent, such as *Gerris thoracicus*, the back-swimmers *Notonecta canariensis* and *Corixa affinis*. Among beetles *Gyrinus dejeani* is abundant, a species that lives on the surface feeding on small animals trapped by the surface tension; and other diving species such as the dytiscidae *Agabus spp.* and *Nebrioporus canariensis*. Among the mosses and algae that grow in these environments the following species are frequently found: the beetle *Ochthebius quadrifoveolatus*, the bedug *Saldula pallipes* and larvae of *Tinotes canariensis*, a tricoptero endemic to this microhabitat.

The majority of these species are common or widely distributed invertebrates in waterways and other areas of the island; none of these species are known to be exclusive to the Park. The climatic rigours and the peculiarities of these kinds of pools favour the presence of eurioic species, common in lowland water sources that are characterised (like here) by high solar radiation and a meagre coverage of hydrophilic vegetation.

## Cave-dwelling communities

The youth of almost all of the land in the Park makes it possible for numerous subterranean cavities to exist where very peculiar fauna can be found. In reality, they are species that live in the subsoil of the entire area, in the dense network of crevices, but the caves represent the only access to this hypogea habitat.

Within the caves there is absolute darkness, elevated moisture and climatic fluctuations on the exterior are not noticeable, so the temperature is relatively constant. The primary productivity is null and there are no energetic resources other than that provided by the roots that reach the subsoil or those that arrive through crevices via water percolation.

These peculiar environmental conditions require that the species who live there adapt morphologically and physiologically. There are three categories of cave-dwelling animals that are grouped according to their level of adaptation and biology: the species that arrive in the caves by accident (trogloxenes), those that show a certain affinity for them, but that can also live in the exterior (troglophiles) and those that permanently and exclusively live within caves (trogolobites). The trogolobites are without a doubt the most interesting because they have such a high level of specialisation that they cannot survive for long outside of this environment. The most noticeable morphological adaptations are extreme lack of pigmentation, the absence or reduction of the eyes, an increased development of other sensory organs and the stylisation of the body and appendages; and as a physiological adaptation they have a much reduced metabolism, a great capacity to fast and notable longevity.

There are many subterranean cavities in the Park, but few of them have the ideal conditions for this fauna. The most interesting from this point of view is the Cueva de Los Roques, named for its proximity to Roques de García. It is extraordinarily rich in cave-dwelling fauna: despite only being 900 m long it has 20 species of trogolobites, some of whom have only been found in this cave. This gives an idea of the faunal importance of this cave, which constitutes an excellent sample of a well conserved volcanic tube. Among other species the cave-dwelling centipede *Dolichoiulus ypsilon* can be found, a moisture cochineal called *Venecillo tenerifensis*, and various species of trogolobite spiders, among them *Dysdera gollumi*, a species known only to this volcanic tube. There are also beetles that have adapted to the hypogene environment such as *Apteranopsis canarienses, Wolltinerfia spp*. and *Domene vulcanica*. This last is one of the most extreme cases of troglomorphism among beetles: in addition to lack of pigmentation, its body and appendages are remarkably more stylised than those of other beetles. In the proximity of the entrance, and in general in shadowy and moist hollows of the area, it is easy to find the spider *Pholcus roquensi*, another species that is only known in this area.

In the north-eastern sector, at the foot of Pico Viejo, there is a system of cavities known as Cuevas Negras, where some species of trogolobites have also been collected. This is a series of six caves and two aligned subaerial channels that geomorphologically form part of the same discharge channel, although currently there is no subterranean connection between them. Despite the fact that the six cavities are short and there is absolute darkness in only a few deep enclaves, the relative humidity in the interior is maintained close to saturation. This makes it possible for trogolobite species to exist, even

in a penumbral area, something unusual in other caves in the Canaries. Four trogolobites are known that are also found in the Cueva de Los Roque and presumably in the entire subsoil of the National Park: the cockroach *Loboptera sp.*, the pseudoscorpion *Paraliochthonius tenebrarum* and the beetles *Wolltinerfia martini* and *Apteranopsis canariensis*. The last beetle is particularly abundant, which is still rare for a species adapted to living in caves.

# Habitats

Teide National Park holds a considerable number of habitats that are associated with different communities of plants and fauna that are of crucial importance to the conservation of biodiversity. This fact is defined in Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora in Europe. According to this directive Teide National Park has eleven Habitats of Community Interest that occupy 75% of its area.

The following is a description of these habitats, grouped in the corresponding units and superior sub-units, using the nomenclature and numeration they were attributed by the directive.

### *4. Temperate Zone Heath and Scrub*

**4090 primary and secondary Mediterranean and oro-Mediterranean scrubs frequently dominated by *genisteas***

These are the highland scrub found on mountains with Mediterranean climates above the timberline that are strongly adapted to high-mountain conditions and summer droughts.

- Summit “retamar” (*Spartocytisetum nubigeni*)

  When mature, this habitat is dominated by retamas (*Spartocytisus supranubius*) and codesos (*Adenocarpus viscosus*), the main species of the dry mesophytic supra-oromediterranean series found on the island of Tenerife. Despite the ability of these species to colonise, the formation of well-structured cambisols or *rankerform* soil takes thousands of years in the rainy conditions that dominate the summits that are so dry during the summer; therefore, the retamas are sparser in the badlands and lapilli created by historic eruptions. The *Echium wildpreti* community that thrives in the small reservoirs of the temporary waterways that are carved in the relief after snow fusion or during storms in the winter or autumn is particularly prominent.

- “Alhelí” and “rosalito de cumbre” (*Erysimo scopari-Pterocephaletum lasiospermi*) community

  This is a habitat dominated by chamaephytes, mainly *Pterocephalus lasiospermus*, *Erysimum scoparium*, *Descurainia bourgeauana* and *Scrophularia glabrata*. These species constitute either the first colonisation of the rocky soil or the first stage of substitution due to the decapitation of the terrain, both of retamars (*Spartocytisetum nubigeni*) and escobonales and mesocanarian pines (*Sideritido-Pinetum canariensis*). These chamaephyte communities are very frequent in all of the alluvia today converted in semi-mobile stony ground due to the alteration of the milieu.

## *8. Rocky Habitats*

### 8310 Caves not used for tourism

This is a habitat made up of volcanic tubes and large and small caves, where the absence or precarious amount of light conditions a particular biota. They especially hold cave-dwelling species of fauna that are highly specialised or endemic. The diversity of the flora is relatively poor, with only algae, bryophytes, lichens and, to a lesser degree, spermatophytes that grow in the entrances of the cavities, particularly species that require a humid environment like some bracken. The fauna is extraordinarily interesting because of the great variety of invertebrates, some of which have an extremely local distribution, and also because they constitute an elemental habitat for species of chiropters that use the caves as winter refuges or to install breeding colonies.

### 8320 Vegetation that colonises recent volcanic flows, cliffs and craters

The young substrates that come from volcanic activity are usually rich in nutrients but do not retain water well. This is why it is colonised by a singular flora well-adapted to dryness dominated by lichens and meaty plants capable of accumulating humidity on their leaves and stems. The fauna of these lava fields is non-specific, common in other arid habitats including the caminero (*Anthus berthelotii*, endemic to the Canary Islands) and the alcaudón (*Lanius excubitor*)

- Violeta del Teide (*Violetum cheiranthifoliae*) community

  An uncommon habitat in the National Park that is dominated by the famous violeta del Teide (*Viola cheiranthifolia*), a hemicryptophyte that thrives in lapilli deposits or in other rocky environments between 2,400 and 3,500 m. Although they generally don't have many species they are usually accompanied by *Silene nocteolens*, *Stemmacantha cynaroides* and *Argyranthemum teneriffae*.

- "Berol peludo" (*Cheilantho guanchicae-Aeonietum smithii*) summit community

  Habitat that is exclusive to the mountains of El Teide's Circo de Las Cañadas (1,200-2,300 m) common in meso and dry mesophytic supra-Mediterranean strata. The vegetation grows in fissures in vertical basaltic and phonolitic rock, especially those exposed to the solar meridian, in the pine (*Sideritido-Pinetum canariensis*) domain. Among the most common plant species of this habitat, *Aeonium smithii*, endemic to Tenerife, which reaches the thermo-Mediterranean strata in the middle altitude of the south of the island is quite notable.This habitat is also characterised by the presence of *Rhamnus integrifolia*, *Aeonium spathulatum*, *Silene prox. berthelotiana*, *Erysimum scoparium* and *Descurainia gonzalezii.*

- *Gnaphalium teydeum* (*Vulpio myuri-Gnaphalietum teydei*) annual grasslands

  This is a habitat dominated by annual grasslands made up of *Vulpia myuros* and some bryophytes that thrive exclusively around the fumaroles on the Tenerife summit, on oligotrophic soil, in the dry oro-Mediterranean ground.

- Lichens that colonise recent volcanic flows

  This is an extremely rocky habitat where the youth of the volcanic substrate and the absence of a developed edaphic covering make it difficult for plant species to settle there; this is why only lichens and, to a lesser degree, bryophytes are able to cover more than 10% of this area. Spermatophytes are relegated to being a pioneer species that occasionally colonises cracks and small hollows where an incipient soil has accumulated. The precariousness of the plant biota condition some simple trophic chains so that the most notable fauna are invertebrate species.

### *9. Forests*

**92A0 Willow groves on beds that have been temporarily been turned into a pool or that are temporarily**

- Sauzal (*Rubo-Salicetum canariensis*)

  This is a habitat found in the barrancos (ravines) in which water flows for at least a good part of the year. They are found only very occasionally in the National Park. When this habitat does appear it extends from the infra-Mediterranean terrain to the upper meso-Mediterranean and they are dominated by the tree *Salix canariensis.*

**9561 Open endemic Mediterranean forests of *Juniperus* spp.**

- Tenerife pine with Canarian Cedar (*Sideritido solutae-Pinetum canariensis*, communities of *Juniperus cedrus)*

  This is a habitat of open pines from the dry, mesophytic meso-Mediterranean layer of the island of Tenerife. *Pinus canariensis* is the most abundant tree and often accompanied by *Juniperus cedrus* which is the Canarian version of the western Mediterranean juniper known as *Juniperus oxycedrus.* The cedar, which is locally known as *Juniperus cedrus*, should be more common but because it is vulnerable to fire and possesses high-quality wood, today it is sparse and almost always found in crags and abrupt zones that are protected from fire. They are also very well adapted to dry environments.

- Summit Retamar with Canarian Ceder (*Spartocytisetum nubigeni*, communities of *Juniperus cedrus*)

  Hábitat dominado por arbustedas ralas caracterizadas por la presencia de *Juniperus cedrus* asociado al matorral de retama del Teide.

**9550 Macaronesian pines**

- Tenerife pine (*Sideritido solutae-Pinetum canariensis*)

This habitat is represented by open pines of the *Pinus canariensis* species and escobonales of *Chamaecytisus proliferus* ssp. *angustifolius* of the dry mesophytic meso-Mediterranean soil of the island of Tenerife. In its most typical form, on the sunny slopes, they are found at an altitude of 1,200 and 2,200 m above sea level; on the windward slopes they are found above the laurisilva and fayal-brezal forests and also above the alizé winds. At higher altitudes they are substituted by leguminosae scrubs. *Pinus canariensis* is the most abundant and characteristic tree of this habitat. The escobon mentioned earlier can become the dominant tree not only in the pine tree scrub brush but they can also form dense communities where there are no pines. This habitat holds an exclusive fauna among which endemic birds like the pinzón (*Fringilla teydea*), the pájaro carpintero (*Dendrocopus major*) and a rich endemic invertebrate fauna stand out.

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# Report on the ecological value

## General Information

The peak of Mt. Teide, soaring 3,718 m above sea level, is not only the pinnacle of the Canaries Archipelago, but also of the entire Macaronesian Region, a bio-geographic entity in the Atlantic attached to the Holarctic Realm. The archipelagos of this region, the Azores, Madeira, Savages, Canaries and Cape Verde, are volcanic islands with clear similarities in their flora although not so much in their fauna. Teide's peak is also the pinnacle of the entire Atlantic Ocean, in fact, the only ocean islands on the planet that surpass Teide are the gigantic volcanoes of Hawaii, the Mauna Kea and Mauna Loa, both with summits close to 4,200 m If we take into consideration that the average depth of the Atlantic Ocean around the Canaries oscillates between 3,000 and 3,500 m, Teide is actually a 7,000 m volcano, with approximately half of its mass underwater.

## Exceptional biodiversity

From an ecological point of view, Teide National Park possesses an exceptional biodiversity as is evidenced by the great number of endemic fauna and flora in such a small space (after its recent expansion, the Park has an area of approximately 19,000 ha (19 $km^2$). This large number of endemic species is fomented by the convergence of two insular phenomena: first, the inescapable physical isolation of an ocean island like Tenerife and second, the further isolation of its high-mountain ecology due to its tremendous altitude (it's the only place in the archipelago higher than 2,425 m, more than one kilometre beyond the altitude of La Palma). Furthermore, Teide National Park varies in altitude by more than 2,000 m, a distance larger than the height of Gran Canaria, giving it the best defined slope in the archipelago and, along with the Hawaiian Islands, the best defined in the world.

Teide National Park has catalogued 140 vascular plant species to date, of which no less than 50 are endemic to the Canary Islands and are found nowhere in the world except for the Park and its immediate surroundings. Moreover, another large number of plant species are found nowhere in the world except for the Park and the summits of the neighbouring island of La Palma. The fauna of the National Park is far from being totally catalogued but it must be emphasised that approximately half of those that have been catalogued are species endemic to the Canary Islands and up to 7% are not found anywhere in the world except for Teide National Park, a site particularly rich in invertebrates.

## Ecosystems that are unique in the world: Canarian summit scrub and the peak ecosystem

The great height of the peak of Mt. Teide gives the National Park two of the six ecosystem zones that are known in the archipelago. These zones, from the coast to the summit, are as follows: i) the coastal scrub, ii) the thermophile forest, iii) laurisilva, iv) the pine forest, v) the summit scrub and vi) the peak ecosystem. The summit scrub, or Canarian high-mountain scrub, is found exclusively on the two islands that have altitudes superior to 2,000 m, La Palma and Tenerife. In Tenerife this circles Teide National Park and at approximately 2,000 m extends in both slopes to the summit of Pico Viejo (3,100 m).

The Canarian high-mountain climate generally lacks a mar de nubes ("sea of clouds") during most of the year (the "sea of clouds" rarely reaches Izaña at 2,375 m), as this phenomenon habitually occurs between 1,700 and 1,800 m. Because of the influence of the Alizé winds does not allow for the "sea of clouds", the summit scrub and the peak ecosystems have the most extreme characteristics in the entire archipelago. Winters bring frequent night-time freezing and snowfall, when the Atlantic storms affect the archipelago, that leaves the high mountain area covered in snow for weeks and even months. This precipitation totals between 500 mm/year to 2,000, progressively decreasing as the altitude increases until it equals the precipitation of the coastal area (250 mm/year) around the peak of Mt. Teide. Today the summit of Tenerife is not perpetually covered with snow, but this was most certainly the case during the Quaternary peak glacial periods, the last of which occurred barely 15,000 years ago.

The average temperature of the summit varies greatly with the altitude, oscillating between the 9.5º C registered in the Izaña station and 3º C in La Rambleta (3,500 m), with a certain margin until the summit for even lower annual average temperatures. The lowest absolute temperatures registered on the summit are lower than -10º C, for instance, Cañada de La Grieta (Tenerife) registered a historic low of -21º C in 1912. However, during the summer it practically doesn't rain and the large rise in temperature at midday are countered by pronounced drops in temperature at night, leading to daily thermal variation that can be greater than 30º C. The relative humidity is generally lower than 50% as the "sea of clouds" infrequently reaches this altitude leaving the summits almost always clear. Because of this Izaña is the Spanish meteorology station with the highest number of sunlight hours (10 hours sun per day of the 12 that are theoretically possible) throughout the year.

From a biogeographic point of view, the high-mountain scrub of Tenerife is similar to that of mountain scrubs at a similar height on alpine mountains in the south of the Iberian Peninsula (Sierra Nevada, Mulhacén, 3,478 m) and the north of Africa (Atlas, Djebel Toubkal, 4,165 m), although it is made up of totally different species. Like the other scrubs it is dominated by nitrogen feeding leguminosae and just as occurs in those other summits, the bearing of the scrub is semi-spherical and pillowy, thereby minimising its contact with the exterior, an evolutionary answer to the intense thermal stress of the region. Because of this the summit scrub ecosystem has one of the most predictable and marked reproduction periods in the archipelago. It habitually blooms at the end of May and the beginning of June, while it gives fruit in late summer and at the beginning of autumn the reproductive cycle ends.

Few volcanic islands on the planet reach an altitude high enough to situate their summits above the level where trees can grow, a concept known in ecology as the "timberline". On latitudes similar to that of the Canary Islands this only occurs on the already mentioned Hawaii Island (Mauna Kea, 4,205 m and Mauna Loa, 4,169 m) and the nearby island of Maui (Haleakala, 3,055 m) in the same Hawaiian Archipelago in the Pacific Ocean, on Grande Comores (2,361 m), the Pitón des Neiges on Reunion Island (3,069 m) in the Indian Ocean, Pico de Pico in the Azores (2,351 m), the Pico de Fogo (2,829 m) on the Cape Verde island of the same name and La Palma (2,425 m) in the Atlantic Ocean. All of these volcanic islands, which are still growing as their geological activity in historical eras indicates, possess high-mountain scrubs or grasses above the "timberline" at different stages of development, ranging from thick coverage (as occurs in much of Teide National Park) to others where they are hardly apparent at all. This is due to the fact that they are immersed in unsynchronised processes of primary ecological succession (based on the age of the flows) that occur especially slowly because of adverse temperature and precipitation conditions.

This is an especially valuable aspect of Teide National Park because it is like observing a magnificent slow-developing experiment that is probably unique in the world for the diversity of materials emitted and the formations created (see the geological and geomorphological reports), that will allow us to understand how different characteristics inherent in the volcanic flows such as age, physical or chemical nature of the substrate, incline, exposure, etc. affect the primary ecological succession.

## Vegetation

Physiognomically, the summit or high-mountain scrub of Tenerife is just as it name suggests, a plant formation dominated by scrubs with no trees due to the adverse climate. This scrub is clearly dominated by the most emblematic plant species of the Park, the retama or Teide white broom (Spartocytisus supranubius), a plant whose individual specimens sometimes grow over 2 m tall with diameters of 8-10 m. The white broom has straight, hairless grey-green stems with small linear leaves and white-pink flowers that grow in dense groups and have a sweet smell that attracts insects.

The retama's scientific name, supranubius, means "above the clouds" in Latin, alluding to the fact that this species grows in altitudes where the sea of clouds almost never appears. This species is without a doubt the protagonist of the National Park's landscape and is also found naturally in the summits of La Palma, although currently it is sparsely distributed. It also gives its name to the most extended formation, the summit or high-mountain retamar. The retamar is a unique ecosystem, not particularly diverse in plant species in its habitual facies, mainly formed by scrubby species that try to minimise exterior contact. The ecosystem's biomass is as sparse as its appearance, weighing around 1.5 kg/m$^2$, while its net primary production (PPN), quite diminished by the adverse climatic conditions that prevail, is around 0.25 kg/m2 per year.

Other plant species endemic to the Canarian high mountain whose largest, and sometimes only, world populations exist in Teide National Park are the hierba pajonera (*Descurainia bourgueana*) with beautiful yellow flowers, the falsa conejera (*Pterocephalus lasiospermus*) with pink flowers, the codeso del Pico (*Adenocarpus viscosus*), which dominates the high mountain of La Palma, the magarza de cumbre (*Argyranthemum*

*teneriffae*), the cabezón del Teide (*Cheirolophus argutus*), the alhelí (*Erysimum scoparium*), the fistulera (*Scrophularia glabrata*), the tonática (*Nepeta teidea*) or the taginaste rojo (*Echium wildpreti*), which is the Park's symbol and probably its most spectacular plant thanks to its great vertical inflorescence with many intensely red flowers.

The taginaste rojo plays the starring role in one of the most interesting examples known of evolutionary convergence with other phylogenetically separated species. This adaptive convergence rests on the fact that species growing at high altitudes, both insular and continental, with similar environmental characteristics, have developed similar evolutionary answers to common problems, such as the presence of a base rosette that gives rise to a majestic vertical inflorescence, as occurs in the well known silversword (gen. Argyroxiphium) in the Hawaiian Archipelago, the lobelias of the high mountains in eastern Africa or the vegetal species (gen. Puya) of the high barren plains of the Andean Puna.

Other less-abundant plants endemic of the Park that habitually find refuge in the most inaccessible bluffs of the National Park include the Canarian Cedar (*Juniperus cedrus*), the taginaste picante (*Echium auberianum*), the jara de Las Cañadas (*Cistus osbaeckiafolius*), the rosal del guanche (*Bencomia exstipulata*), the cardo de plata (*Stemmacantha cynaroides*), the jarilla (*Helianthemum juliae*), the moralito (*Rhamnus integrifolia*), the turgayte (*Senecio palmensis*), the *Silene nocteolens*, the cerrillo de la cumbre (*Arrhenaterum calderae*), or the perejil de cumbre (*Pimpinella cumbrae*), among others.

Above this summit scrub (which may extend closer and closer to the ground while still maintaining respectable covers to at least the Peak Viejo summit at around 3,100 m, and to the culmination of the island's altitude) an ecosystem grows that is exclusive to the island, since none reaches this altitude outside of Tenerife, that completes the range of ecosystem zones in the archipelago. This is the peak ecosystem, characterised by very sparse vegetation that in its lower section (up to around 3,400 m) is mainly made up of gramineae, the magarza de la cumbre and, above all, by the Teide violet (*Viola cheiranthifolia*), the tallest growing phanerogam in Spain. From 3,400 m to the summit, close to the fumaroles gramineae are found, the borriza de la cumbre (*Gnaphalium teydeum*) and a moss and lichen carpet.

## Autochthonous fauna of the summit scrub

The fauna native to the island summits is made up of a large number of invertebrate species, 50% of which are endemic of the Canaries, the majority being insects although some bird and reptile species are also found. Among the invertebrates that stand out for their abundance and scientific interest are beetles like the pimelia (*Pimelia radula ascendens*), a species endemic to Las Cañadas; this omnivore has a round black body and is frequently found under rocks or sometimes slowly moving among the retamas. Another beetle that stands out for its large size and contrasting colouration (black and white bands), is the gorgojo del Teide (*Cyphocleonus armitagei*), a species endemic of the summit scrub of Tenerife, a phytophaga that is found on branches, trunks and the large flowers of the magarza. Among xylophagous or retama or codoso wood-eating species, the longicornio de Las Cañadas (*Trichoferus roridus*) stands out. Another extremely beautiful beetle is the flamboyantly coloured buprestid (*Antaxia fernandesi*), also endemic to Las Cañadas. This ecosystem also has a rare species of endemic mantis (*Pseudoyersinia teydeana*) that is

exclusive to Las Cañadas and nearby pine trees. Opilones (*Bunochelis spinifera*) are very abundant and can even be found in the Teide's crater. Among the diurnal butterflies the small blue-winged manto de Canarias (*Cyclyrius webbianus*) stands out; this butterfly is usually found flying in open spaces. Species of endemic beetles, nocturnal butterflies, wasps, a small land snail and spiders can also be found.

Among vertebrates, two species of reptiles stand out, the lagarto tizón or Canary lizard (*Gallotia galloti*) that can frequently be seen during the spring or summer in altitudes almost as high as the Teide Peak, and the more infrequent lisa or skink (*Chalcides viridanus*), that can be found under rocks in areas with high humidity. Among birds, the most common vertebrates, few species nest. It is common all year round to see mosquiteros (*Phylloscopus canariensis*), camineros (*Anthus berthelotii*), canaries (*Serinus canarius*), vencejos (*Apus pallidus* and *A. unicolor*) and alcaudones (*Lanius excubitor koenigi*), who feed by capturing animals that stick to the branches of some plants. In Las Cañadas crows (*Corvus corax tingitanus*) were once abundant but they are currently very rare. The last milanos reales or red kites (*Milvus milvus*) of the Canaries were seen in Izaña in the 1960s. Today the cernícola or kestrel (*Falco tinnunculus canariensis*) is very abundant and can usually be found flying over the entire area of Las Cañadas. The most interesting bat taxa is the endemic known as "orejudo canario" (*Plecotus teneriffae*), that hides in the caves of Las Cañadas during the day.

Some species are found in the Park during the spring and summer such as the herrerillo or blue tit (*Parus caeruleus teneriffae*)and the pinzón azul or chaffinch (*Fringilla teydea*), that although it lives in pine trees can be seen at these altitudes in search of food during mating season.

## Strong points of the proposal

- The peak of Mt. Teide is the pinnacle of the Atlantic Ocean and, after Hawaii, the highest volcanic island in the world.

- An extremely interesting aspect of Teide National Park is its "double insularity": the first refers to its physical isolation as an ocean island and the second to the ecological isolation caused by being the highest summit of a biogeographic region. These phenomena have led to an increase of endemic species in its biota.

- Teide National Park is one of the few islands in the world that can support zonal ecosystems above the "timberline" (the altitude where trees can no longer grow), giving rise to two unique ecosystems: the summit retamar and the peak ecosystem.

- Teide National Park has one of the best natural experiments in the world in primary ecological succession, tied to the variety of emitted materials and created formations as well as the adversity of the climate that slows this process down enormously.

- Teide National Park has an exceptional biodiversity of flora with close to 50 species of vascular plants that are exclusive to the Park or whose largest populations in the world are found in the Park.

- Teide National Park holds one of the best examples of adaptive convergence in existence, that of the Hawaiian silverswords (*Argyroxiphium*) and the Canarian taginastes (*Echium*).

- Teide National Park has an extremely important biodiversity of fauna, especially of invertebrate animals.

# The landscape

## Introduction

This work makes reference to a geographical concept of the landscape and is presented according to the usual method. As such, the concept establishes a sum of observed territorial configuration and of its image, the culturally endowed image. We have given preference here to the first aspect, the natural configuration of the territory included in the actual National Park, but we have also traced the main features of such a cultural image, as it qualifies the value of the natural figures and provides an undertone which is very present in the perception of El Teide.

The landscape, understood as such, is the formal make-up of the volcanic territory and the altitude ecosystem. It presents a visible face which is the observable land and the existential landscape. This face is immensely characteristic in its forms, elements, colours, layouts, units, and responds to the uniqueness of the volcanic and altitude zones. The relationship is established from both a geomorphologic and biogeographic structure, combined in a way that materializes an ensemble of specific forms. These forms are spatially distributed in units of a geomorphologic and biogeographic type, according to the natural territorial elements, with dominants of diverse character and different entity. These units combined form a final mosaic of natural landscapes. Its analysis gives as a result a “state” of the landscape, the moment of its observation. We have added to this fundamental make-up of landscape mosaic some brief, but necessary, notes on the perceptive cultural contents as an ensemble of endowed values.

To demonstrate the entity of the ambit studied in these aspects, we have written the following report by firstly paying attention to the landscape uniqueness of El Teide, highlighting its forming elements and describing an ensemble of panoramas with the visual distribution of said elements. Secondly, we have placed our attention on the elements and on the landscape units of the relief. Thirdly, we have proceeded in the same way considering the elements and landscape units of the vegetation. Lastly, we have added both analyses and their respective maps in order to obtain a final map of global or integrated units, the landscape units strictly said. Geographically understood, the landscape of El Teide is the grouping of such units. It is evident that various levels of unit dissociations can be formed to a degree of detail that some have called “cellular geography” and that, equally, associations of groups in greater complexity, amplitude and internal differentiation can be made. We take off from a generic cataloguing progressing in this differentiation towards an average scale, which is the most expressive. As a complement, we have included the main ideas of the cultural meanings of these landscapes.

From this analysis we can gather, with realism and precision, the elevated richness in natural values of the landscapes of Teide, its accentuated uniqueness not only in the geography of the Archipelago but also in a more ample sense, and the quality it has acquired as a universal patron in the cultural and scientific aspects.

# The landscape uniqueness of El Teide

## *Landscape elements of El Teide*

The fame acquired by el Teide (3.718 m altitude) throughout the centuries comes from its elevated silhouette seen from the sea, looking over the clouds of the trades, practically hanging over them, sometimes accentuated with the splendour of the snow or illuminated by a sun preceding the sunrise in the semi-darkness at sea level, and in occasions, apparently smoky from the effects of the fumaroles of its apex. Mountain of harmonious cone in solitude over the Atlantic ocean and the Canarian Archipelago, the great volcano extended its fame from old among the stories of voyageurs and the myths of the horizons.



**The Teide shadow landscape over a "sea of clouds"**

Isolated mountain in its surrounding of islands and ocean, it is the only one in its elevation throughout extraordinary distances, along its meridian or along its parallel. Such a volcanic construction superimposes the larger levels of the highest Canarian islands, such as La Palma or Gran Canaria, forming a sole ambit suspended in altitude: the combination of the Cañadas and el Teide strictly said. When travellers began to ascend this geographic floor and come close with a rationalist mind to its relief, they were surprised by this ample cup-shaped area added to the landscapes of these islands, formed by the amphitheatre of the Cañadas, forming a singular and different enclosure. In it rises the stratovolcano with its cinder fumaroles in a peculiar arid environment of subtropical mountain, with its scrubs particular to the altitude and isolation not only insular, but of the mountain. The combination of the Cañadas and el Teide surprised them as if they were dealing with a new island suspended or leaning on the back of Tenerife. This world on the world was constituted by formidable lava flows, by a rocky landscape in rough and disproportionate constructions, crater mouths, labyrinthine in its detail and of a single piece in its great ensembles, in which the great mass of the double volcano of Teide and Pico Viejo serve as centre or axis. Only a popular place name of one of its elements, "The valley of the pulled stones", is expressive of the perception in those who baptized it of old in a place principally defined by its crumbled rocks. El Teide adds to the general geographic singularity of the archipelago in the ocean, to the Canarian regional uniqueness and to these that of its enclosures, its singular forms laced between themselves on different scales.

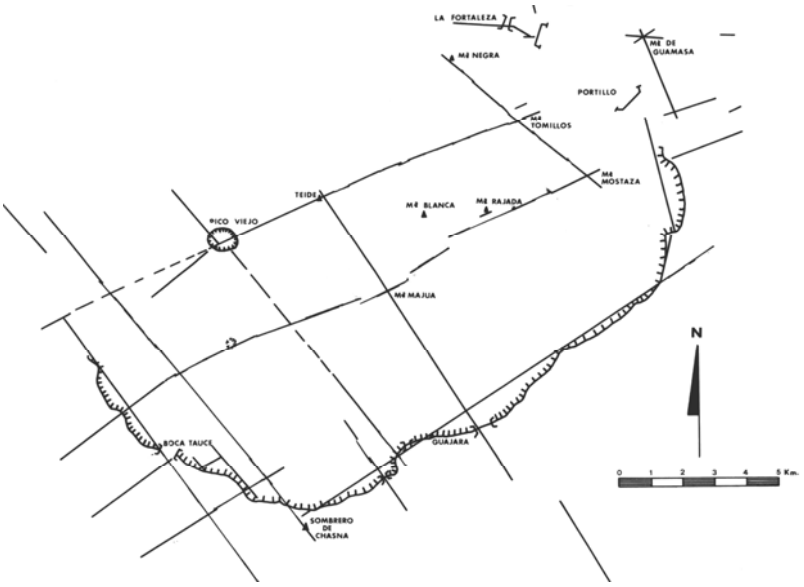
These forms seem strange to the outsider; they are tough, strong, of intense colours, rough, with the aesthetics typical at the same time of the great volcanoes and those of the great deserts. To the specialist they indicate an infrequent richness of eruptive forms, of types of explosive and effusive constructions, of modalities of cones and outflows, concentrated in a delimited space, with a precise order in its rocks, times and relieves that indicate a strict logic in its dynamic, in its space, in its evolution and in its matter, where the appearance could be chaos and of a violent geology. Even the spread of its peculiar vegetation of altitude, influenced by the stony floor, the different humidity of the places, the climate in the floors and in thresholds and suntraps of the mountain, the old grazing lands and the most recent eruptions, express high degrees of natural harmony with this substrate and a liveliness that contradicts the superficial impressions of sterility in a rocky, cold and arid environment. The vegetation of el Teide is typical of this volcano, adapted to its norms and forms. To see Teide from these perspectives is to see it as it is in reality: an exceptional landscape, undoubtedly grandiose where the feelings enjoy, but reason also learns. To the careful observer, the area and the greater forms multiply into various sceneries on an average and detailed scale, an expansion of diverse environments. The forms of the landscape are hence revealers of units on different scales, of processes of different eras, of different relieves constructed and modelled with modalities congruent among each other and with the geographic system of the combination Teide-Cañadas. These create ample sectors composed of multiple differentiated shelters in which the singular vegetable landscapes relate and differentiate at the same. This is el Teide and its planets; the multiplicity of other worlds within the Cosmos.



**Landscape of Las Cañadas from Montaña Blanca**

In this way, such an observer can appreciate at the same time, firstly the harmony and the beauty of the ensemble in the conic volume of the stratovolcano, distinguishing 1,700 metres of drop over the structural terrace or atrium of Las Cañadas. Secondly, this atrium, the Cañadas strictly speaking, with a floor of crescent moon, and areas of around 2,000 metres altitude, shaped today by the ample volcanic-filled caldera base created from the sum of a network of minor volcanic mouths, of outflows from Teide and Pico Viejo and of its peripheral domes, with diversity of lavas from chordates with soft flows to viscous flows of obsidian blocks, and of flats of fine torrential and lacustrine deposits trapped without exit and interweaved in between such lavas. Thirdly, by a tall spike of unevenly-shaped rocky needles that crosses and divides the atrium in two, designated “Roques de García”, roots of old volcanoes previous to el Teide and dismantled. Fourthly, closing the ensemble to the south, the rest is markedly lineal and softly arched from the volcanic edifice precedent to Teide and affected by the mentioned caldera of las Cañadas that reaches over 2,700 metres altitude in its largest summit; dissymmetric edifice that shows to the north an accentuated scarp, partially carpeted by abundant debris, and to the south a pronounced slope in ramp towards the altitudes of mid-lands and even to the next coast. These are the sceneries made up at the same time of medium and minor forms such as outflows, ridges, cones, craters, volcano fields, domes, fissures, walls, taluses, flats, blocks, needles, tubes, jameos, channels, malpaises and laijales, all of them in a clear relief.

The organisation of the volcanic relief in time and space follows here very defined geometric models, adapted to a very common network of fractures in Tenerife and in the entire archipelago, contributing to a new clearly structured spatial disposition. Two alignments predominate: first the NE-SW, which directs, among others, such marked relieves as the wall of the Cañadas and its atrium or the gap of Boca Tauce, the volcanoes that constructed its edifice and rosaries of eruptive centres like the Fortaleza, Montaña Negra, Montaña de Las Lajas, Pitón del Teide, los Gemelos, the crater of Pico Viejo and the eruptive mouths of Narices del Teide. In second place, the alignment NW-SE, which controls, for example, the western wall of the Cañadas, the volcanoes of the western area, the ridges of the eruptive mouths of the Abejera, las Lajas and Montaña Rajada, the fissure of Montaña Blanca, the mouths of el Teide and of Montaña Majúa and the incision of the Degollada de Guajara, or links the Roques Blancos with Pico Viejo, with the tall spike of Los Roques de García and with the face of the Degollada de Ucanca. A display prefixed by the tectovolcanic scheme with its capital influence on the division of the volcanic and erosive landscape elements so evident that, combined with the vulcanologic and climatic evolutions, it becomes one of the keys to the spatial layout of the landscapes. A reading can be carried out in this panel, of the landscape's diverse ages, juxtaposed and superimposed, from edifices demolished to its roots up to eruptions of historic era. El Teide has very specific visited sectors and, in contrast, very solitary ample areas: it is its ensemble, of different access routes, that manifests this diversity, but even only in the most tourist points is it possible to observe this richness of landscape aspects.



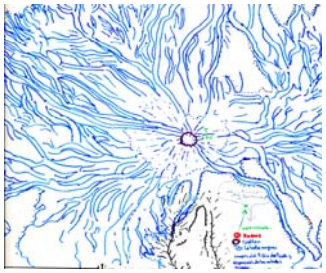

**Guideline of the Teide and Las Cañadas fracture system.**
**The structural geometry organises the harmonious spatial distribution of the larger relief.**

The landscapes of el Teide are directly defined, in principle, by its forms of relief, such as the caldera and the stratovolcano, and with more detail, by elements such as the culmination of the great stratovolcano by the recent overlapping lava ash cone, by the black outflows spilling from it in mane by its flanks, by the old outflows of the double stratovolcano, by the peripheral domes and its outflows, by the cones of minor sferic apparatus, by the mouths and lavas of the historic eruption of Narices del Teide, by the ample and complex crater at the summit of Pico Viejo, which constitutes one of the pieces

with the most entity in the ensemble, by the rim of Los Roques, by the varied scarp and talus of the Cañadas, by the dome plateaus of this edifice, by the prints of torrential incisions and stone outflows, by the alluvium and endorheic deposits. The extensive scarp of Las Cañadas shows its different composition and pattern: from east to west, it begins with alternations of outflows stratum and explosion products, followed by an arc of pumice deposits, continued by outflow deposits, they stand out in a central sector of domes and massive outflows and prolonged by the discontinued outflows, cut by dykes and finished off by tableaux. All this ensemble of landscape elements reveal the construction and modelling stages of the volcanic ensemble and accumulate a nourished geodiversity in a coherent system. To it we add physiognomic units of vegetation, today in full evolutionary dynamic, which adapt to the circumstances of their situation without hiding the rocky base, but rather highlighting it. The sectors are well differentiated: in the summit and external ridge of the lineal edifice of the Cañadas, in its internal wall and talus, in the lava atrium and in the endorheic atrium, in an inferior ring of el Teide and Pico Viejo and in an elevated nucleus in the tops of both twin volcanoes. The naked areas are combined with the herbaceous and bush tapestry. These divisions result in great units, the cathedrals of the system, and in circumscribed sectors, the chapels of the greater edifice.

There are, hence, strong and sharp colours under the zenith light, greys, blacks, whites, reds, grey-browns, ochres, sometimes blues and its mixtures, plus the bright greens of the retamas, the dull of the codesos, the intense of the margaritas, the yellows of the hierbas pajoneras. The full colours of the landscape reveal, in reality, the schemes of a powerful and characteristic nature. The power of such nature is manifested to the sight for those who distinguish the meanings of the landscapes, both in a multiplication of units -it all depends on the scale at which we are observing inserted in the roughness of the forms, whether these are outflows, pumices, sediments, etc., with a clear tendency to shape delimited metric spaces, circumscribed natural “gardens”, in collaboration with the distribution of the plants, as in its association in ensembles according to great forms and communities and in an everything differentiated by the general influence of the altitude, by its character of island on the island, and by the enclosure formed by the composed edifice in this volcanic cupola.

The landscape evolves in time, it has dynamics. To start with, eruptive. A visit to the summit of el Teide with its fumaroles or to a dome crater with its lavas corrugated by the brush of the viscose flow, or to Las Narices del Teide which show the strength of a recent eruption, or an observation in the black outflows or in the field of south-western volcanoes, will allow us to see cones and lavas that seem to have stopped in their eruption not too long ago, with the appearance of an abruptly interrupted dynamism shaping the actual forms. In second place, there is a dynamism in the erosive model of the shapes, perceptible in the torrent of Corbata del Teide or in the talus of debris of the wall of Las Cañadas, indicators of different climatic stages after the opening of the caldera and the edification of the stratovolcano. And, furthermore, in the vegetation and with rapid physiognomic changes: he who can contrast pictures of the vegetable cover 25 years ago with the present one will observe interesting positive modifications consequent to the preservationist management of the National Park.



Graphic 1.A



Graphic 1.B



Graphic 2.A



Graphic 2.B



Graphic 3

**Graphic 1.A: Peak area. Teide crater, peak cone and radial black lava flows.**
**Graphic 1.B: Peak area. Pico Viejo crater, large and internally complex.**
**Graphic 2.A: Slope formations. Roques Blancos dome with its voluminous flows.**
**Graphic 2.B: Slope formations. Narices del Teide ("Teide's Nostrils"). Historic eruption (1798) with its rosary of craters and its lava flows spilling over the slope of Pico Viejo and the western atrium of Las Cañadas.**
**Graphic 3: Las Cañadas and the Llano de Ucanca. Mesas that culminate in the Las Cañadas edifice and scarp on its northern slope. The atrium plains are trapped between the debris talus that comes from this scarp and the flows coming from Teide and Pico Viejo.**

Furthermore, throughout the year, the landscape of el Teide shows a phenologic variation full of contrast. Undoubtedly, the phenologic variation is something common to many places, but here it shows some especially marked characters and stands out in a defined environment precisely for the attenuated seasonality: a winter with snow, which becomes the protagonist of the landscape, a spring in explosive flowering with intense dominion on the environment -retamas, tajinastes, etc.-, a dry summer where the mineral dominates again, an autumn interrupted by periods of storm with the late live colours of the plants, among them the yellow of the hierba pajonera. And change, furthermore, according to the passing of the hours of the day, of intense light where a sunrise of hanging lights and large shadows that brings out all the colours of the lava and the plants, contrasts with a noon of zenith sun without shades except in the dominant vertical until a fast sunset of soft tones where all the shapes become highlighted. But even more appealing is the sky of the night, of such extreme purity and transparency in the atmosphere that the constellations fill the sky with an unusual proliferation and clarity and where the Milky Way draws its course with an unusual brightness. The close presence of astronomic observatories obeys to these exceptional virtues of the altitude atmosphere in el Teide, on the sole base of a spot elevation of high mountain in a point of subtropical latitude placed in the Atlantic Ocean.

All of this has led to an insertion of el Teide throughout centuries in the cultural models of the European naturalist travels, the high subtropical volcano in the ocean, between Europe and America, the last in Europe and the first in America, the last Etna and the first Chimborazo, the most remote and yet accessible, for example as the first "equinoctial" altitude of Humboldt. Today this perception is maintained, which endows the volcano with cultural contents that add to its natural figure in an inseparable valuable way.

***Cultural contents of the landscape***

The cultural content of el Teide starts, with more or less precision, on the one hand from classical European references and, on the other, from the mythical infernal or practical meaning, from its herding use and obsidian gathering by the Canarian aborigines. From this mythical meaning comes its original name, Echeyde, with the Guanche meaning of hell, and of those imprecise images comes its literary post in the European culture as volcano that rises from the horizons.

It has been written by some authors in relation to the legend of "Atlantis", high over the seas, a light of flame hanging in the night in the altitude over the ocean, even with the volcanic island close to Africa mentioned in the Periplo by Hannon, that is with the so-called "Throne of the Gods" of Estrabon and Ptolomeo. The symbol remained in the mythical references to the remote Purpurarias or in many other versions of the islands with paradisiacal characteristics where winter is unknown. In the legendary medieval travel of Saint Brandan hell is found in the crater of an active volcano elevated over the ocean, high over the clouds in a diffuse legend in which el Teide and Iceland could be united for it is possible that its fantastic location leaned on this Atlantic cultural tradition, and it could also be in relation to the purgatory of the Divine Comedy, within the mythical swaying of the pre-Renaissance Quimeric geography. Quotations from Dante and Tasso have been used as literary descriptions adapted to a diffused image of el Teide. The image of our volcano was, without doubt, object of a mixture of travelling references, of diverse myths, of different accounts, maybe of different places and ended up being used to stage not only hell but also, the purgatory and paradise. And even to place on it the highest altitude in the world, mistakenly guessed and even calculated from the sea, and supported in the books for a long time.

The particular fame acquired by the exaggerated altitude given to Teide came from false calculations that had come to estimate, among other figures, up to fifteen leagues in the 16$^{th}$ Century or ten thousand toesas or twenty-seven thousand feet (still more than 8,000 m) in the 17$^{th}$ Century. Nevertheless, such elevation was not deduced from the accounts of those who had already ascended since the 16$^{th}$ Century. Even if Bufón himself reduced the spot elevation, he gave it an altitude of league and a half, and played it down as "one of the mightiest mountains in the Earth". The geographer M. Terán commented that also a well-known Spanish naturalist, José Torrubia, had critically gathered in 1754 a numeric estimation of the maximum elevation, still inexact, of the Peak of Tenerife, "considered as the highest in the world. The truth is that it can be climbed in three days, and that having measured it in perpendicular, it only has an elevation of a Germanic mile". In 1704 Feuillée had placed, nevertheless, the elevation of el Teide under that of Mont Blanc and the map of Borda of 1766 already gave it a reasonable altitude (1,904 toesas or 3,713 m). In any case, this false fame, classifiable among the myths that disfigured the

reality and shaped the legend of el Teide, gave place to one of the motors of the celebrity of this mountain, reflected in multiple historical references.

The luminous peak over the seas was considered during centuries, even by Darwin in the 14th Century and by Unamuno already in the 20th century, as “another world” suspended in altitude over the seas, enlacing with the characteristic impressions of the Romantic writers, for example, on the peak of Etna or Mont Blanc. There is, hence, an entire cultural cycle of el Teide, constructed, with diverse contents and at the same time similar ones, by mythical accounts, by traveller’s chronicles, by literary impressions and by scientific reports. Equally, it also constitutes a specific theme of graphic representations, drawings, paintings and etchings, repeated, frequent, that go from fantastical topical images to panoramas that search above all for the fidelity to the model. The references increase from the Renaissance but its golden age corresponds to the illustrated voyages, in which the precision of the description and the scientific observation definitively substitute the old legends of the horizons. It is a process of parallel cultural perception to that of the Alps, sometimes done by the same authors, which is applied to el Teide as the most remote mountain inserted in the patron of knowledge and feeling of the European nature.

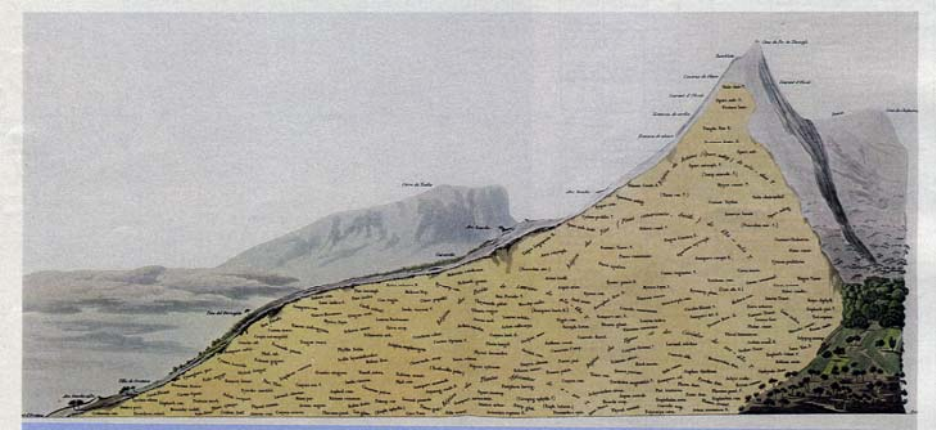
The old ascents to its summit, not only in search of sulphur but motivated by a love for knowledge, made of this volcano a particular highlighted element in the scientific knowledge and its image was, for this reason, extensively spread. It was a specific objective, among many others, for naturalists with a decisive importance in the history of science such as Humboldt, Von Buch, Darwin -although he was unable to land in Tenerife- or Haeckel.



**Von Buch panorama of 1825**

The experiences obtained once and again in the volcano were incorporated to the knowledge with a priority and, in occasions with a transcendence, like in the moment in which the Plutonists abandoned the Geognosy to initiate the modern Geology; or when the plant geography required an amplification of its comparative knowledge; or when the altitudes were barometrically recorded in search of a first precision of the mountains; or when meteorological records typical of the latitude and altitude were searched for, only observatory risen over the ocean; or when its purity of air allowed for the observation of the cosmic space. El Teide became a trial place and its data passed on to substantially enlarge the fields of knowledge of the 18$^{th}$, 19$^{th}$ and 29$^{th}$ Centuries. These data were even passed on to very known manuals of Geology, Botany, Climatology and Geography, and the image of the Teide became popular as something obligatory in science and education. Therefore, the landscape of el Teide is in itself an important source of knowledge in

modern history and science and constitutes a common image in the diffusion of such knowledge.

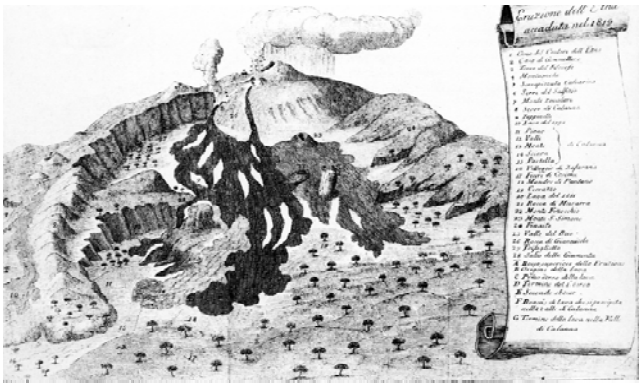


**Model of the mountain-vegetation geography created by Humboldt after he climbed Teide.*Essai de géographie des plantes.1806***

Among all the accounts, Humboldt's is the essential one in these multiple aspects: as travel, ascent, description, sentiments, strict and opportune observations, and high level of contribution to science. He climbed Teide in 1799 influenced by the ascents of H.B. de Saussure in the Alps and of other authors in Etna, as did Ramond a little later in the Pyrenean Monte Perdido. He fulfilled it within a research project that, as is well-known, was initiated here but that principally included America. The Canarian mountain is hence situated not only in the maps and routes, but also in its naturalist senses, as the obligated point of scale between Europe and America. With it, el Teide participates, together with Mont Blanc and Monte Perdido, in the process, at the end of the 18th Century beginning of the 19th Century, of scientific exploration of the high mountain and, as a consequence, obtains a new success derived from Humboldt's fame: it becomes situated among the three or four culturally most symbolic European mountains, associated to an eminent scientist. The figure of el Teide became further inserted since then into the history of our cultural progress, in what came to be the modern axis of the knowledge of nature. It specifically appears linked to the birth of Physical Geography. El Teide goes on to be taken as a model of volcanoes and as a sanctuary for scholars. Cordier's stay in 1803, Von Buch's in 1815 or Berthelot's ascent shortly after in 1827, are examples of the successive scientific waves that mark a style of understanding that does not cease. When Darwin came close to the Canaries by boat he was precisely reading Humboldt, voluntarily incorporated to a line that included el Teide in the need for the advance of science.

Since long before, some authors had considered Teide as a second Etna in the Atlantic or in the horizons, applying a classical model of volcano for its classification and understanding. Torriaini was one of them. Virgilio's Etna was taken by different writers as a base for what a volcano was and was associated to the myths that repeated the image of the eruption in remote seas. The legend of San Brandan, which is one of these derivations -a christianised Aeneid- reaches in fact the Canary Islands with a beautiful myth of the invisible island that is occasionally materialized and to which it was given that name. In any case, Etna is a cultural model, a patron of myths, poems, studies, rooted in the classics like Esquilo, Píndaro, Hesiodo, Virgilio, Ovidio and many others, or more succinctly from the Odyssey to Petrarch. Etna is also, since Empédocles, the reasoning.

And, above all, has been a cultural model of the travel to the volcano, of the educated travel. This model was passed on to el Teide, the other Etna in the distance, like a value added to its landscape from a cultural base exported from the Mediterranean to the Atlantic.



**Etna as seen by Gemmellaro in 1819**

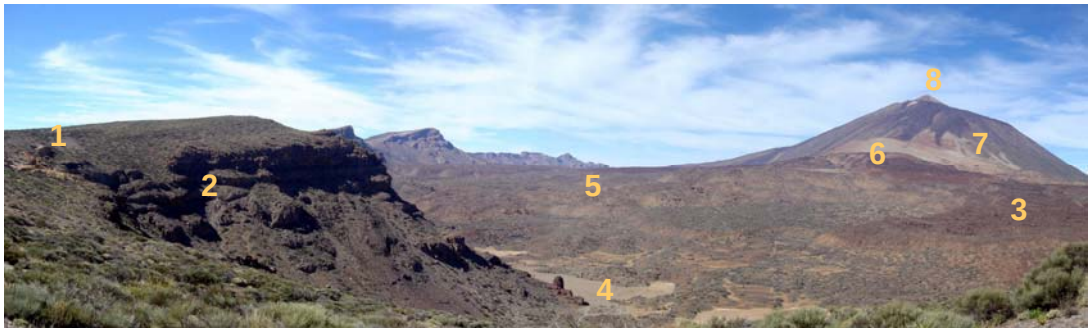
Many are the affinities in the travellers' accounts of the ascension of both mountains. For example, Goethe ascends Etna in 1787 and proceeds to admire it in a way that creates a practically identical canon to the one that is later applied to the sentiments of the landscape provoked by the ascent to el Teide. Goethe crosses the outflows, contemplates from above the coast in spite of the fog, sees the snowy summit surpassing the clouds, sees the "magnificent countries that extended at my feet… from Siracus to Mesina, the ample beach with its curves and gulfs". When Humboldt climbs Teide, using Etna many times as a comparative reference, he writes, for more clarity, that "the excursion to the Peak is like the ones that are done in the valley of Chomoix and to the peak of Etna", and continues this itinerary of Goethe's experiences almost word for word: hence he describes step by sep how the fog dissipates and in his sight appears the summit of el Teide above the clouds illuminated by the sun, sees then the coast also suddenly in a big tear of the sea of clouds and describes his surrounding in the summit: "Above us, the vault of heaven of a dark blue; at our feet, old lava floods; around us, that scenery of desolation...; to the distance, downwards, the vineyards…; the seven islands… like in a geographical map". This is the same literary resource used by Ramond in the summit of Monte Perdido or reaches a later traveller to Etna who significantly inverts the influence terms and imitates Humboldt equally describing his view as "if we had looked at a geographical map". Hölderin, in his work "The death of Empedocles", retook the image of the view from the summit of Etna, of the rivers, the islands and the sea, which, in fact, it already shared with el Teide. Humboldt and, in turn, el Teide had created a great following. They did it up to the same point as from where the education had started.

The cultural assimilation among both volcanoes goes from the style of the scientific travels, to the collection of stories of the ascents, in the chosen points of views, as in the caves with ice of Etna and Teide, the similar shelters to bivouac among the rocks, the arrival to the crater and the vision at sunset from the summit. Even in Etna, the memory of the British voyageurs, there was a "Casa del Inglese" (House of the Englishman) and in Teide, for the same reason, an "Estancia de los Ingleses" (Stanza of the Englishmen).

Intimate relations, in addition, in the cultural model that is added to the landscape uniqueness of the high Canarian mountain like an adjustment of civilization that endows a particularly strong influence to the high, isolated and distant volcano in the Atlantic. The insertion of the volcano in the select network of protected world natural areas under the name of National Park in the year 1954 consecrated in a definite way the symbolic itinerary of el Teide as both a unique and international figure worthy of special respect. In the landscape of el Teide all those regards are kept and whoever knows how to listen hears in it the silent voices of all the authors who have legated cultural contents to the nature of the volcano.

### *Panoramas of el Teide*

With the aim of descriptively situating the most expressive elements of the landscape in its areas and of giving a first visual image of its combinations, although without entering still in its systematic organization, we highlight five points of view from which we can observe in circle a series of panoramas complementary to el Teide.



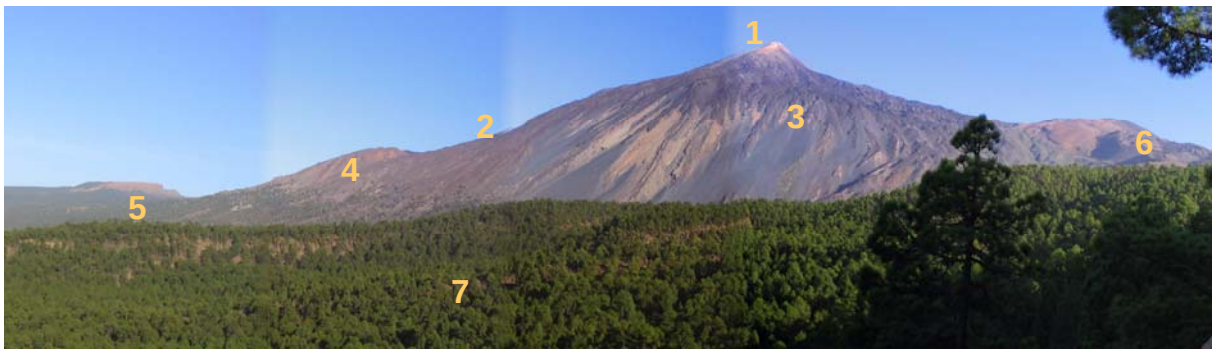

**Panorama 1: Southeast viewpoint. Landscape elements guide seen from the Filo de Las Cañadas**

**1. Las Cañadas dorsum with *Descurainia bourgaeana* and *Spartocytisus supranubius***
**2. Staggered Las Cañadas scarp, that continues unevenly, forming the border of the caldera.**
**3. Massive and viscid red lavas of the atrium**
**4. Ochre plains of the atrium**
**5. Uneven landings on old lava flows with *Spartocytisus supranubius***
**6. Domes with cupolas and massive flows, coloured red, sienna and ochre**
**7. Teide stratovolcano. Old edifice**
**8. Teide's summit cone with its black lava flows**




**Panorama 2: Eastern viewpoint. Landscape elements guide seen from La Fortaleza**

**1. Las Cañadas edifice bordering the caldera**
**2. Montaña Blanca peripheral dome, with its pumice covering**
**3. Teide stratovolcano with its gentle old form**
**4. Teide's recent summit cone and its outpouring of black lava flows**
**5. La Abejera and Pico Cabras septentrional periphery domes**
**6. Smaller cones of the eastern atrium**
**7. Lavic and sedimentary landings of the eastern atrium with dense covering of retama (Spanish Broom)**



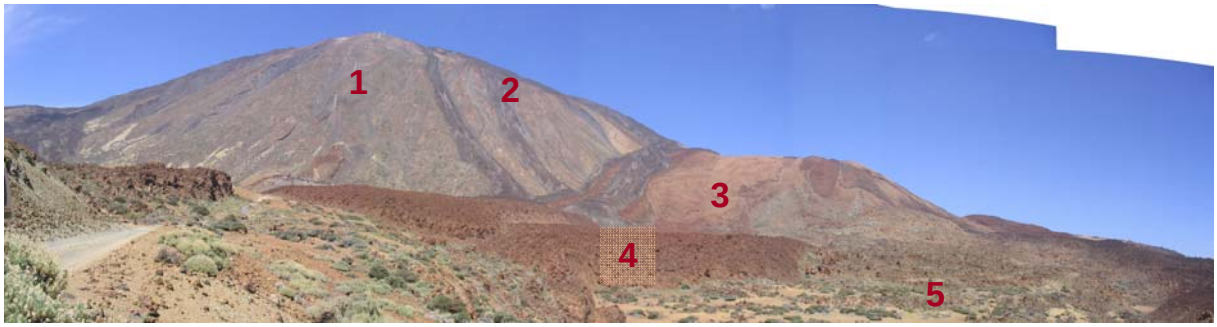

**Panorama 3: Northern viewpoint. Landscape elements guide seen from the northern pine forest**

**1. Teide's recent summit cone**
**2. The extended profile of the old Teide**
**3. Black lava flows and slopes ruled by dark debris from the northern Teide**
**4. Pico Cabras northern peripheral dome**
**5. La Fortaleza. Old eastern edifice, isolated, but related in aspect and origin with Las Cañadas**
**6. Voluminous north western peripheral dome of Los Roques Blancos**
**7. Large wooded slope north of Teide that connects with the septentrional slopes of the island.**




**Panorama 4: West viewpoint**. Landscape elements guide seen from Samara

**1. Northern slope of Teide**
**2. Teide's summit cone and western lava flows**
**3. High mountain pass between the twin Teide and Pico Viejo volcanos**
**4. Pico Viejo. Border of the great summit crater of this volcano**
**5. Western slope of Pico Viejo, with old lava flows colonised by retama (Spanish Broom) and recent adventitious**
**Cones, including the historic Narices del Teide (Teide's Nostrils) eruption**
**6. Roques Blancos peripheral dome coming from the stratovolcano's slope and overflowing with a great number**
**of lava flows.**
**7. Recent western volcano field at the base of the stratovolcano with cones and lava flows forming the upper border of the Canarian pine forest**

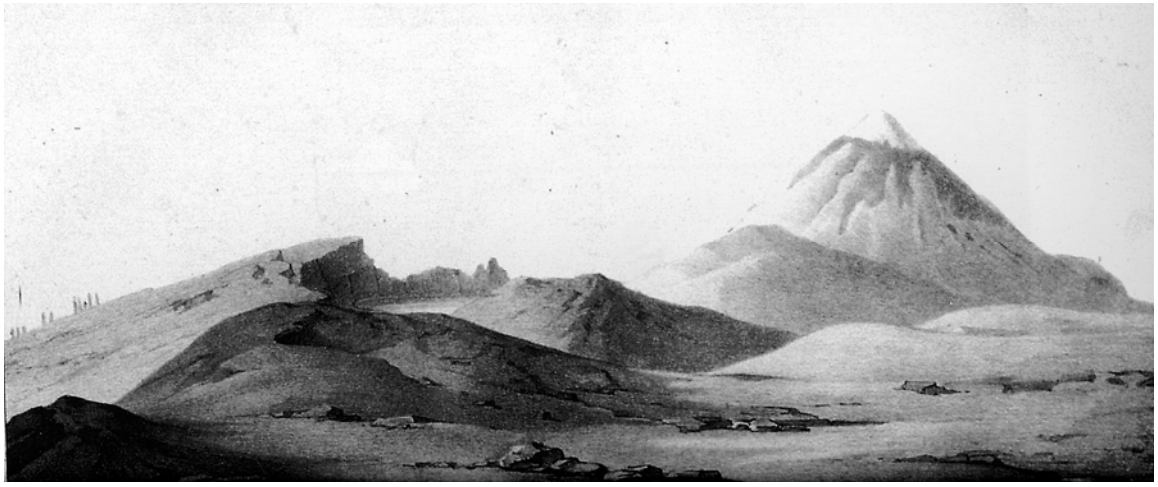



**Panorama 5: Southern viewpoint**. Landscape elements guide seen from the meridional atrium.

**1. Teide stratovolcano, with its wide old brown-coloured slopes in a wide cone, covered with retama (Spanish Broom)**
**2. Recent black lava flows that pour over the back of the stratovolcano coming from the summit cone**
**superimposed on older forms.**
**3. Peripheral basal domes south of Teide, with their viscid, reddish, arched lava flows and its partial**
**Covering of pumice, plus ochre on the cupola of Montaña Blanca**
**4. Blocks of very thick red lava flows, coming from the domes**
**5. Plains between the flows with debris and pumice, colonised by retamas and atrium scrub.**

## The morphological dominant of the landscape of the Teide National Park

In few places of the world does the volcanic relief offer the amounts of nuances, materials, forms and structures in a space of such scarce surface as in the Teide National Park. The diversity of elements in the relief is palpable not only to a small scale, with the definition of the great volcanic ensembles that make up the mountain area of the island: the old edifice of Las Cañadas, the Atrium, corresponding to the volcanic caldera, and the twin stratovolcano of the Teide-Pico Viejo, but also to large scales, where to an entire series of volcanic elements (needles, domes, cones, craters, pumice fields, blocky outflows, chordates, in planks, tubes, jameos, mounds, lava channels, etc.) we have to add those derived from its dismantling (torrents, endorheic flats, alluvial fans). The landscape of the Teide National Park is, furthermore, eminently mineral. This character is determined not only by the omnipotent presence of the volcanic forms. Contributing to it as well are the features of the vegetal cover, that permit a direct observation of the rocks, as well as the existence of extreme climatic conditions, which enable the survival and the preservation of the mineral world without great alterations throughout ample periods of time.



**Panorama created by Hartung and others in 1867**

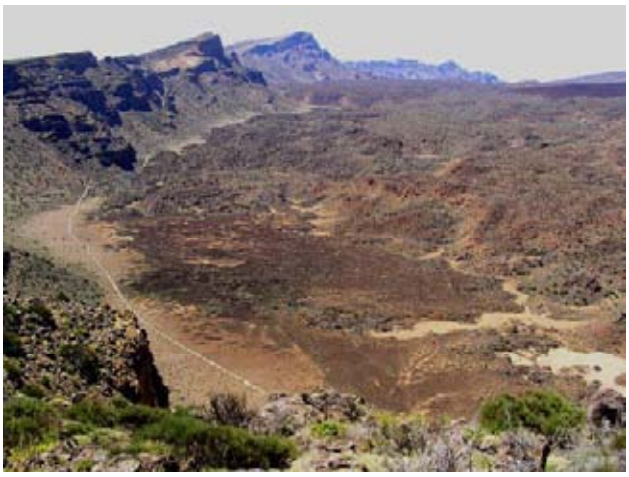
The peculiarity of el Teide is also due to the unusualness of its geographic emplacement (in a passive continental margin), and in spite of it, the existing structural connections in this ambit respond to a scheme that is conditioned and is itself a prolongation of the distant oceanic surrounding (the mid Atlantic ridge) and of the great structures that characterize the entire north-western African territory (the Atlas mountain chain). The volcanic system of Las Cañadas-Teide is located in a central position in the archipelago, right in the area where the connection is established between those other two worlds. As much the great relieves that characterize it as the minor elements of which it is made up of are organized according to a net geometry in which these connections are palpable and evident. From this point of view, this volcanic system can be considered as the meeting point and union between the Atlantic and the African continent.

### *The Cañadas edifice. The keys of the past*

It corresponds to the volcanic edifice previous to the formation of La Caldera de Las Cañadas, whose remains are only visible in the back of the wall and in the arched scarp that develops in a continuous way between El Portillo -situated to the NE- and the sector of el Roque del Cedro -situated to the SW- and which prolongs towards the north, although now in an isolated way, in the sector of La Fortaleza.

These spectacular scarps have been formed as a consequence of the destruction of the culminating old edifice of Las Cañadas. Part of the history of this volcanic ensemble has thus disappeared under the action of tectovolcanic processes or has been left blurred after the intervention of the erosion. But, observing the wall and the ridge in detail, the rocks and the strata that arm these scarps, as well as the detritic deposits situated at its feet, can still tell us the vicissitudes of its formation and of its posterior evolution. The volcanic brows narrate the spatial and temporal alternation of eruptive processes not always with the same characters, although always following a logic, an order and a coherent system, in an equal temporal and spatial dialectic, but ever changing, enabling to reconstruct the morphology and evolution of the old destructed edifice. The forms of erosion and detritic accumulation help to complete the evolutionary history, temporally and spatially linked the moment of the opening of La Caldera with the moment of the closure produced by the outflows emitted from El Teide and Pico Viejo.

It is in the wall where the history of the eruptivity of the National Park remounts to more distant eras; it is here also, logically, where the forms generated by the erosion acquire greater prominence.



**Las Cañadas wall and atrium**

In this ambit and at present, the products emitted during old eruptions are still visible; through them we can get to know not only the type of eruptions that generated them but also, from their layout and site, the forms of relief today destroyed and the evolutionary sequences of the same. Its characters talk to us, therefore, of the succession of very different types of eruptions that oscillate among the low explosiveness and the eminently

effusive ones to the ones of an average or high degree of explosiveness, with massive and potent effusions and formation of pyroclastic layers. The piling and spatial disposition of all these materials allow us to point out that the volcanic edifice of Las Cañadas, today demolished, does not correspond, nevertheless to a sole truncated cone edifice whose evolution was shortened by the generation of la Caldera de Las Cañadas, following the model that has been proposed for the formation of the majority of the caldera of volcanic genesis in the world. The remains today exposed in the scarp permit to reconstruct a more complex Cañadas edifice, made up, in reality, of a spatial lineation of a system of dome volcanic constructions of great expanse, arranged following a precise geometry, whose remains are observed not only in the scarp of the wall of Las Cañadas, but also in the interior of the atrium, in Roques de García.

Following the destruction of the Cañadas edifice, the torrential processes and the freeze-thaw action sculpted the storeys of lava and pyroclasts opening small furrows, giving place to gullies that adapted to the conditions imposed to the differentiated pilings of the volcanic materials or to the modalities of the climatic changes operated throughout the most recent quaternary. The drainage of these small and short gullies, interrupted and constrained by the outflows emitted from the stratovolcano, the ravines evolved towards closed basins. At the foot of the more or less complex volcanic crowns fragments accumulated, ripped from the wall, which in this way formed taluses of softer unevenness. Ravines and taluses feed the numerous accumulation flats which extend at its feet, connecting in an almost imperceptible way the vertical wall of the scarp with the calm world of the endorheic flats of the atrium.



**Detritus fan on the central wall of Las Cañadas**

The morphologic elements that define the ample scarp of Las Cañadas are, therefore, always the same; culminating crowns of massive or fragmented rocks carved in the roots of the old edifice, alternating taluses and ravines, carpeting its base; occasionally together with these elements we can even observe relict forms derived from the past climatic situations of greater cold, like small nivation niches, stone outflows, small drainage basins, inverted remnants of the old slope, etc.

All these elements combine among themselves according to differentiated ways in relation to the architectonic structure of the scarp itself (lithology, geometric potency and layout of the strata, degree of coherence of the rock, etc.), of the age of formation of each

one of the sections of the calderas or even of the modalities of the erosion processes under which the excavation and accumulation forms were elaborated and the time during which these have taken place. Hence, under an apparent morphological uniformity, the wall possesses, nonetheless, substantial changes which enable the definition of at least two morphologic units of lower hierarchical range; even though the combinations of detail still permit the characterization of many other geomorphologic sceneries.

From Guajara to the west, in the western wall the existence of the fronts in an elevated number of small streambeds which group to define small drainage basins, separated by interfluves that descend from the summit towards the flats; of taluses that pull almost from the highest elevations and that leave the scarp reduced to only culminating crowns or to small cornices localized at half slope; the presence of various pitons, dikes or old detritic deposits, generated in cold phases, forming inverted relieves, on the one hand; on the other, the appearance in the relief ridges in the shape of plateaus or “hats” of profiles not purely structural, as well as the development of paleochannels decapitated as a consequence of the formation of the caldera, denote a greater general dismantling of all this sector.

Although the recession of the scarp by erosion is evident throughout the entire wall of Las Cañadas, it is manifested here in an express way, highlighting the oldest antiquity not only in the initial volcanic construction but also in the opening date of the caldera of this section of the Cañadas Edifice and, logically, in some of the detritic deposits that carpet the volcanic forms. The landscape of the western wall hence owes its main features to the action of the incision and accumulation processes developed in old modelling stages and indicators of contrasted climatic changes of great transcendence in the relief, later retouched by the more recent phases of dismantling. Its importance is manifest, as it permits to establish a chronological union nexus between the opening stage of the Caldera and its posterior filling by the outflows of Teide and Pico Viejo, between what happens in the higher region of Tenerife and what is produced at inferior elevations in the rest of the island, hence permitting to determine and specify a part of the morphoclimatic history of Tenerife, not reflected through the volcano type materials.

From Guajara towards the east, in the eastern wall the articulation of the elements changes in a more or less evident way. The strip that draws the front becomes narrower with transversal developments that in no case surpass the 600 m; for this, in spite of the fact that the difference of levels between the summits and the atrium are smaller the sense of verticality is still maintained. The culminating crowns acquire greater development, showing in a clearer way the internal architecture of the old Cañadas edifice and practically characterising two thirds of the slope; furthermore they appear articulated in scarps, shoulders and cornices that manifest an ensemble layout of greater structural heterogeneity, with significant changes in the nature, potency and disposition of the strata. All this permits an internal subdivision of this scarp in at least five different sections.

Correlatively, the interfluves are substituted by rocky rams, the defined drainage basins disappear and the number and length of the ravines becomes noticeably inferior; the taluses are reduced, not only in extension, but also in thickness, indicating a notably inferior detritic tapestry. These features are in accordance with the most recent ages established for the construction and also for the opening of the caldera in this sector of the Cañadas edifice.

All these elements of the relief that characterize the old Cañadas edifice, both the volcanic ones as the modelled one, are laid out hence, following a harmonic organization that derives from and is congruent with the volcanic history of the edifice itself and with its most recent morphoclimatic evolution.

***The Atrium. The transit area***

Even though the atrium constitutes on a small scale one of the great morphologic units that characterize the volcanic relief of the Teide National Park, in the sense that it constitutes a depressed sector between the wall and the Teide Pico Viejo, its internal morphology is profoundly linked to both the volcanic processes generated in the stratovolcano and to the erosion processes that have marked the most recent history of the imposing walls of Las Cañadas. In this way, the morphologic elements that characterise the ample atrium of Las Cañadas are, on the one hand, the flats of sedimentary accumulation that flank in a more or less continuous way the inferior base of the wall of La Cañadas; on the other, the lava outflows that coming from Teide and Pico Viejo enter into the depression and redraw in a constant way its detailed morphology. The personality of these sedimentary flatlands and of these lava levees is, precisely, what endows the atrium with its more specific and particular feature; the impact of the relief forms that hosts the atrium is of such category that the features derived from its particular genesis and from its depressed character fade in the face of the sharpness of the lava outflows and the orographic contrast of these with the accumulation flatlands.

Maybe because of this, it is precisely in the atrium where the diversity of forms, processes, textures and colours is more ample. Riding between the volcanic world and the erosion one, between the stratovolcano and the wall of Las Cañadas, and in spite of its lesser visual impact, the atrium must be considered as one of the units of emblematic relief of the park. It is here, furthermore, where man's action has been greater; not in vain is its character depressed, between the scarped world of the wall and the world of the high mountain of el Teide, as well as its natural opening to the north, to the south and to the west what has propitiated that it can be considered as a transit way between the island's rich north and the past and poor south. It is here also, where the Guanches established their summer grazing lands and where, with all the present logic, the existing main tourist routes and footpaths were developed in the interior of the park.

The atrium can hence be considered a transit unit; between the old and the recent, the erosion and the construction, between the volcanic and the erosive and between the north and the south of Tenerife, between its traditional use and its present use. This transition does not mean, nevertheless, a loss of identity nor a blur of the constituting elements. In the atrium an ample range of relief forms are found, both directly derived from eruptive processes, and modelled in the course of time by the action of the current waters, the ice and, even, the wind.

This transit we are talking about is not, therefore, only conceptual or morphological, it is also spatial. From the north to the south first, from its connection to the wall of Las Cañadas to the base of the stratovolcano later, we gradually go by multiple nuances that permit the definition of other minor units in the interior of the atrium, but which at the same time could be subdivided into other many spaces with entity and contrasted personalities.

In this way, it is possible to distinguish as geomorphologic units of a lesser scale two different atriums, separated by a spectacular wedge which is the prolongation of the features that define the amphitheatre of the walls of Las Cañadas, but that at the same time owns a personal morphological entity: Los Roques de García, which form its third great unit.

In this way, we can differentiate a first sector, the eastern atrium, with shapes of clear relief; an eminently volcanic world of reduced horizons, of great stone blocks of cutting sharp edges that descend downslope towards the wall, until generating striking spaces, softened only here and there by the uniformity impressed by the whitish pumice accumulations or by the narrow endorheic flats that are formed at the foot of the wall of Las Cañadas or el Teide.

A world that owes its special configuration to the existence of recent lava outflows of viscous magmas of great thickness that, emitted from the dome edifices of the Teide base or from mouths located in the depression itself, digit themselves or arrange themselves fan-wise when entering the atrium, they interlace, juxtapose and interpose until constituting a relief of apparent chaotic layout that is only lost when the volcanic forms are seen at a distance.

In this atrium predominate the direct volcanic forms, very recent, with barely any retouches derived from the action of the erosive processes. It is the dominance of the viscous outflows, massive, thick, with sometimes obsidian textures, and made up of a superficial relief that in an ensemble we could denominate as in blocks, but which become multiplied in the detail. We find in this way, outflows in massive polyhedric blocks of great proportions, finished off by a clinkercrust, chaotic, strongly welded and separated by fissures of vast proportions; thick outflow blocks of smaller size also appear, with forms in pinnacle, needles or even with spherical characters, separated or not by cracks; there are still outflows with clinker fragments or angled of smaller size, very similar to the outflows *aa.* All these forms can, furthermore, appear to be forming by themselves determined lava units, or layout in a combined way in one only flow; to find themselves practically buried under the thick pumice strata or to show a slight pumiceous cover, to show drainage channels or arches, accentuating even more visibly the existing diversity. Only in the base of the stratovolcano or at the foot of the wall do forms appear of softened relief corresponding to sectors of sedimentary accumulation, drawing a narrow and discontinuous strip, constrained between the wall and the volcanic flows.



**Blocks of domatic flows**



**Domatic flows covered with pumice stone on Montaña Blanca**

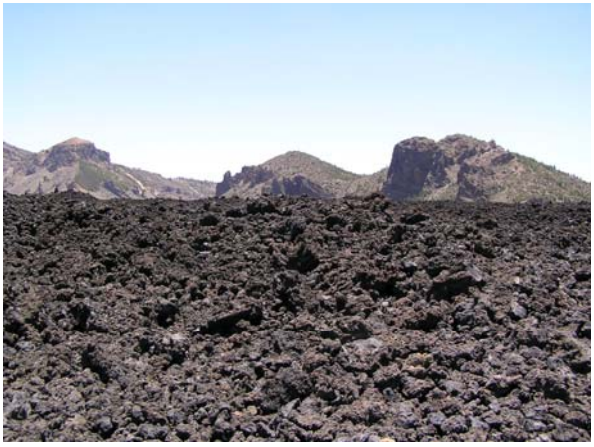
It is in the western sector where the atrium acquires its most evident depressed characters, for it constitutes a closed area both to the south, by the wall of Las Cañadas, to the north, by the double stratovolcano Teide-Pico Viejo and to the east, by the pearls of volcanic needles of Los Roques de García, connecting with all these areas, in all cases by more or less accentuated differences of levels.

Shaped then, like a great closed basin, the western atrium possess, nevertheless, more diaphanous and open horizons than the eastern one. This is due to the characters of the morphologic elements as much of the modelled ones as the volcanic ones that integrate it. On the one hand, a greater predominance of the spaces linked to the sedimentary accumulation, that acquire here not only a greater extension and a greater spatial diversity, but also a greater imprint in the landscape. On the other, the presence of outflows of less outstanding topographies, more fluid and with visibly inferior potencies, with continuous surfaces of undulated, lobed, roped, draped etc. character, or well with fragmented surfaces of a chaotic and clinkered nature, constituted by bristled elements of smaller size; sometimes even outflows of transition between the features can be observed.



***Pahoehoe* flows on Pico Viejo**

In the interior of this ample atrium there are, nevertheless, defined morphologic variations that are related not only to the particular eruptive dynamic which has generated them but also the age of the same with its erosive remodelling. Hence elements stand out such as the extensive Valley of Ucanca, the initial *pahoehoe* outflows of the Pico Viejo formation, the ample lava slopes partially carpeted by detritic materials that bind together with no solution of continuity with the back of the stratovolcano, the detritic fan of Chafarí or the vast sector occupied by the materials emitted during the eruption produced in the 18th Century, Las Narices del Teide (1798).



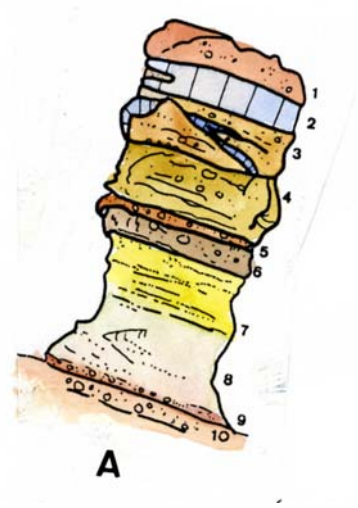
***AA* lavic outpourings from Las Narices del Teide**



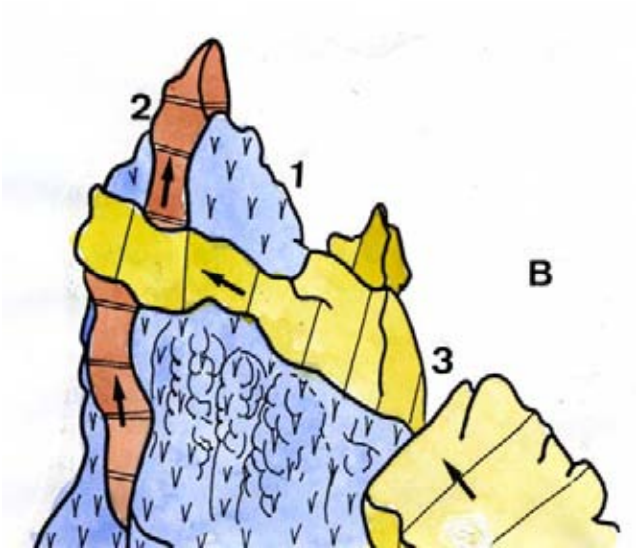
**Relief shaped like runes on Roques de García**

There is no spatial contact among these two worlds of the atrium. Separating both spaces are the Roques de García, constituting the only sector of the atrium in which the verticality dominates. Its sharp and ruin-shaped volcanic needles are articulated in such a way that, its prolongation appears to not only divide the atrium, but also to mark the transit between the two great units of the wall and between the two great cones of the stratovolcano. Its castled forms obey the action of the differential erosion on an old

volcanic system of great morphological complexity, where the old emission conducts predominate; the forms, although dependent on the structure are fundamentally erosive. Los Roques de García constitute hence, a morphological counterpoint with respect to the rest of the atrium. Its spatial location, in the approximate centre of the National Park makes them into an authentic spinal cord of the relief.




**ROQUE CINCHADO:**
**1: Layer of compact gaps.**
**2: Sill.**
**3, 4, 6 and 9: gaps.**
**5: Gap of thick material.**
**7: Clear band.**
**8: Pyroclasts and gaps.**
**10: Basal gap.**




**NEEDLE OF THE CREST OF ROQUES DE GARCÍA:**
**1: Box of trachytic material.**
**2 and 3: Successive intrusion dikes that reinforce the shape of the**

**Examples of elements that define in detail the formations on the Roques de Garcia landscape**

### *The Teide-Pico Viejo. The new land of fire*

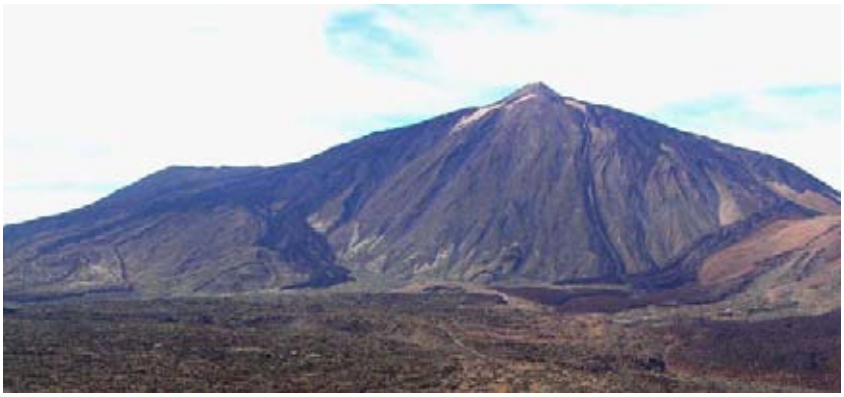
Following the destruction of the Cañadas edifice and the formation of the caldera, the eruptive activity was spatially transferred, becoming concentrated around only two eruptive mouths and shaping a new territory of fire. Territory that possess an essentially dual nature. Duality in the processes, in the phenomena, the deeds and the forms, and that is, at the same time, genetic and structural, evolutionary and chronological, morphological and spatial, and even perceptive and cultural.

The stratovolcano Teide-Pico Viejo is the result of a transfer and concentration of the eruptive activity produced in the last thousands of years of a narrow strip of parallel layout to the western wall of Las Cañadas. It constitutes a voluminous mountain that partially covers the old structures, closing them in the north; a high recent mountain superimposed to the old volcanic constructions partially dismantled of Las Cañadas; the duality of a world over another world, of an island on another, of the recent on the old.

This double nature is also structurally manifested, from the network of fractures that spatially organize its main volcanic forms. On the one hand, the NE-SW fractures, around which are aligned not only the two main eruptive mouths of the stratovolcano, but also part of the minor elements which give it shape, as La Montaña de las Lapas, Los Gemelos or the chains of craters and edifices of the Volcano of Las Narices del Teide, of the Montañas de Chío, of the open alignment of the volcano La Corona and Montaña Chafarí, or of the emission points of the dome of Montaña Rajada. On the other, the volcanic ensembles of Abejera, Pico Cabras, Roques Blancos, or the complex system of effusive points of Montaña Blanca which are articulated according to fractures of the marked NW-SE course.

In this narrow strip the majority of the volcanic eruptions of the last one hundred years have concentrated, first through the two main craters of the stratovolcano: El Teide and Pico Viejo, and later, giving place to volcanic cones and to an entire ensemble of domes that trim its base and tear its flanks. A simple geological history, with a concentration of the activity in the main peaks first, and later with the construction of minor peripheral volcanic structures. A history and an evolution also dual where inasmuch the first emissions are basaltic, the last ones are trachyte and phonolite; a stratovolcano of a phonolite surface and a basaltic heart.

Yet it is, without doubt, the topographic and morphological aspect where this duality of the high Tenerife mountain is more evident, as much as it can be considered a double volcano. In reality, then, two great volcanic constructions with marked common features, whose products become bound, are juxtaposed and superimposed, without losing in no moment, its unique character; but at the same time, two volcanic ensembles with differentiated personalities, to the extreme of appearing in an individualized way even in their names. This duality is manifested hence in an express way even in the different morphological units of average scale that make it up.



**Teide-Pico Viejo double stratovolcano**

On the one hand, the stratovolcano of el Teide, of more sober and pronounced profiles. An edifice of a certain antiquity, with an old culminating crater depression, hidden at present, and whose remains are only visible in the volcanic rams that flank La Rambleta. A great conic edifice characterised by steep slopes, constituted by the piling of lava outflows that have already lost their original morphological features, and the show

evident signs of its dismantling in torrents like in the La Corbata, or in the detritic taluses that carpet and homogenize the volcanic forms.

A voluminous mountain that finds itself, nevertheless, rejuvenated in its cusps, in its flanks and in its base by the materials emitted in very recent stages, that are what form the most outstanding morphological elements of the ensemble. Hence, going around the great cone at its base, the ensemble of domes, recent outflows of Abejera, Pico Cabras and Los Gemelos, together with other older ones and partially buried by the outflows of greater youth, like the dome ice cake of the saddle point of Pico Viejo[1] or the projection which forces the last lava flows of el Teide to change course in the southern flank of the stratovolcano, shape a spatial unit of great morphological uniqueness. In spite of its elevated viscosity and its dome nature, the outflows emitted from these eruptive centres are spilled by ample spaces, prolonging the specific features of the stratovolcano going beyond its strict morphostructural ambit. Equally, the pumice accumulations possess ample areas of dispersion and morphologically characterize the territory of other units, such as the western atrium or the field of volcanoes Portillo-Izaña. Just as another noticeable element of the ensemble, do the small summit volcano of El Piton del Teide and the black outflows, of marked filiform features, stand out, which are overflowed from the same and which cover almost two thirds of the stratovolcano and that, in spite of its features of greater fluidity, practically in no case to the surpass the limits of the edifice itself. Duality, therefore, also in the facts, the phenomena and the elements that constitute and shape the harmonious ensemble of el Teide.



**Montaña Blanca-Montaña Rajada domatic group**

In contrast with el Teide, Pico Viejo constitutes a cone of less outstanding profiles and volumes, of a more calm personality, although equally rich and rotund. The greater geologic youth of this edifice determines that its slopes be formed by lava outflows whose morphologic features of detail are still perceptible, existing an elevated morphological variety. Here predominate the lava outflows generated by fluid flows, with superficial morphologies of the pahoehoe type -roped, lobed, draped, in planks, in guts etc.-, or with the habitual chaotic forms of the aa; nevertheless, they stand out in the landscape for their own structural, morphological and chromatic characters, the occasional blocky outflows of

[1] Both the dome ensembles of the Los Gemelos and the lava ice cake close to it belong, therefore, from a morphological point of view, to the volcanic system of el Teide. Nevertheless, it is important to specify that its placement in the saddle point of Pico Viejo determines that topographically it is inserted in this volcanic edifice, for which scenically these ensembles are considered as a unit of Pico Viejo.

a dome type. Many of these lava flows possess already a carpet of detritic materials which contribute to the homogenisation of the superficial morphology of detail, although without losing, in no case, its greater structural features. As ensemble and counterpoint with el Teide, the slopes are here, furthermore, not so homogenously modified by the recent volcanism, although its imprint in the landscape is equally outstanding. Only towards the SW and the W, the historical volcanic system of Las Narices del Teide or the forceful and formidable dome relief of Roques Blancos, respectively, introduce morphological elements of first order and also dual, which contribute to a greater diversification and richness of the morphological landscape.

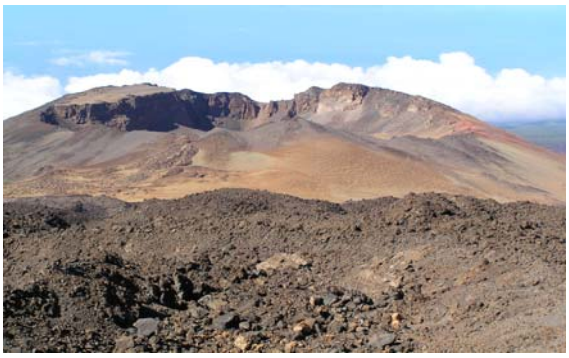


**Las Narices del Teide volcano. 1798 eruption**

In spite of all of this, it is in the culmination of the great cone of Pico Viejo where the contrasts with el Teide and the peculiarity of the volcano become more evident. Culminating 600 metres below el Teide, Pico Viejo is crowned by a crater of vast proportions, of more than 800 m diameter and of around 200 m depth; a crater eight times the diameter and almost five times deeper than the crater of el Teide. An eruptive mouth not only of greater span and spectacular nature but also of greater morphologic complexity, with intra-crater lava platforms situated at two different levels, explosive funnels, nested craters, intra-crater outflows, vertical scarps, taluses, and with modelled forms of detail generated under low cold conditions. An focus centre that reveals a prolonged and interesting eruptive history and which complements the already varied volcanic relieves of the stratovolcano. Here also, in Pico Viejo, the duality is internal, for the characters of the elements of the relief which shape it, and externally, for the counter position with the other close volcanic peak.



Teide terminal cone and crater



Pico Viejo crater

Finally, this duality is manifested even in the form with which the great mountain of the Canaries has been and is perceived. While el Teide is identified as the highest mountain of the islands, visible from many points of Tenerife and from the archipelago, Pico Viejo is only perceived as an autonomous edifice once beyond the line of volcanic monoliths of Los Roques de García or from very close points to the stratovolcano. Quarters of hell and in of malefic divinities such as Guayota, el Echeide of the guanches has been considered by the Canaries many times as a protective and familiar being: "father Teide", showing once more the duplicity of its nature. A duality, in definite, that signifies richness and contrasts, variety.

***The extracaldera volcanic fields. The connection with the exterior volcanic world***

The geomorphology of these two extracaldera volcanic fields, but inserted within the boundaries of the Teide National Park, is essentially defined by the presence of big and small volcanoes of monogenic crater, that cluster and align themselves together according to specific fractures, oriented NE-SW or NW-SW, adapting to the same structural scheme we have seen characterizes the volcanism of the Teide-Cañadas ensemble. In both cases, they correspond to sectors in which the contact is produced between this central volcanic ensemble of the island and the other two recent volcanic structures of Tenerife: the ridge of Pedro Gil and the one of Bilma or Cumbres de Abeque, situated to the NE and SW respectively of the National Park.

We are talking of areas of relatively simple structural and geological features, but that geomorphologically are rich in volcanic forms of detail; relieves that complement the volcanic forms associated with the basaltic volcanism present in the crest edifice of the island. In them dominate the simple volcanic cones, of Strombolian-type, ring or in horse-shoe shaped, which present craters in funnels, open or closed, and with maximum diameters following the direction of the dominant fractures. These small volcanic edifices can appear both in an isolated way, individualized ones from others, and juxtaposed, attached, overlapping and, in some cases, superimposed, constituting volcanic groupings more or less dense that draw from discontinuous or continuous alignments, to clustered agglomerations or layouts.

The recent age of all these ensembles determines that the modelled forms be reduced and the appearance of short but not very deep ravines on the cone ridges or

localized in the existing corridors between the volcanic edifices. There are also occasionally small flats of sedimentary accumulation, generated in the small levees existing between volcanoes or associated to the closure of old hydrographic networks as a consequence of the installation of eruptive ensembles of historic age.

This is the general scheme for both volcanic fields; nevertheless there are small morphological nuances that permit the definition of two different units. On the one hand, the volcanic field of Portillo-Izaña, associated to the ridge of Pedro Gil; on the other, the eruptive ensemble of the volcanoes of Amara-Cruz de Tea, which represents the most south-western sector of the ridge of the Cumbres de Abeque.

These difference are the result of spatial organizations of clearly contrasted elements. In the sector of Portillo-Izaña, the eruptive apparatus align themselves around fractures of clearly NE-SW direction, grouping until shaping a volcanic field of elevated density of edifices by $Km^2$. In this volcanic field the eruptive ensemble of the Volcanes de Fasnia stands out, corresponding to one of the three apparatus generated during the first historic eruption of the island, produced between late 1704 and early 1705.

In all this sector, the greatest number of cones, its contrasted ages and its direct placing in the line of the summits make possible the existence of types of modelling of greater incidence in the landscape. Hence stand out, the endorheic flats of Maja and the hydrographic basin of the Corral del Niño which, closed by the placing of the historic volcanoes of the eruption of 1704-1705, has evolved until transforming itself into a small flat of sedimentary accumulation.

On the contrary, the volcanic field of Samara is shaped from a smaller number of volcanic edifices, these spreading in clear volcanic lineation of a discontinuous nature. These volcanic alignments prolong, in reality, the aligned layout of NE-SW of the ensemble of volcanic edifices inserted in the back of the great edifice of Pico Viejo (Montaña Cruz de Tea, or Reventada), to become positioned in the farthest locations according to contrasted orientations ofNW-SE courses (Montaña Samara). From them, part the lava outflows of a still fresh morphology. In the landscape dominate the direct volcanic forms, small fissure volcanoes, lava fields and fields of pyroclast accumulations, with no existing noticeable modelling elements.

| GEOMORPHOLOGIC UNITS AND ELEMENTS IN THE LANDSCAPE OF EL TEIDE | | |
|---|---|---|
| **Principal Units** | **Minor Units** | **Outstanding morphological elements** |
| Stratovolcano | Teide | Pitón and Coladas Negras<br>Basal Domos: Montaña Blanca- Rajada, Abejera, Pico Cabras, Los Gemelos<br>Slopes with erosive remodelling: lava ridges, Torrents, Taluses |
| | Pico Viejo | Crater<br>Flank Domes: Roques Blancos<br>Radial basaltic ensembles: Narices del Teide (1798)<br>Lava slopes |
| Atrium | East Atrium | Blocky outflows<br>Basalt cones and atrium domes<br>Endorheic flats<br>Alluvial fan: La Corbata |
| | Roques de García | Pitones, dykes, neks |
| | West Atrium | Pico Viejo slopes with lava flows<br>Historic lava flows Narices Teide (1798)<br>Endorheic Plains<br>Chafarí alluvial fan |
| Cañadas | East Wall | Lava flows and ample pyroclasts<br>Taluses reduced in thick and development<br>Rocky spolons<br>Scarcity of torrents |
| | West Wall | Closed drainage basins with separation interfluves<br>Marked torrents<br>Detritic deposits in inverted relieves<br>Developed detritic taluses<br>Narrow culminating brows<br>Dykes and pitons |
| | Ridge | Guajara<br>La Fortaleza |
| Extracaldera volcanic fields | Portillo – Izaña | Basalt volcanic agglomerations<br>Fasnia Volcano (erruption 1705)<br>Endorheic Plains |
| | Samara | Discontinuous volcanic lineation of basaltic nature<br>Lava fields<br>Pyroclast deposit fields |

## The vegetation bloom of the Teide National Park

Even though from a floristic point of view, the Teide National Park holds great interest for its elevated proportion of regional, island and local endemism, the plant life has a relative landscape importance, scarcely contributing to the aspect of this area. The climatic characteristics of Alto Tenerife, cause stress, especially thermal, on the forms of vegetal life to which these respond with a dominantly bushy physiognomy, which only tinges the appearance of this territory. As an ensemble, it is a characteristic bush of the high template mountain, but it incorporates elements of great morphological uniqueness, like the species of the gender *Echium,* which evoke the image of the vegetation of the highest floors of the tropical mountain, indicating the geographical character of latitudinal transition of this high Atlantic mountain.

The scrubland does not take importance away from the forms of relief, but rather, on the contrary, through its different degrees of continuity and coverage, as well as its different combinations of florist species, emphasises the geomorphological features, highlighting and helping to define the geography of the forms of relief. Only during the spring blooming period, does the vegetal cover cease to be a discontinued green bloom and acquires a greater general importance, for the white, yellow, red, pink blue and violet paintbrushes diversify the habitual dominant chromaticity of the ochres and black of the rock. It is also in this season when the atmosphere fills with varied and intense aroma, which contribute to the sensations that the landscape brings out in the visitor.

The vegetation is composed of numerous floristic species, among which the most common ones are *Spartocytisus supranubius, Pterocephalus lasiospermus, Descurainia bourgaeana, Adenocarpus viscosus, Erysimum scoparium, Argyranthemum teneriffae, Echium wildpretii, Echium auberianum, Nepeta teydea, Scrophularia glabrata, Cheirolophus teydis, Carlina salicifolia, Tolpis wellbii, Andryala pinnatifida, Viola cheiranthyfolia, Pimpinella cumbrae, Ferula linkii, Micromeria sps., Lotus sp.* and *Sideritis sp.* Different combinations of some of them characterize concrete forms, atmospheres and places, but for their own dimensions, for their abundance, for their adaptation capacity to varied ecological situations or well for its morphological and chromatic uniqueness, those that have a greater landscape imprint are the retama (*Spartocytisus supranubius*), the hierba pajonera (*Descurainia bourgaeana*), the rosalillo de cumbre (*Pterocephalus lasiospermus*), the codeso (*Adenocarpus viscosus*) and the tajinastes (*Echium wildpretii* y *Echium auberianum*).

The great variety of original volcanic forms or remodelled by the erosion, with its different chronologies, the contrasted massiveness, superficial continuity and fragmentation of the rocky structures, the different relative topographic situations, the different inclination levels of the terrain, the unequal degrees of intensity, present and past, of the torrential processes, frost wedging and gravity slides, have such a powerful ecologic effect that they shadow the direct influence of the local climatic variations. They are, therefore, the forms of relief the ones that fundamentally determine the geography of the types of vegetal landscape of the National Park, from the multispecies scrubland to the rocky walls populated only by disperse samples of cedros (*Juniperus cedrus*), pines *(Pinus canariensis*) and moralitos *(Rhamnus integrifolia*). The sharpness of the forms of relief as conditioners to the vegetal landscape, is interrupted only in the places where man created a vegetal cover with an exceptional scenic coverage and colouring, due to the concentration of the tree elements -*Pinus canariensis*-.

The narrow association observed today among the morphological and vegetal components of the landscape has increased since the declaration of this space as a natural park which implied the suppression of the herding use. The coincidence of the vision of the travellers and scientists of the 19th and 20th centuries regarding the existence of a very scarce vegetal coverage constituted almost exclusively by the *retamar,* as well as the evolution of which habitual walkers of the park have been witnesses, indicate that in the last 50 years a progressive biological occupation has taken place, in whose process there has been an outline of a great diversity of habitats and ecological niches that have not yet become fully defined. For this, from a scientific point of view, el Teide is not only a laboratory volcano, but that it also constitutes an exceptional model of vegetal landscape dynamic of the subtropical mountain in volcanic territory.

## *The types of vegetation*

### Scrublands of *Spartocytisus supranubius*

Open scrubland of *Spartocytisus supranubius*

It is a monospeces scrub that develops in the sectors occupied by taluses of active scree, both from the wall of Las Cañadas and from the stratovolcano Teide-Pico Viejo. Therefore, the thickness size of the *clastos* and the scarce stability of the substrate carry out a floristic selection, as well as causing the present scrubland to have a stunted aspect and an open layout.

Scrubland of *Spartocytisus supranubius* with *Descurainia bourgaeana*, *Nepeta teydea*, sometimes *Cheirolophus teydis* o *Pinus canariensis*, and *Echium wildpretii*.

In the deposits of the wall there are *retamares* with a certain floristic variety that respond preferentially to the presence of fine fraction and to a certain stability of these detritic accumulations, some of them with morphological prints of frost wedging imprint. Accompanying the *retama*, samples are seen of *Nepeta teydea, Descurainia bourgaeana* and *Echium wildpretii*, and even groupings of *Cheirolophus teydis* and some *Pinus canariensis*. The coverage of this bush, whose main physiognomy comes from the presence of the broom, is approximately 50-70% of the surface and has a frequent location in the western and central section of La Pared, even though they are related to the sedimentary accumulations of Los Roques de García.

Disperse elements of *Spartocytisus supranubius*

This type of vegetation adapts itself to a lava morphology of dome blocky outflows and to basaltic lava surfaces of great and irregular fragments with barely any pumice coverage. The difficulties of superficial accumulation of *finos* determine the low degree of coverage of this vegetal manifestation. From the point of view of its distribution, one its most striking characteristics is a certain spatial repetition, given that it tends to combine with other types of vegetation in the lava spreads/spills of the atrium to create particular mosaics that shape different units of vegetal landscape.

Local retama concentrations with isolated samples of *Argyranthemum teneriffae* and *Tolpis wellbii*

Another of the expressions of the *retamar* that is distinguished by the scarce florist and cover significance is situated in the lava spills of the stratovolano and also in certain sectors of the dome ensembles. The lava surfaces of heterometric rocks and of considerable size impose a limited presence of the vegetation, which is reduced to small samples of *Spartocytisus supranubius, Argyranthemum teneriffae* or *Tolpis wellii*. This type of tree vegetation can be recognized, for example, in the outflows of Montaña Blanca and Montaña Rajada, as well as in the lava flows of Teide-Pico Viejo.

Scrubland of *Spartocytisus supranubius*, *Argyranthemum teneriffae*, *Descurainia bourgaeana*, *Nepeta teydea* and *Scrophularia glabrata*

This scrubland is distinguished by a certain floristic diversity and superficial cover, given that the retama is accompanied by other species such as *Argyranthemum teneriffae*, *Descurainia bourgaeana, Scrophularia glabrata* and *Nepeta teydea* with a maximum cover of 80%. The favourable conditions of the lava substrate of more or less regular surfaces, and the scarce potency of the pumiceous mantle that can partially cover the outflows, permit this landscape predominance in the vegetal element. Bushes of these characteristics can be seen in the lava spills of Montaña Corrales and around Montaña Las Lajas and Montaña Negra.

Scrubland of *Spartocytisus supranubius* with *Agyranthemum teneriffae*

The scrubland composed mainly of the *retama* and *margarita*, with an average cover, are related to the Teide outflows of some antiquity. The significant transformation of the substrate allows for a coverage of 60-70% of the volcanic surface.

Open scrubland of *Spartocytisus supranubius*, *Descurainia bourgaeana* and *Pterocephalus lasiospermus*

It is a scrub formation typical of the recent basaltic cones. This type of vegetation corresponds to a scrubland principally integrated by *retama, hierba pajonera* and *rosalillo*, which, in general lines presents a sparse and very discontinuous cover, imposed by the slope, the size of the pyroclasts and the scarce stability of the substrate in which it is developed.

Relatively dense scrubland of *Spartocytisus supranubius* with *Descurainia bourgaeana* and *Pterocephalus lasiospermus*

On the sedimentary materials identified in the deposit of La Corbata and in the flatlands situated at the foot of the volcanic cones of Portillo-Izaña, there are scrublands composed of *Spartocytisus supranubius, Descurainia bourgaeana* and *Pterocephalus lasiospermus,* that surpass 50% of the surface, although internal variations can be appreciated according to the unequal spatial effect of the surface runoff. Contrary to the previous type of vegetation, this bush formation presents a more continued and closed development.

**Scrubland with *Juniperus cedrus***

Multispecies scrubland with *Juniperus cedrus*

This scrubland presents an important density that is mainly distributed among the floristic elements *Spartocytisus supranubius*, *Pterocephalus lasiospermus*, *Adenocarpus viscosus, Nepeta teydea and Micromeria* sp. Accompanying these bushes, our attention is called by the numerous samples of *Juniperus cedrus* and some of *Pinus canariensis* that extend up to the tree strata the vertical structure of this type of vegetation, although they have a disperse spatial localization. The

importance of the pines may be due to the proximity of the forest corona immediately inferior in altitude.

**Scrublands of *Adenocarpus viscosus***

Concentrations of *Adenocarpus viscosus*

The *codesos* gain importance in those substrates composed of pyroclasts, but with a certain degree of stability over the outflows of clinker fragments, and in relatively stabilized deposits. For this reason, the concentrations of *Adenocarpus viscosus* are seen only in determined sectors of the dome outflows, in the streambeds of the channels of some currents of old lava of the stratovolcano, or in the fields of lapilli of Samara. Nevertheless, this type of vegetation does not achieve a noticeable superficial development, but, together with other bush manifestations already pointed out, usually forms a part of vegetation mosaics characteristic of the park.

Grassland of *Arrhenatherum calderae* with *Adenocarpus viscosus* and *Nepeta teydea.*

This vegetal manifestation is distinguished by the uniqueness of its floristic composition, result of the presence of sedimentary material of torrential origin on the lava spills of the southern face of Pico Viejo. The most striking from a point of view of the vegetation is the physiognomic predominance of the graminea *Arrhenatherum calderae* that associated to *Adenocarpus viscosus* and to *Nepeta teydea*, shape a grassland-scrubland with an average cover rate of 60-70%.

**Scrublands of *Pterocephalus lasiospermus***

Scrubland of young elements of *Pterocephalus lasiospermus*

The groups of plántulas and young samples of *Pterocephalus lasiospermus* constitute a type of vegetation characteristic of the sedimentary deposits of torrential and frost wedging nature. This species tolerates vertical movements produced by the action of ice-thawing. The concentrations of rosalillos can be seen, for example, in the front of the deposits of La Pared or in the sectors of alluvial fan of La Corbata, or in the intralava coulee-like forms filled with pumices or covered with slag, typical of the dome outflows and some basaltic ones.

Open scrubland of *Pterocephalus lasiospermus*, *Adenocarpus viscosus* and *Spartocytisus supranubius*

Another scrubland composed by *Pterocephalus lasiospermus*, but integrated as well by *Adenocarpus viscosus* and *Spartocytisus supranubius*, it is related with the endorheic flatlands, as well as with pumiceous surfaces that recover the dome outflows. These substrates of small soil texture facilitate the settlement of the first two floristic elements followed by the *retama*. It is a scrubland with a discontinuous cover that generally oscillates between 20-40% of the surface.

**Open vegetation**

Disperse elements of *Argyranthemum teneriffae*, *Scrophularia glabrata* and *Descurainia bourgaeana*

On the recent lava materials of basaltic nature and on the outflow sectors with a blocky morphology, vegetation is hardly distinguished, except in some very isolated plants of small size of *Scrophularia glabrata, Argyranthemum teneriffae* and *Descurainia bourgaeana.* The youth of the volcanic materials, in the first case, and the difficulties for the accumulation of fines imposed by the surface of dome outflows, in the second, explain these features of the vegetation.

Isolated samples of *Erysimum scoparium, Nepeta teydea, Echium auberianum and Viola cheiranthifolia*

In dome ensembles like Montaña Blanca and Montaña Rajada a very scarce vegetation is developed, of isolated elements of *Nepeta teydea, Echium auberianum, Erysimum scoparium* and *Viola cheiranthifolia* and in which the significant floristic variety it presents calls attention, in spite of its low cover with less than 5% of the surface.

Disperse elements of *Juniperus cedrus* and *Rhamnus integrifolia*.

It is a vegetal manifestation typical of the culminating rocky brows of the wall, to which the fisuricol species *Juniperus cedrus* and *Rhamnus integrifolia* adapt. These floristic taxa progress locally in fissures and small topographic overhangs, therein that they constitute only disperse vegetal elements on an ample rocky surface.

Open scrubland of *Pterocephalus lasiospermus* and *Spartocytisus supranubius*

On the rather continuous and regular volcanic surface of the *pahoehoe* outflows, the mountain bus opens in a significant way, given that the transformation of the rock forms and the capacity for accumulation of the fines on the rock, are noticeably reduced. Nevertheless, internal variations are appreciated in the scrubland according to the forms of detail of these outflows. Thos that present forms in plates or sheets, only contain samples of *Pterocephalus lasiospermus* situated in the fissures with a 5% cover. In those that have a gut morphology with a greater volume and irregularity, for they are spilled by sectors of greater slope, the predominant plants are *Spartocytisus supranubius* and *Scrophularia glabrata,* with a 25% cover. Lastly, in the gut forms with fine and very fractured lava crust, the abundance of *finos* in surface causes an increase of the coverage and a dominion of *Pterocephalus lasiospermus*.

**Pine groves**

Isolated trees of *Pinus canariensis*

This type of tree vegetation is exclusively composed of *Pinus canariensis,* which grows without difficulty in the fissures and small cornices of the scarps, especially in the western sector of the wall, and in the potent and massive dome outflows of Roques Blancos and of Abejera. The greater part of the pines are young and are arranged in a disperse way.

Pine grove with varied underbrush

The surfaces of pine groves with imprint on the landscape are situated in determined sectors of the perimeter of the park and are the result of the spontaneous development of *Pinus canariensis* in places like Montaña Guajara and to the forest repopulations of the rest. Due to the altitude, the underbrush that accompanies these pine groves are fundamentally integrated by *Spartocytisus supranubius*, together with other species like *Adenocarpus viscosus, Chamaecytisus proliferus,* and *Carlina xeranthemoides,* among others.

***The great features of the vegetal landscape***

The great variety of elements of the vegetal landscape, or the types of vegetation, that are recognized in El Teide are juxtaposed and spatially combined, forming a puzzle of great aesthetic harmony with the forms of relief and with the colours and textures of the rocky formations. Some of the define by themselves the vegetation of some places, but it is more frequent for them to interspersed, weaving vegetal landscapes characteristic and typical of concrete sectors. As a consequence, apart of the little physiognomic relevance of the vegetation in the general aspect of el Teide, the other fundamental feature of the vegetal component of its landscapes the multiple spatial association of very different types of vegetation, as a docile response to the contrasted ecological conditions that can be given in spaces of scarce extension. To these two singularities we have to add the fact that there are ample surfaces with no apparent vegetal cover, which correspond to the forms of the most modern volcanic creation, to the most compartmented rocky surface, to the places whose substrate is integrated by very fragmented and mobile rock. Or to the vertical petrous walls.

**The main contrasts**

As a consequence of the first characteristic pointed out, in order to appreciate some spatial variation of the vegetation, apart from the peripheral sectors with pine grove, the observation must be rather closer than the necessary to obtain such geomorphologic results. Even so, the changes that can be considered on this level of detail are the most elemental ones: if there is or not vascular vegetation, its port, its degree of spatial coverage and its density. Six main spatial units of vegetation result from this.

Spaces with no apparent vegetation

They occupy a wide strip of the direction E-W, which includes the major part of el Teide, the crater and north of Pico Viejo and which becomes thinner in the extremes, in the dome ensembles of Montaña Blanca-Montaña Rajada, with some of their outflows, and of Roques Blancos. Separated from this strip, the historic volcanoes of the Narices del Teide and of Fasnia, have the same characteristics, as well as the very rough and bristled fronts of the outflows of the stratovolcano that form a pool close to the Llano de Ucanca.

Scrubland of the eastern atrium

It is singular for being an open bus formation dominated by *Spartocytisus supranubius, Pterocephalus lasiospermus* and/or *Adenocarpus viscosus*. It forms an aureole that includes the lava outflows with different degree of pumice cover and endorheic flats, coming away only from the small sectors of Pico Cabras and the summit of Guajara.

Scrubland of the old outflows of the stratovolcano

It is a relatively closed and multispecies scrubland. This unit comprises the old outflows of the stratovolcano, partially covered by sedimentary deposits, and is fragmented by some black outflows of el Teide and by the volcano created in 1798. In the north of the eastern atrium it appears again in the lava spills less covered by pumices.

Vegetation mosaic of the wall of Las Cañadas, La Fortaleza and Los Roques de García

In this area a tight spatial rhythm is produced of the alternation of rupiculous vegetation, open scrubland of *Spartocytisus supranubius* and closed and multispecies scrubland, vegetal expressions that considered independently only have a scenic entity on the scale of much detail.

Mosaic of the volcanic field of Portillo-Izaña

In a similar way to what occurs in the previous unit, in this one an agile spatial succession is produced of discontinuous and open scrubland of *Spartocytisus supranubius* in the recent pyroclast cones and of closed scrubland of *Pterocephalus lasiospermus* in the sedimentary deposits.

Forest of *Pinus canariensis* of the north of the stratovolcano and the back of the wall

This discontinuous unit contributes little to the characterization of the landscape of el Teide for being situated in the most hidden edges of the National Park, in spite of introducing the most marked vegetal discontinuity.

**The authentic tesseras of the vegetal landscape**

By increasing the level of visual approach, the major part of these divisions break down into other minor ones. In order to identify and delimit them it is essential to go into Las Cañadas, go around el Teide, Pico Viejo, its different lava spills, the dome ensembles and its ruddy outflows, the endorheic flatlands of the atrium and the wall, the space of the most complex vegetal landscape. It is not enough to catch a sight from afar the vegetal cover. Only in the blooming season can they be distinguished in a more panoramic vision with the help of the characteristic colours of the most abundant floristic species and of the chromatic compositions resulting from its mixtures. These are the spatial units that make the characterization and interpretation of this vegetal landscape more accessible. They perfectly reflect the complexity of the internal geography of the National Park, without losing the authentic dimensions of the spatial variations of the vegetation by reducing them

to occasional modifications of the habitat. This is, therefore, the most adequate level of detail for recognizing the vegetal landscape of the Teide ensemble.

The criteria of the physiognomic characters is no longer enough to identify the geographic variations and must be complemented with the consideration of the floristic composition. Hence, the types of vegetation, with its degrees of spatial imbrications and the territorial continuity of its expressions, are the ones that allow to specify this section of the vegetal landscape. Some of its tesseras are characterized by one only type of vegetation, but the most usual is for this to be a spatial composition of some of them that characterize it; even certain "types" are repeated in different units, for which the authentic entity of these is given by the mosaic.

Spaces with no apparent vegetal cover

- Absernce or scarce presence of vascular vegetation in the volcanic terrains

  This is an extensive spatial unit, but discontinuous. It encompasses the terrains of the historical volcanoes of Fasnia and of Narices del Teide, where the relatively short time gone by since the eruptions has not made possible the sufficient accumulation of fragmented material in surface so as to develop vascular plants. The black outflows and the volcanic neck of el Teide have similar characteristics, well, even if here there are disperse samples of *Viola cheiranthifolia* and, in both spaces, of *Argyranthemum teneriffae,* they do not generate a vegetal cover with physiognomic entity.

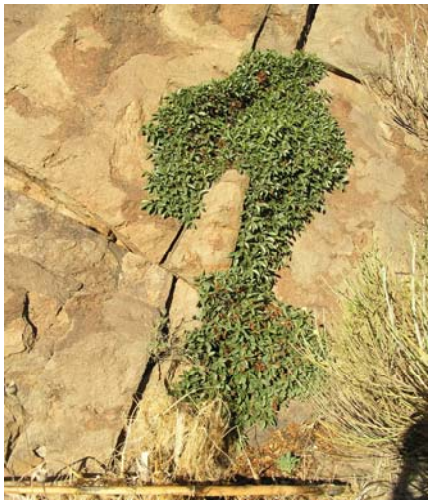


**Apparently barren area**

The crater of Pico Viejo, the pumiceous saddle point which separates it from el Teide and the domes of Los Gemelos, have very little vegetation, it is reduced to *Viola cheiranthifolia* with scarce presence of *Silene nocteolens* at the foot of the black outflows and of *Spartocytisus supranubius* in the SE edge of the lava platform of the Pico Viejo crater. Something similar occurs in the dome of the Roques Blancos, for young disperse samples of *Pinus canariensis* and *Spartocytisus supranubius* appear only in an occasional rim of the outflows.

- Disperse samples of rupicolous vegetation in the scarps of the walls of Las Cañadas

  The upper rocky scarps that constitute the brow of the wall of Las Cañadas and La Fortaleza are apparently devoid of vegetation and only thoroughly can we discover that *Juniperus cedrus, Rhamnus integrifolia* and, above all in la Fortaleza and in western Las Cañadas, *Pinus canariensis* frequently make use of the network of joints of the rock.

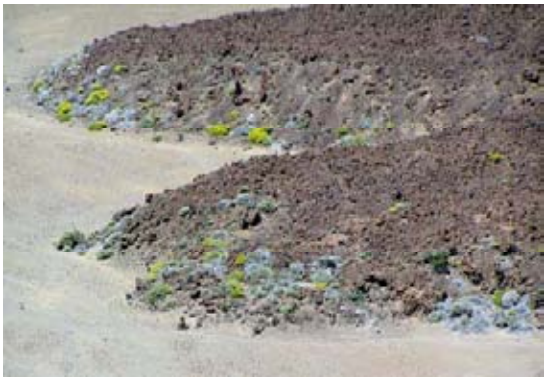
**Scattered examples of rocky vegetation on scarps**

- Very disperse samples of *Argyranthemum teneriffae* in blocky outflows of the eastern atrium

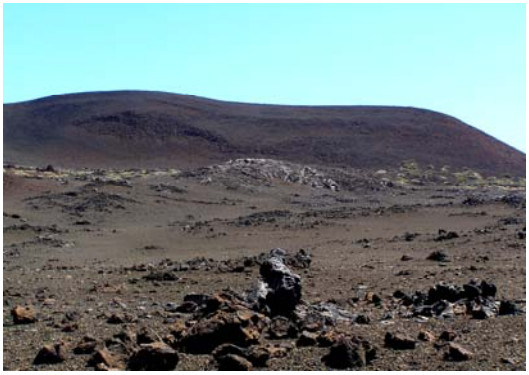
  The bristled and apparently sterile outflows in blocks with sharp obsidian edges of the eastern atrium have relatively abundant populations, although not very evident, of *Argyranthemum teneriffae* and, in lesser proportion of *Scrophularia glabrata*. Only where the voids are less deep, can we observe very local concentrations of *Spartocytisus supranubius*.

- Disperse samples of *Argyranthemum teneriffae* and of *Tolpis wellbii* in old outflows of the western atrium

  The distal and not very steep spaces of the oldest outflows of Teide and Pico Viejo, in the northern closure of Llano de Ucanca, have such scarce vegetal cover that they recall the lava spills of the historic volcanoes and noticeable contrast with the most inclined sectors of the same outflows its marked *aa* morphology with great superficial discontinuities causes for them to be mainly occupied by *Argyranthemum teneriffae* and *Tolpis wellbii*. Only in the edges, the fine fraction contributed by the wind from el Llano de Ucanca has facilitated the formation of a scrubland edging of *Spartocytisus supranubius, Argyranthemum teneriffae, Pterocephalus lasiospermus* and *Adenocarpus viscosus*, which makes the frontal lines of the outflows stand out even more.



Garland of vegetation on the frontal lobes of the flows in the Ucanca sector



Samara, an area with little vegetation

- Disperse samples of *Argyranthemum teneriffae, Adenocarpus viscosus* and *Spartocytisus supranubius* in Samara

  In a similar way as with the previous unit, in the ensemble of recent volcanoes of Samara, *Argyranthemum teneriffae* is disseminated by the extensive mantle of pyroclasts which covers the lava outflows, but always associated to the foot of the small and distant rocky outcrops. There where the thickness of the lapilli strata is greater, there are ample and soft coulees in which are grouped the *Adenocarpus viscosus* and forms a natural landscape which evokes that of La Geria, in Lanzarote. These concentrations constitute, together with small spots of *Spartocytisus supranubius* of the start of some lava outflows, the only significant vegetal cover of the area occupied by the lapilli field. Towards the west, in the slopes of Montaña La Botija and Montaña Adara there are disperse elements of *Pterocephalus lasiospermus, Erysimum scoparium, Scrophularia glabrata* and of *Adenocarpus viscosus*, which at its base are mixed with *Pinus canariensis* dispersos.

- Disperse samples of different species in Montaña Blanca and Montaña Rajada.

  Montaña Rajada and, especially, Montaña Blanca are the places in which one can most easily enjoy the beauty of the *Viola cheiranthifolia*, which, in the most favourable springs splotches some of the pumiceous slopes with paintbrushes of the colour that gives it its name. In Montaña Blanca, the blue and violet notes increase and are diversified by the presence of *Erysimum scoparium*, capable of forming small prairies, of *Echium auberianum* and, to a lesser degree, of *Nepeta teydea*. Between Montaña Blanca and Montaña Rajada there is a small concentration of *Adenocarpus viscosus* and, towards the north, *Spartocytisus supranubius*, which contribute to a greater degree to the landscape of this sector due to the dimensions of its samples and its scarce phenologic variation.



***Erysimum scoparium* population on Montaña Blanca**

- Discontinuous spots of *Pterocephalus lasiospermus, Adenocarpus viscosus* and *Spartocytisus supranubius* in the endorheic flats

  In the areas of slit accumulations that are displayed in a chain fitted between the wall of Las Cañadas and the lava spills coming from the north, the little existing vegetation has particular characteristics of a great local scenic entity. Its singularity is not owed to the species present, but rather to the way in which they are distributed: in the areas most frequently swamped, a small external strip develops of *Mentha sp.* -not always present- and towards the periphery, with a relatively concentric layout associated to the soft topography, there are central ensembles of *Pterocephalus lasiospermus*, trimmed by a band of *Adenocarpus viscosus* -on occasions- also *Echium auberianum* and, already in the contact with the rock of the outflows, *Spartocytisus supranubius*.

  Sometimes, like in Maja, in the flats of small dimensions or in the borders of the bigger ones, on the slit strata of rocky fragments is displayed of very clinker nature, where we can find important populations of *Descurainia bourgaeana* or of *Pterocephalus lasiospermus*.

  The relative lowest topographic position of Ucanca and the existent of overhanging relieves in its surrounding, make for the entrance of current water in the flat to have a morphogenetic effect which causes a variant of this model of organization. The more habitual or more recent runoff beds are exclusively occupied by young samples of *Pterocephalus lasiospermus*, in the small terraces cut by those, dominates *Adenocarpus viscosus* and there are more adult individuals *Pterocephalus lasiospermus* and, above it, in the most stable areas there is a relatively open scrubland of *Spartocytisus supranubius* with *Petrocephalus lasiospermus*.



**Endorheic plateau vegetation**

- Young isolated pines of the dome of Roques Blancos.

  In its most distal area, the outflows of Roques Blancos are covered by an extensive pumice mantle through which young and very disperse samples of *Pinus canariensis* are advancing from the pine grove situated at a lower altitude, constituting the sole vegetation of this dome that contributes to the characterization of its landscape.

**Scrubland areas**

- Monospecies scrubland of *Spartocytisus supranubius* of Teide-Pico Viejo

  On the analysis scale used for the characterization of the vegetation geography, this scrubland of variable spatial cover and continuity is the type of vegetation with scenic transcendence which is developed at a higher altitude, reaching 3.100 m in Pico Viejo. They are samples of *Spartocytisus supranubius* of little bearing and great diameter, which appear isolated or in small groups trying to colonize the unstable scree taluses that descend the black outflows in the north of el Teide. In the loop holes of older rock of the same place, or in the less active of the southern summit of Pico Viejo, this species organizes compact groups. And in the more or less flat streambeds of lava channels of old outflows from el Teide and Pico Viejo, or between the black digits of the last outflows of el Teide create magnificent “seas” of retama.



**Scrub comprised only of *Spartocytisus supranubius* on Pico Viejo**

- Monospecies scrubland of *Spartocytisus supranubius* with *Argyranthemum teneriffae* of the southeast slope of el Teide.

  Framed by the almost sterile black outflows and interrupted by some of them, the existence of this scrubland in the oldest outflows of el Teide contributes to a local scenic discontinuity of first order, which is exhibited at the most common entrance of the National Park. The cohabitation of *Spartocytisus supranubius* and the *Argyranthemum teneriffae,* the two species with permanent physiognomic importance which reaches the highest altitude. Only in the base of this slope, indicating the transition with the atrium, do the following species incorporate into this scrubland *Adenocarpus viscosus, Descurainia bourgaeana* and *Pterocephalus lasiospermus*.

- Very discontinuous and open scrubland of *Spartocytisus supranubius, Descurainia bourgaeana* and *Pterocephalus lasiospermus* in pyroclast edifices of the atrium.

  It is a fragmented spatial unit of small surface but that abruptly break the organization of the typical vegetation of its surrounding, even if the floristic composition does not vary too much. This organization can be recognized very well in Montaña Tomillos, Montaña Mostaza, Montaña de Arenas Negras and Montaña Majúa. The vegetation concentrates in a very particular way at the base of the flanks and in the craters of the cones, creating sometimes vertical lines that connect both areas.



**Discontinuous scrub on Montaña Negra**

- Open scrubland of *Spartocytisus supranubius, Adenocarpus viscosus* and *Descurainia bourgaeana* in a pumice covered outflow of the eastern atrium.

  The lava outflows that fill the eastern atrium of Las Cañadas in its northern sector present a very marked contrast and of notable scenic significance whose determining factor is the important pumice cover. The vegetation -*Spartocytisus* supranubius- is preferentially situated in the rocky outcrops (not very projected) and sometimes distant, which border the pumice basins. In the slopes of these *Descurainia bourgaeana* forms edges that do not reach the central flat. Only where

the flatlands have a great extension *Adenocarpus viscosus* can constitute a open scrubland in which old samples can be seen of great bearing and vitality.

In the centre of this area the pyrocalst cone of Montaña Tomillos introduces a change in the layout of the plants and in the selection of the species, for both in its flanks and in its crater there is only *Spartocytisus supranubius* and *Descurainia bourgaeana*, indicative features of a variable of the previous unit.



**Very open lava flow vegetation with pumice stones on the northern sector of the eastern atrium**

- Multispecies scrubland of the outflows of Montaña Corrales and of the sector of Montaña Las Lajas and Montaña Negra.

  The previous spatial unit is flanked by another of discontinuous nature in which the degree of cover and the floristic diversity are superior. There are outflows with *aa* morphology and of transition from *pahoehoe* to *aa*, very slightly faded by the pumice cover, in such a way that the density of rocky overhangs and the variation in the structure of the rock are very superior. It is a scrubland integrated by *Spartocytisus supranubius, Scrophularia glabrata, Argyranthemum teneriffae, Descurainia bourgaeana, Pterocephalus lasiospermus, Adenocarpus viscosus* and *Echium auberianum*. These general features become modified in the *pahoehoe* outflows in the plains close to La Fortaleza, where a very dense and almost monospecies *retamar* appears.

- Multispecies closed scrubland of sedimentary deposits of the wall and of La Corbata.

  Even though there are differentiating nuances in the degree of floristic richness and in the proportion win which the different species appear, the scrubland of the talus of the eastern and western sections of the wall of Las Cañadas and the torrential deposit of La Corbata have in common their multispecies nature, their high density and which in marginal situations derives into a *retamar* or a scrubland of *Pterocephalus lasiospermus*. The scrubland of the talus occupies a horizontal strip, parallel to the unit of the scarp and to the endorheic flats. It is the riches and is comprised of*Spartocytisus supranubius, Descurainia bourgaeana, Pterocephalus lasiospermus, Erysimum scoparium, Nepeta teydea, Scrophularia glabrata, Pimpinella cumbrae, Cheirolophus teydis* and, with very scarce representation,

*Adenocarpus viscosus*; species to which can be added in a very disperse way an occasional sample of *Juniperus cedrus*, and, with locally abundant populations, *Echium wildpretii*.

In the deposit of La Corbata the most outstanding taxa are *Spartocytisus supranubius, Descurainia bourgaeana* and *Pterocephalus lasiospermus*, although there are also samples of *Adenocarpus viscosus.* These species are distributed in tight association with the degree of activity of the channels of surface runoff, the thickness of the slide accumulation material and its fragmented rock spatial selection.



**Mixed scrub established on the wall of Las Cañadas**

- Multispecies closed scrubland with *cedros* and pines of the mountain of La Fortaleza

Between the very closed pine grove in the north of the National Park and the very open rupicolous vegetation of the scarp of La Fortaleza, there is a space characterized by a very dense scrubland composed of *Pterocephalus lasiospermus, Adenocarpus viscosus, Erysimum scoparium, Micromeria* sp., *Rhamnus integrifolia* and *Spartocytisus supranubius*. In the ensemble of the scrubland, outstanding for their higher bearing are the retamas and samples of *Juniperus cedrus, Pinus canariensis* and, even, a brezo (*Erica arborea*).

- Dense scrubland of *Pterocephalus lasiospermus* in the firebreak of La Fortaleza

The previous bus formation prolongs towards the north due to the interruption of the pine grove by an ample firebreak, but here it is an almost monospecies and very dense scrubland of *Pterocephalus lasiospermus*, which only in its contacts with the pine grove becomes enriched with *Spartocytisus supranubius* and *Adenocarpus viscosus*.

**Spaces with bush and rock mosaic**

- Mosaic of rocky scarps with multispecies scrubland of Los Roques de García

The complex juxtaposition of the rupicolous vegetation and of a scrubland integrated by species that tolerate a certain instability of the substrate is the fundamental feature of

this unit. The varied rocky structure of the rock forms, needles and dykes permits the installation of rupicolous species -*Juniperus cedrus, Rhamnus integrifolia*, among others- and of others relatively tolerant to the absence of soil -*Pterocephalus lasiospermus* and *Cheirolophus teydis*-. In the short and very inclined taluses at its foot, *Spartocytisus supranubius, Pterocephalus lasiospermus, Descurainia bourgaeana* and *Cheirolophus teydis* divide the space according to the degree of instability of the substrate.



**Scrub mosaic and rocky vegetation on Roques de García**

- Mosaic of different faces of the scrubland of *Spartocytisus supranubius* with scrubland of *Pterocephalus lasiospermus* of the volcanic field Portillo-Izaña.

  It is one of the spatial vegetation units of greatest extension of the National Park, although it frames the areas corresponding to different units such as Llano de Maja and the historic Volcano of Fasnia. Outside these, it regularly maintains the spatial interdependence of the discontinuous and open scrublands of *Spartocytisus supranubius* and *Descurainia bourgaeana* of the recent volcanic cones, with areas of no vegetation and with the closed scrubland of *Pterocephalus lasiospermus, Nepeta teydea, Descurainia bourgaeana* and *Spratocytisus supranubius* of torrential accumulation forms, affected by the frost wedging phenomena. Only to the west, the entrance of *Pinus canariensis* in Montaña Guamaso introduces a nuance in these general features.

- Scrubland mosaic of *Spartocytisus supranubius* and scrubland of *Pterocephalus lasiospermus* of the eastern atrium.

  This mosaic defines the vegetal landscape of the dome outflows of Montaña Blanca and Montaña Rajada which presents a greater pumice cover. In it are spatially associated two types of vegetation: the scrubland of *Spartocytisus supranubius, Scrophularia glabrata, Carlina xeranthemoides, Argyranthemum teneriffae, Nepeta teydea* and an occasional sample of *Juniperus cedrus* on the rocky overhanging lines, with the bushland of *Pterocephalus lasiospermus,* integrated also in a very

inferior proportion by *Adenocarpus viscosus*, of the pumice flats and levees. Punctually, this mosaic is interrupted by small endorheic flats with no vegetation.

- Scrubland mosaic of *Spartocytisus supranubius,* scrubland of *Adenocarpus viscosus* and scrubland of *Descurainia bourgaeana* in the southern flank of Pico Viejo.

  In the medium slopes of the southern face of the stratovolcano the existence of deposits that partially cover the old lava materials favours the development of a type of vegetation of particular physiognomy, integrated for the most part by *Adenocarpus viscosus, Nepeta teydea* and *Arrhenatherum calderae*, which characterizes the areas of greater sedimentary accumulation and by which a sporadic runoff circulates, In these slag agglomerations that border it, this scrubland is progressively substituted by more or less monospecies manifestations of *Argyranthemum teneriffae* and, to a lesser degree, of *Descurainia bourgaena*. These types of vegetation for a relatively tight mosaic with the more open scrublands of *Spartocytisus supranubius* and *Argyranthemum teneriffae* of the tight rocky lines that frame them. Towards the south, where the deposits are less potent over the *aa* outflows, the mosaic is organized between *Spartocytisus supranubius* in the rocky edges and the dominion of *Descurainia bourgaeana*, which is accompanied by *Adenocarpus viscosus*, in the small intermediate structural terraces.



***Spartocytisus supranubius* and *Pterocephalus lasisospermus* mosaic Montaña Blanca lava flows covered with pumice stone**

Contrary to what happens in the *pahoehoe* outflows of the east of the Volcán de La Corona, the cordadas lavasof Los Roques de García are not coverd by torrential deposits and constitute a subunit of singular landscape for the opening of the scrubland and the dominance of the rock. The floristic composition varies according to the thickness and the level of fracture of the external strata of the outflows, alternating an almost monospecies scrubland of *Pterocephalus lasiospermus* with poorly grouped samples of *Spartocytisus supranubius*.



***Adenocarpus viscosus* and *Arrenatherum calderae* Mosaic with *Spatrocytisus supranubius* scrub on the southern slope of Pico Viejo**

- Mosaic of rock groynes with *Spartocytisus supranubius* and multispecies scrublands of the central wall of Las Cañadas.

  From the sector of Pasajirón-Guajara to Boca Tauce the general organization is modified of the types of vegetation of the wall. The deposits with multispecies scrubland are displayed like open fans towards the atrium, separated by different types of rock spikes. Sometimes they are dykes, and only show a very open scrubland (*Spartocytisus supranubius*) in the basal deposit; sometimes they are remains older deposits and that have a greater vegetal cover and a greater floristic diversity (*Descurainia bourgaeana,Erysimum scoparium, Nepeta teydea, Pimpinella cumbrae* and *Echium wildpretii*); other times they are of a clinker or lava nature and in them an intermediate physiognomic situation is given and the scrubland of *Spartocytisus supranubius* begins to impoverish once more. This landscape design of vertical dominance is reinforced by the stone outflows which sometimes are drawn in the deposits and that are well defined by the apparent absence of vegetation.



**Mosaic of different scrubs and rock on the central wall of Las Cañadas**

At the foot of Guajara, between Los Caprichos and los Azulejos, there are samples of *Pinus canariensis* splattered among the pluriscpecific scrubland of the stabilised deposits, and less frequently, in the reefs of the rock spikes.

**Areas with forest**

- Forest of *Pinus canariensis* of the borders of the National Park.

  This discontinuous unit of pine grove with varied underbrush owes its presence of the major part of the surface to conifer plantations realized in the years 40-50 of the 20th Century. The great density of the forest mass conditions the scarcity of the underbrush, which is limited to the small clears and which presents a varied composition. Only in the ridge of Guajara is the pine grove spontaneous and open and its integrators alternate in the area with *Spartocytisus supranubius*.



Pine tree plantation in El Portillo

## The scenic mosaic of El Teide

### *The stratovolcano Teide-Pico Viejo*

**Description**

It is the most extensive unit of the National Park, occupying the largest part of its western half, with the highest altitude, 3.718 m, and which presents a greater difference of level from the base to the summit, 1.700 m. It is integrated by a voluminous conic mountain extended in northeast-southeast direction, surrounded in the south and in the east by the atrium, the topographic unit of lower altitude and flatter landscape, while in the north it reaches the limit of the park and to the west the unit of Samara bursts in outlining its perimeter like a narrow strip of different landscape.

The stratovolcano is characterized above all by the volume and verticality of the general shape of the relief, but the geography of its minor units participates as well in an important way in its appearance. In the central area and with an order that emphasizes the

northeast-southeast model, the volcanic plug/neck of el Teide and the peak/top of Pico Viejo, constitute the two summits, from where the rest of the subunits are outlaid in a grossly radial way, except in the saddle point situated between those two. The spatial variant of the landscape with greater continuous surface is the one of the black outflows of el Teide, which characterize the greater part of the eastern sector of the stratovolcano. In second place, although repeatedly interrupted by other subunits, the medium slopes of Pico Viejo stand out.

The landscape has an absolute morphological dominance, as the greater part of its surface is characterized by the absence of evident vegetal cover and in the southern flank, better represented in Pico Viejo than in El Teide, the scrublands of diverse characteristics unequally cover the slopes. Only in its northern limit, the forest of *Pinus canariensis* creates a very clear discontinuity in the general dominion of the rock.

### Minor units

| MINOR UNITS |
|---|
| The neck of El Teide |
| The black outflows of El Teide |
| The southeastern slope of El Teide |
| The saddle point domes of Pico Viejo |
| The crater of Pico Viejo |
| The Narices del Teide |
| The high slopes of Pico Viejo |
| The southern low slopes of Pico Viejo |
| The Roques Blancos |
| Montaña Blanca and Montaña Rajada |
| Pico Cabras |

### Uniqueness

It is *La Montaña* of the National Park, of the island and of the archipelago. This character endows it with an extraordinary value from two perspectives, from the *observed point* and from the *observation point.* From the first, due to its size, its shape, the forms its hosts and its contrasted colours, as well as for the sensation and the idea of morphological dynamism it provokes, the Teide is the most searched panorama in the interior of the National Park. It is also the elevated and interior horizon of Tenerife, permanent referral point for immediate and close orientation, for it is also of the closest islands, from where the most real visions are obtained of the different facets and of the authentic magnitude of the mountain. It is even the silhouette that, above the clouds, allows the traveller to locate the island he does not see. From the second perspective, the highest point of this watchtower enables to see, in clear days, four islands apart from Tenerife, and the northern slope from Anaga to Teno. Also, it is the only place from where the National Park's surface can be observed in an almost complete way and, beyond, the volcanic ridges of Pedro Gil and of Abeque. But, especially, it is the balcony of the impressive crater of Pico Viejo; with no doubt, *El Cráter* of the Upper Tenerife.

The Volcanic Neck of Teide

- Description

Superimposed to La Rambleta (3.500 m), this is the most elevetaed landscape of the entire National Park. It is a truncated cone edifice of outflows and trachyobsidian pyroclasts, crowned by a crater of scarce dimensions, corresponding to the sub historic activity of the stratovolcano. The altitude at which it is located, of great inclination of its flanks, the degree of substrate fragmentation and the morphodynamic processes which affect it cause there to be no evident vegetal cover; only some disperse samples of *Argyranthemum teneriffae* and, in spring, of *Viola cheiranthifolia*, are capable of living in this environment.

- **Uniqueness**

More than its physiognomy itself, the landscape uniqueness of this unit is derived from its spatial relationship and its contrast with the most immediate ones. Noteworthy are the tones of white and blue colour which give these floristic species present in the spring season, particularities that can only be appreciated with a detailed observation.

The black outflows of El Teide

- **Description**

This unit of irregular outline is comprised of lava spills of black colour which, leaving La Rambleta, cover in a more or less compact way the northern flank of the stratovolcano, in a more discontinuous way the east and the south, while in the west, it only covers its upper part. For the most part, they are *aa* outflows, organized in lava channels. Its recent age is the main reason for the absence of vegetal cover, creating marked scenic discontinuities with the slopes of older materials on which they flow. Only some samples of *Argyranthemum teneriffae* and exceptionally of *Spartocytisus supranubius* are present in these lavas and contribute in no way to the physiognomy of the ensemble.

- **Uniqueness**

It is the landscape unit of the stratovolcano, which, by itself, provides a great sensation of morphologic dynamism. This impression is produced by a very plastic adaptation of the pre-existing forms, bifurcating and detouring according to the topographic accidents. Its most characteristic form, the lava channels of very marked runoffs, also reinforce this impression. The scenic identity of this unit is so strong that it endows the stratovolcano of which it forms a part, with a great uniqueness.



**Teide python and black lava flows**

The southeastern slope of El Teide

- **Description**

Its scenic individuality in the ensemble of the southeast slope of el Teide and its delimitation are given by the absence of black outflows, what causes it to be the only place in el Teide where the forms of torrential nature can be observed. The existence of a more or less closed scrubland of *Spartocytisus supranubius* and *Argyranthemum teneriffae* reaffirms the particular physiognomy of this slope.

- **Uniqueness**

The absence of original morphology of the outflows, the presence of torrential forms and scree taluses, apart from the existence of a type of scrubland exclusive for its floristic composition and high cover, are features that give an outstanding singularity to this unit in the ensemble of the stratovolcano. The spring blooming emphasizes its uniqueness due to the coincidence of the white colour of both species comprising this scrubland, which strikingly contrasts with the black outflows which surround it.



**Southeast slope of old Teide**

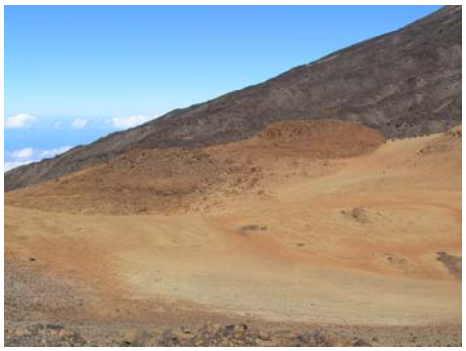
Dome ensemble of the saddle point of Pico Viejo

- **Description**

It is an area characterized by groups of forms of a dome nature, such as the small domes-outflows of Los Gemelos, the massive cake of the saddle point strictly speaking with its associated outflow, which flows down the southern flank of Pico Viejo, and the pumice accumulations coming from these and other close dome centres. These forms are characteristic and defining elements of the landscape, since no vegetal cover exists with a physiognomic importance, give that it is limited to spring samples of *Viola cheiranthifolia* and to some occasional population of *Silene noctoelens*.

- **Uniqueness**

In spite of its scarce extension, this is a unit of the landscape which is individualized by morphologic and chromatic contrast with the adjacent ones, on the one hand the black outflows of el Teide and, on the other, the crater and the lava ridges of the ensemble of Pico Viejo. Its relative topographic situation and the scarce orographic importance of these domes make it so that they can only be seen from the saddle pint itself and from the edge of the crater of Pico Viejo, nevertheless they are scenic elements of great aesthetic value and geomorphologic interest in the way they enrich the range of dome forms of the National Park.



**Twin domes on the Pico Viejo landing**

The crater of Pico Viejo

- Description

It is a strictly geomorphologic landscape unit. Associated to the volcanic activity, in this concrete area, the eruptive process does not create a prominent topography, but rather generates a concave form. The principal cavity hosts minor morphologic elements which indicate the complex eruptive sequence, with a peripheral scarp, two lava structural terraces, a small slag overlapping cone and two eccentric explosive funnels. Only at the southern edge of the superior lava terrace do a few samples of *Spartocytisus supranubius* enter.

- Uniqueness

The dimensions of the crater cavity, its internal morphological complexity and its contrast in these two aspects with the other main crater of the stratovolcano, makes this eruptive mouth a morphologic and scenic referral point of first order of the volcanic type territories. It is the grandiose crater which corresponds to a spectacular stratovolcano such as Teide-Pico Viejo. Its relative topographic position, makes it so that, in a way similar to the crater of Teide, it can only be seen from the upper western slopes of el Teide.



**Interior of the Pico Viejo crater**

Las Narices del Teide

- Description

Fissure volcanic edifice constructed by the eruption of 1798 whose morphology expresses a specialization of the eruptive dynamism, with explosive activity in the superior mouths, give place to the pyroclast cones and the lapilli fields, and effusive activity in the inferior mouths, with lava spills that cover part of the flank of Pico Viejo and fill the atrium until reaching the wall of Las Cañadas. The short age of the volcano is the reason for the absolute absence of vascular vegetation in this unit. Only in the external borders of the lapilli field where the strata of these has less depth, there are some samples of *Spartocytisus supranubius*, which enter from the monospecies *retamar* of the surrounding.

- Uniqueness

The individuality of this area as a landscape unit also responds to the historic nature of the eruption which generated it. From it originate its most particular features, the freshness of the volcanic forms, the intense black colour of its surface, the lack of vegetal cover and the geographic fact that a minor unit erase the contact between two units of a greater range, the stratovolcano and the atrium. The problem of the spatial hierarchy of these landscape units is a fact typical of the volcanic territories, in which the flow of the lava spills surpasses the space in which the eruptive processes are generated.



**Las Narices del Teide. 1798 eruption**

Upper slopes of Pico Viejo

- Description

It is a discontinuous unit, whose perimeter, in the most extensive fragment, has a very irregular design due to the existence of other units situated at a lower altitude, which, with a radial layout, enter as wedges in the upper slopes of Pico Viejo. Its individualization and its limits are more due to the characteristics of the vegetal cover than to those strictly morphologic ones. The forms of relief of this unit are fundamentally taluses of gravity, with intense local functionality, which only in a sporadic way leave space to see the subjacent outflows. On these screes and on the lava loop holes a monospecies scrubland is developed of *Spartocytisus supranubius*, of various degrees of continuity and coverage.



**High slopes of Pico Viejo**
**with dense *Spartocytisus supranubius* scrub**

- Uniqueness

It is the scrubland of *Spartocytisus supranubius*, for the spatial continuity of its monospecies nature, for the varied forms and the special grouping way of the bushes that comprise it, what dotes this area with singularity. In no other area of the park does

the *Spartocytisus supranubius* constitute by itself a vegetal cover of this extension. But what is most visually surprising is the lenticular shape of the bushes and its agglomeration forming sheets, in determined enclaves of the most elevated sectors.

Lower slopes of Pico Viejo

- Description

It is the unit of greater surface, although discontinuous of Pico Viejo. Its superior edge is dented due to its adaptation to the perimeter of the recent outflows that descend from El Teide and Pico Viejo and to the one of the previous unit. Except the northern appendixes, it corresponds to the area of average pitch of the southern and western slopes of Pico Viejo. They are undifferentiated lava outflows whose essential feature is the conservation of its bigger morphostructural elements -arches, lava channels, etc.- even though its superficial morphology can be partially hidden by deposits of torrential origin, gravity and endorheic. To this morphologic puzzle a mosaic subtly adapts of types of vegetation, comprised now by a greater number of species, which introduces the principal distinctive feature with the previous unit.

- Uniqueness

It is a landscape unit to see from within, to walk it, for from the outside the morphologic puzzle and the phytogeographic mosaic are bounded. The game of the microtopography generated by the outflows, with longitudinal passages and sometimes transversal, between and within those, guides the localization of the sedimentary accumulation forms and of the small gullies, creating a section of ecological cells which is translated into a particular mosaic in the ensemble of the park, integrated by types of relatively contrasted bushes.



**Lower slopes of the southern flank of Pico Viejo**

Roques Blancos

- Description

It corresponds to one of the landscape units of greater geomorphologic rotundity. Defined by its dome characters, in it predominate the massive, potent and sterile outflows, which open in fan, with multiple and voluminous digitations and with channels of well marked lava. These lava flows spill from an extended edifice which, is in turn prolongation and part of the outflows themselves. In the western end of the unit, these outflows are carpeted by pyroclast accumulations in which appear young and isolated samples of *Pinus canariensis*, the only vegetation with a certain physiognomic relevance of Roques Blancos.

- Uniqueness

It is the dome edifice which is best individualized as a morphologic and scenic unit within the National Park. The singular forms and layout of its lava spills, provide a unique sensation of volume and movement.



**Roques Blancos dome**

Montaña Blanca and Montaña Rajada

- Description

Landscape-wise, the continuity of the pumice mantle is what enables to differentiate this unit of the ensemble of the stratovolcano. Nevertheless, to its physiognomy also contribute in a very important way the morphologic features that bloom from the cumulo-domes that integrate this sector. Among those forms stand out two great pyroclast lomes of Montaña Blanca and the crater, the profusion needles and the rocky lobes of the eastern and northern backs of Montaña Rajada. It is an area with no apparent vegetal cover, but with the presence of diverse floristic species of very marked phenologic contrasts.

- Uniqueness

It is a dome complex very rich in minor morphologic elements, indicative of eruptive dynamics of very differentiated features, eminently effusive in the case of Montaña

Rajada and explosive in the case of Montaña Blanca, in a special way in its final phases.



**Montaña Blanca**

Pico Cabras

- Description

It is a new unit defined by the existence of a dome apparatus. It is another cumulo-dome characterized by the existence of a outflowing channel that corresponds to the axis of the edifice and which draws an apparent crater extended in direction of the slope. In the external superior arc of the apparatus small and short tongues of dome lava overhang, which contribute to give even more volume to the edifice.

The topography derived from the general form and from the detailed forms, articulate the localization of a discontinued vegetal cover. The scrubland of *Spartocytisus supranubius* and *Pterocephalus lasiospermus* is preferentially concentrated in the depths of the channels, in the base of the flanks and in the passages existing between the lobes. From the plantation of the pine grove situated to the north, enter progressively isolated samples of *Pinus canariensis.*

- Originalidad

The landscape value of this united is related to the particular morphologic characters of Pico Cabras and, above all, to its spatial relationship with the unit of black outflows. Furthermore, the marked rupture that causes this form in the northern profile of el Teide, turns Pico Cabras into a landscape unit of notable physiognomic importance in the panoramas that are enjoyed from the proximities of Izaña and from La Fortaleza.



**Abejera and Pico Cabras peripheral domes**

### *The wall of Las Cañadas*

#### Description

It constitutes a landscape unit very well individualized for its own features and for its contrast with the adjoining ones. It is very lineal, with a slightly rippled arch and open to the northeast, and is integrated by an abrupt wall that closes, except in the northeast, the main unit of the atrium. It reaches its highest altitude in Guajara (2.715 m) in the central area of its expansion. From here, both towards the northeast and towards the west, the wall loses altitude and tends to become fragmented in the extremes, where its outline becomes faded by the superimposition of recent volcanic forms. Equally, does the landscape progressively lose complexity in the same direction, given that the relation between the rock brow and the inferior scree talus becomes simpler. The geographic interdependence of these two elements of the landscape conditions the general features of an evident vegetal cover of a bush type. Also in the two ends does the closed forest formation appear generated by the plantation of *Pinus canariensis* mid-20$^{th}$ Century.

#### Minor units

| MINOR UNITS |
|---|
| La Fortaleza |
| The eastern wall |
| The central wall |
| The western wall |

#### Uniqueness

Its position in the space and its configuration make it to be considered *The other Mountain* of the National Park: in fact, its ridge is the mountain to the south of the island. If the stratovolcano causes a sensation of dynamism for the superimposition and juxtaposition of original volcanic forms, this other mountain has the particularity that the topographic surface cuts the volcanic structures, for which the wall has the value of telling us of the oldest chapter of the history of this territory. It is like a great explanatory panel visible throughout its entire outline -with the exception of La Fortaleza- from the road that crosses

the park and the unique horizon in the stretch of it that goes from Montaña Mostaza to Montaña Majúa. A more detailed observation of the wall, provides the knowledge of the succession of the eruptive episodes in time and space and to the relation between the lithological changes, the topography, the old modelling forms, the intensity of the present morphogenetic processes and the adaptation of the vegetation to the different degrees of stability, granulometry and humidity retention of the substrate.

The edge of the wall offers a magnificent panorama, from the west, south and east, of a large part of the ensemble of Las Cañadas and Teide-Pico Viejo, with its varied and valuable landscapes. Also here are revealed the hidden views from the base of the wall, the forms and the bushes of the most ample cornices. Towards the south, the view gets lost in the sea and its journey from the top of the wall can estimate the dimension of this mountain, whose topographic base is situated at scarce distance. There is here an immediate landscape, the one of the heads of ravine of different amplitude with abundant *Echium wildpretii* standing out in the scrubland; another close one, that of the pine groves which become denser as they lose altitude; and the farthest one, the ample strip of population of the midlands and tourist edifications of the coast.

La Fortaleza

- Description

It is the stretch of the wall of lesser longitudinal development and of greater topographic and spatial individualization. With very similar features to those of the eastern wall as regards its scenic organization, it stands out for its vertical and ample rocky brows and for its detritic taluses even less developed than in those. The existence of variations in the functionality of the processes of gravity in the taluses make it so that in very little surface there be a tight alternation of types of vegetation. On the ridge it goes from a very closed scrubland of the plateau summit to the dense pine grove of the northern slope.

- Uniqueness

Morphologically, La Fortaleza presents the interest of possessing the greatest grouping of small nivation niches, the most evident forms of erosion in relation to the existence of past cold morphogenetic phases. From the point of view of the vegetal component of the landscape, this sector stands out for the concentration of *Juniperus cedrus* samples, which appear as much in the scarp, as in the talus itself, as well as of *Echium wildpretii* which in winter dyes of red the ample sectors of the basal deposit.



**La Fortaleza**

The eastern wall

- Description

Its most characteristic features are the greater height and greater topographic uniformity of its culminating rocky brows and the lesser development of the detritic taluses situated at its foot, with less marked torrential forms. This simple organization in strips of the morphological elements is also reflected in the spatial layout of the types of vegetation. These systems of territorial organization, general to the entire unit, are interrupted only in its northern end, by the superimposition of monogenic pyroclast edifices of basaltic nature.



**Wall of the eastern Las Cañadas**

- **Uniqueness**

Contrary to the simplicity of the elements and the articulation of the types of landscape, this strip of the wall possesses a great aesthetic value, in relation to the chromatic richness associated in the outcrop of different volcanic materials. It also constitutes an only sector of the wall where a fitted form of a torrential nature exists, whose source of nutrition is found outside the strict ambit of the wall.

The central wall

- Description

It is the section of the wall which is strictly open to the north. In it the morphological elements present a more complex spatial articulation than in the rest of the world, complexity that becomes evident as well in the shape of its ridge/back. In the wall, the culminating petrous brows of little altitude dominate, there are rocky rams which transversally go around the wall, more or less marked drainage basins, torrential fans of different generations. The back is characterized by the succession of ravine heads and of dome tables of great volume and height.

This articulation has a lawful reflection in the layout of the areas with more continuous vegetation which, associated with the deposits, are introduced in wedge style towards the upper part of the wall. In the back, following the topography, also alternate scrubland spots of *Spartocytisus supranubius* in the mountains/summits and of forests of *Pinus canariensis* in the slopes of the ravines.

- Uniqueness

This is the stretch of the wall with the greatest unevenness, and above all to the west of Guajara, where the width of the wall duplicates that of the other sectors of the same. This space has the interest of possessing the most complete temporal sequence and the most diverse typology of detritic, torrential, frost wedging and gravity deposits corresponding to diverse morphoclimatic phases. This diversity is imprinted also in the vegetation mosaic exclusive to this stretch of the wall.



Wall of the central Las Cañadas

The western wall

- Description

In relation to the rest of the wall of Las Cañadas, except of La Fortaleza, this section is characterized for possessing a lesser topographic entity. Its line of ridges is worse defined and the wall is interrupted by various saddle points, corresponding to the decapitated heads of an old hydrographic network that bites the back. In the same way as the eastern wall and La Fortaleza, here the organization of the landscape is

relatively simple, with altitudinal parallel strips, which correspond to the scarp and the talus.

- Uniqueness

The vegetal cover presents a specific feature, the existence of a more or less continuous forest formation of *Pinus canariensis* in the talus and in the ridge, from where some disperse samples have spontaneously occupied the culminating scarp. On the other hand, this unit has an other unique landscape value in relation to the marked chromatic and morphologic contrast with the outflows of Narices del Teide, which occupy the immediate atrium throughout more than two thirds the longitude of this section of the wall.



**The western part of the Las Cañadas wall**

***The atrium***

**Description**

Enclosed by the horizons of both the stratovolcano and the wall lies the central atrium, which lacks closure at its north-west and east faces. The atrium's central position amongst the more mountainous landscape units, determines its extension and layout and helps to shape up its internal features. Thus, the north-westward drift of the wall and the south-westward stretching of the stratovolcano brings about a significant, progressive reduction of the atrium at its west end. This reduction in width starts at the Roques de García, where also an abrupt loss in altitude of the bottom of the atrium takes place.

This unit encompasses the flat, low areas that were filled up with lava outflows from the stratovolcano. It is limited by a narrow strip of endohreic deposits that lies adjacent to the basal slope of the wall. Consequently, the majority of lesser units that make up the atrium's landscape follow a somewhat radial distribution emerging from the stratovolcano..

This is another clear example of a landscape that has been essentially shaped by its morphological element; both directly and indirectly, through the association between habitat distribution and composition and shape of volcanic substrates.

## Minor units

| MINOR UNITS |
|---|
| Pumice-covered lava flows |
| Blocky dome lava flows |
| The sector of Montaña Las Lajas and Montaña Negra lava flows |
| The sector of Montaña Corrales lava flows |
| Lava flows of the Ucanca sector |
| Zinder cones |
| The deposit of La Corbata |
| The endorheic flats |
| Roques de García |

## Uniqueness

The atrium is unique insofar it offers within its flat topography the variety of crooked landscapes that barren, impassable, bare rock usually reserves for steep locations. In spite of its 2,000 years of age, the vast planes of Tabonal Negro o Valle de Las Piedras Arrancadas, dotted with large sharp blocks and shiny-black, obsidian edges, seem like the result of a recent eruption.

Although the inner flats lack outstanding orographic features -with the exception of Roques de García- or even contrasted vegetation units, its landscape is actually quite varied and allows for successive fragmentation. Ultimately, even a flat-faced, rocky outcrop with a young Broom sidling growing in narrow crevasse could become a landscape unit. The atrium's accessibility and closeness provide a close-up insight into the intricacy of landscape dynamics. However, the most magnificent appreciation of this element of the National Park can only be acquired from outside; either fragmentarily from the wall's rim or in its nearly full entirety and grandiosity from La Rambleta.

### Pumice-covered lava flows

- Description

This unit covers a vast extension of the eastern atrium, as a discontinuous border around the dome complex of Montaña Blanca y Montaña Rajada. It is actually made up by most part of flows from the mentioned domes plus those from Montaña Majúa and Montaña Tapada (also Volcán del Depósito). The unit is segregated from nearby units within the eastern atrium based on the presence of a superficial layer of pumice that blurs the detailed morphology of the underlying lava, while allowing major structural elements to emerge. In general, vegetation cover on these lava flows is low.

- Uniqueness

One of the most outstanding features of this unit's landscape is the vegetation mosaic that results from adaptation of different plant species to a variety of biotopes. Although

the vegetation shows low specific diversity, with elements of flora that occurs regularly in other parts of the park, the resulting map of associations is somewhat unique. Thus the landscape results in a balanced repetition of flats and small depressions dominated by Pterocephalus lasiospermus on the one hand and rocky outcrops with Spartocytisus supranubius on the other. The only exception to this pattern is found at the lava flow on the north sector of the atrium where the absence of Pterocephalus lasiospermus allows for Sticky Broom to occupy its habitat.

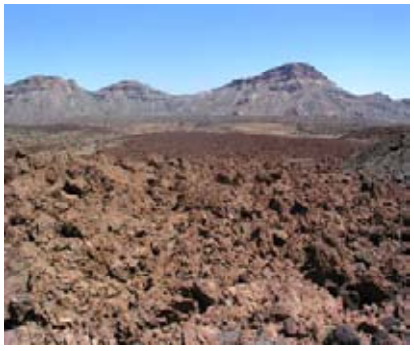


**Montaña Blanca flows covered in pumice stone**

Blocky dome lava flows

- Description

This is a discontinuous unit whose constituent blocks once originated from individual lava fluxes. Some of these blocks can be found within the unit described above, as they originated in the Montaña Blanca-Montaña Rajada dome complex. The distinct singularity of this unit comes from the detailed morphology of the lava flows. These flows consist of massive lava bodies broken down in large blocks separated by deep fractures, showing a ragged surface and devoid of pumice deposits. Such characteristic features bring about harsh conditions for the establishment of plant cover, hence the purely morphologic nature of the unit.



**Blocks of domatic flows in the eastern atrium**

- Uniqueness

These may be deemed as the most spectacular lava flows in the whole Canarian Archipelago. The reasons for this uniqueness can be found in the dimensions of the

blocks, the width of the fractures, the sharp edges of shiny obsidian, presence of flux scratches on the block's fracture planes, presence of channels, arches, lateral moraines bulky fronts, etc. In addition, their dark colour and rough appearance contrast drastically with the fair and soft surface of surrounding dome lava flows.

The lava flows of the Montaña de Las Lajas and Montaña Negra sector

- Description

Morphologically this unit comprises heterogeneous lava flows with a more or less uniform appearance. Major structural elements such as channels, arches, fronts and lateral walls are not present here, although large bulks of rock can still be seen. Pumice can be found filling up small depressions between lava bodies, creating a patchy tapestry throughout the unit. On this substrate we can found a multi-species bush dominated by Spartocytisus supranubius.

- Uniqueness

This is an easily distinguishable area from surrounding landscape units due to a strong contrast. However, it does not posses any remarkable morphological features within the context of the whole park, apart from the high value added by the presence of Spartocytisus supranubius, particularly in the surroundings of La Fortaleza.

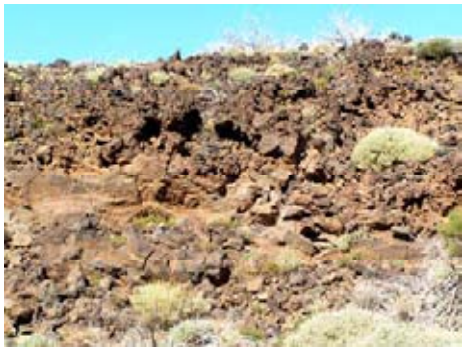


**Mixed flows in the M. de Las Lajas and M. Negra sector**

The outflows of the Montaña Corrales sector

- Description

A number of basaltic lava tongues outflowing from Montaña Corrales cone and spreading over in a fan-wise fashion are included in this unit. Unlike the previous unit, this sector retains some of its major morphological structures, as is the case of outflowing channels. According to evidence found in the present rocks, the lavas from which they originated were markedly fluid, or pahoehoe-like lavas. However, lava flows' surfaces show heterometric fragments that indicate a transition towards aa-type lavas. The plant component of this landscape is characterized by a multispecies scrubland of high coverage and the existence of a spotted plantation of pine grove in its northern end.



**Basaltic flows on Montaña Corrales**

- Uniqueness

The main peculiarity of this unit is the coexistence of major structural features typically found in *pahoehoe* lavas together with fragmented surfaces corresponding to aa lavas. This kind of combined substrate does not impose restricting conditions for the establishment of shrub species. Therefore, instead of vegetation mosaics, a relatively homogeneous floristic composition dominates the lava surfaces.

Ucanca sector lava flows

- Description

The heads of Pico Viejo lava flows, which border on the Ucanca flat, can be identified as a small, fragmented unit according to distinct morphological and biogeographical features. Segregation of this unit cannot be based on its major structural components since the frontal lobes of the lava flows are just extensions of the lower slopes of Pico Viejo. Instead, it is the absence of detritic material layers that characterises these heads, thus allowing observation of *aa*-type lava formations. Vegetation lacks any physiognomic relevance here, with the only exception of a line of shrubs that have colonised sediment-rich soils at the foot of the flow's front.

- Uniqueness

Its segregation is based on visual contrast with other surrounding units, rather than the presence of unique morphological features.



**Frontal lobes of the Pico Viejo flows with no vegetation coverage**

Pyroclast cones

- Description

A discontinuous unit made up of isolated elements located mainly in the oriental sector of the atrium and the lower slopes of Pico Viejo. These cones are ring -or horseshoe-like accumulations of pyroclast, often basaltic material. Generally they posses topographical prominence albeit their reduced height. However in the south end of the eastern atrium, that prominence is diminished by the presence of thick dome lava flows. Vegetation cover is discontinuous and shrubby, and can be mostly found inside the crater and on the lower slopes.



**Montaña Mostaza, with the open and discontinuous scrub common on pyroclastic cones**

- Uniqueness

These cones create punctual interruptions of the landscape due to their smooth surface in contrast with the surrounding roughness, their unique vegetation distribution, and particularly the presence of dark volcanic materials that contrast with the common range of ochre and yellow tones. Among them Montaña Tomillos stands out, with its striking combination of reds and blacks on the flanks that make it a visually relevant image from the Portillo-La Fortaleza sector.

La Corbata deposits

- Description

The unit is orientated along a North-South axis that crosses the atrium from the stratovolcano to the wall. It receives consideration as a separate unit due to the presence of alluvium deposits that cover the original volcanic structures and create a substrate for one of the most dense scrublands in the park. Deposit depth and fragment size vary with distance to the emission focus, both becoming progressively smaller as we approach the Parador de Turismo. The rock surface shows evidence of hillside erosion in the form of temporary channels that braid and progressively vanish as new deposits continue to accumulate. These characteristics impose serious conditions to plant distribution and the occurrence of particular floristic species.

- Uniqueness

This is the biggest deposit of solely alluvial fragments that can be found in the park. Its location and nature is associated with the most localised of all forms of rush water erosion of the stratovolcano. This unit is the most conspicuous dent in the old Teide cone, with steep gullies, which are rare features in other landscape units. These landforms give evidence of the occurrence of intense rush water erosion after the construction of the cone and prior to the emission of the dark lava flows that partly cover them today. The resulting landform is quite exceptional.



**Distribution of flower species according to the size of the material in the La Corbata deposit**

Endorheic flats

- Description

A discontinuous unit found mainly at the foot of the wall, with occasional flats of reduced size occurring among dome lava flows of the central atrium. A remarkable exception to this rule is the Llano de la Maja, located within the Campo de volcanes Portillo-Izaña. These flats are defined in general terms as areas at lower height than the surrounding landscape. In particular, those found at the bottom of the atrium are the lowest areas of the whole park. Consequently, they flood following torrential rains and at their bottom we can find deposits of small fragments of rock removed from the stratovolcano, the atrium's lava flows and the wall. When the depth of the deposits allows it, isolated rocky formations from underlying eruptions emerge from the surface of alluvium. Also, changes due to small topographic differences within the flat can be observed. For instance, silt concentrates in the lower, flood-prone flats, while deposits of larger fragments appear superficially on the outer rim of the flat or at higher, smaller flats. We can even see small torrential water channels in the steeper flanks of some flats. The frequent presence of this morphogenetic activity brings about a fragmentary distribution of vegetation, which distributes itself following the changing layout of sediments resulting from torrential and freeze-thaw processes.

- Uniqueness

The most remarkable feature of this unit is actually its flatness, which generates contrast with the rest of units within the park. In addition, the lack of absolute flatness

allows for the occurrence of small unique microlandscapes, defined by multicolour substrates and specific phytogeographic associations. Occasionally, low, sheltered areas become flooded resulting in small, temporary pools that offer solace from the ever waterless Teidean landscapes.



**Vegetation distribution following the alluvium In the Llano de Ucanca**

Roques de García

- Description

The defining features of this unit are a vertical topography isolated among flat environs, a ruin-like aesthetics and the abundance of morphological elements. Domes, dykes, sills and necks are some of the elements made conspicuous and individualised by differential erosion. Each of them evidences the irregular contour of tectonic distribution and the lithological variation. Deposits of erosive materials accumulate at the foot of these structures, their different sizes reflecting the nature of the rock from which they originated. Eventually these materials feed the adjacent, endhorreic flats of the atrium. The needle-like rocky outcrops support only isolated rupicolous plants, while slopes and alluvial fans accommodate a lose shrub that adapts to the stability of the substrate.

- Uniqueness

Visible from most part of the park area, this unit within the atrium represents a “meeting point” for major landscape units. Here the stratovolcano meets the wall and the East and West atria also come together. Therefore, this not only one of the most emblematic landmarks in the park, bat also one of the best panoramic viewpoints within it.



**Rune-shaped relief known as La Catedral (Roques de García)**

### *Samara volcanic fields*

#### Description

Segregation and delimitation of this unit as a major unit is based on its homogeneity, conferred by recent volcanic forms and the contrast with surrounding units they generate. The presence of these volcanoes creates a disruption in the west slope of Pico Viejo, but due to its marginal location within the park also extends into another major landscape unit of Tenerife, Abeque's volcanic ridge.
In addition to the gathering of apparently fresh pyroclast cones, the most unifying feature of this unit is the presence of a mantle of lapilli that covers older lava flows and partly coats the lower slopes and crater floor of the cones. Absence of plant cover is also a fundamental aspect of this area.

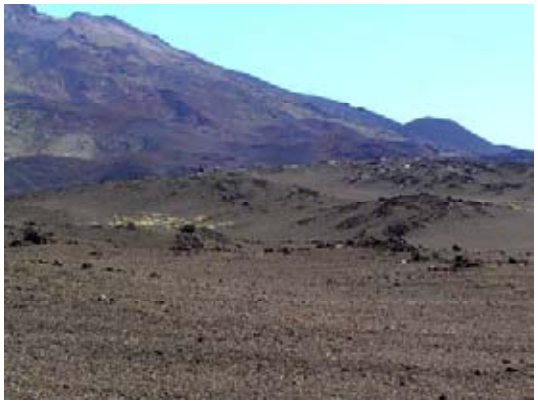
#### Minor units

Taking into consideration the scale of the analysis applied, this landscape unit is not susceptible to being dissociated in sufficiently contrasted lesser sectors thus remaining in this low hierarchical position. The unit described here is only a fragment of a larger natural landscape unit with its own defining features and internal variations. However, the western limit of the unit is here imposed by the National Park limit.

#### Uniqueness

This is in itself a singular landscape: dome-like and conic structures, extensions of rough malpaís and smooth lava flows, volcanic tubes, jameos and hills covered in a tapestry of black pyroclasts from which lava slubs and volcanic cone fragments protrude, after being carried and abandoned like erratic blocks by the lava flow, canarian pines reappear in disperse and small groups at the lower slopes of the stratovolcano after having previously disappeared during the ascension from lower altitudes. Also in shallow depressions scattered amongst the cinder-covered hills we can found codeso bushes. In the background, the ample conic figure of Pico Viejo tapers to the dented rim of its crater. Behind it the dominating whitish figure of Teide's apex appears. To the side, Roques Blancos dome outpours striking volumes of intensely coloured rock in massive formations as part of its spectacular effusive complex. Reds and ochres in the dome, greens and

siennas in the stratovolcano and black and toasted browns in the Samara volcano fields make up an isolated Teidean landscape of intense character. Behind the stratovolcano, at the other side of the sea, the island of La Gomera appears with unusual clarity that denotes its proximity. Further away and this time towards the Northeast is La Palma, while over the horizon El Hierro insinuates, mingling with the clouds at times.



**Lapilli field and recent volcanic forms in Samara**

### *Volcanic field of the Pedro Gil Ridge*

#### Description

Located at the opposite end of the National Park, the volcano field of Pedro Gil brings in, as the above unit did, elements of major volcanic ridges. In the same fashion it occupies a marginal position and its limits are merely administrative, not reflecting the full extent of the full landscape unit. Although the unit is separated from the stratovolcano by the largest sector of the atrium, it is actually with this structure that the field is most spatially related. The contact area with Las Cañadas wall is reduced, but it adds a curious visual effect since the concentration of pyroclasts in the east side of the wall is the actual reason why the wall slowly fades into the volcano field.

#### Minor units

| MINOR UNITS |
|---|
| Field of recent volcanoes |
| Fasnia volcano |
| Llano de Maja |

#### Uniqueness

This volcano field completes the range of volcanic landscapes that define the Upper Tenerife. The presence of this unit within the park, as well as with the Samara volcano field, allows for a better understanding of a broader, more complex volcanic landscape made up by the confluence of the larger volcanic ridges to which these units belong.

Therefore, this is the anteroom of Las Cañadas and the Teide mountain on its most common access.

The north face of the unit often stands floating above the sea of clouds generated by Trade winds in this area. It is not rare either to see a continuous blanket of clouds that extends from here to the island of La Palma. However, in the rare occasions that this blanket vanishes, the resulting view of La Orotava valley is not disappointing: a wide strip of *Pinus canariensis* forest followed by slopes of agriculture fields and settlements descending to the sea.

Portillo-Izaña volcano fields

- Description

This unit connects the complex volcanic building of Tenerife highlands with the Pedro Gil ridge in the same way as Samara does, although some features are somewhat different. Volcanoes here are older than at Samara. Additionally, there is not a unifying lapilli blanket as was the case above. In this case, uniformity is added by the close concentration of around twenty pyroclast buildings, only partly colonised by lose, open shrubs. Lava flows are not visible here, the low areas between cones being occupied by torrential and gravity deposits sustaining a well defined shrub or by some endorheic flats, such as the ample Llano de Maja.

- Uniqueness

This unit comprises the majority of the area of the greater unit to which it belongs, therefore showing similar landscape uniqueness.



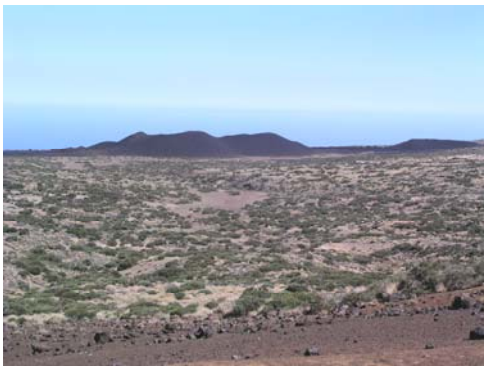
**Portillo-Izaña volcano field**

Fasnia volcano

- Description

This volcano originated in 1705 from a Strombolian fissural eruption. It shows several craters, aligned along the axis of the volcanic ridge in which the volcano is inserted. Lava flows outpoured down the steepest slopes, forming in the Northeast sector a

rippled, discontinuous wall of pyroclasts. As it is also the case in Las Narices del Teide unit the recent history of the eruption and its materials limits vegetation presence to only thallophytes.



**The Corral del Niño with the Fasnia volcano in the background (1705)**

- Uniqueness

Segregation of this unit is based on its geomorphological value, as it is the only volcano within the park that exhibits this particular morphology. Looking closely at this building a variety of small-scale volcanic formations can be appreciated: lava pools, lava outpours, hornitos, overlapping ash cones, funnel-shaped craters, fissural craters, etc. These formations bring valuable insight on the eruptive dynamics of a monogenetic volcano. In addition to its peculiar aesthetics and formations, the volcano's dark materials add chromatic contrast to the landscape.

Llano de Maja

- Description

The largest endorheic plain within its landscape unit, this flatland adds the most important landscape discontinuity to it. The area is located in the space between volcanic cones and contains flat deposits of materials transported from their lower slopes. Currently it is connected to the atrium by means of a small gully that generates the alluvial fan situated at the foot of the East wall on its north end. Vegetation typically distributes in bands, with the conspicuous presence of Descurainia bourgaeana.

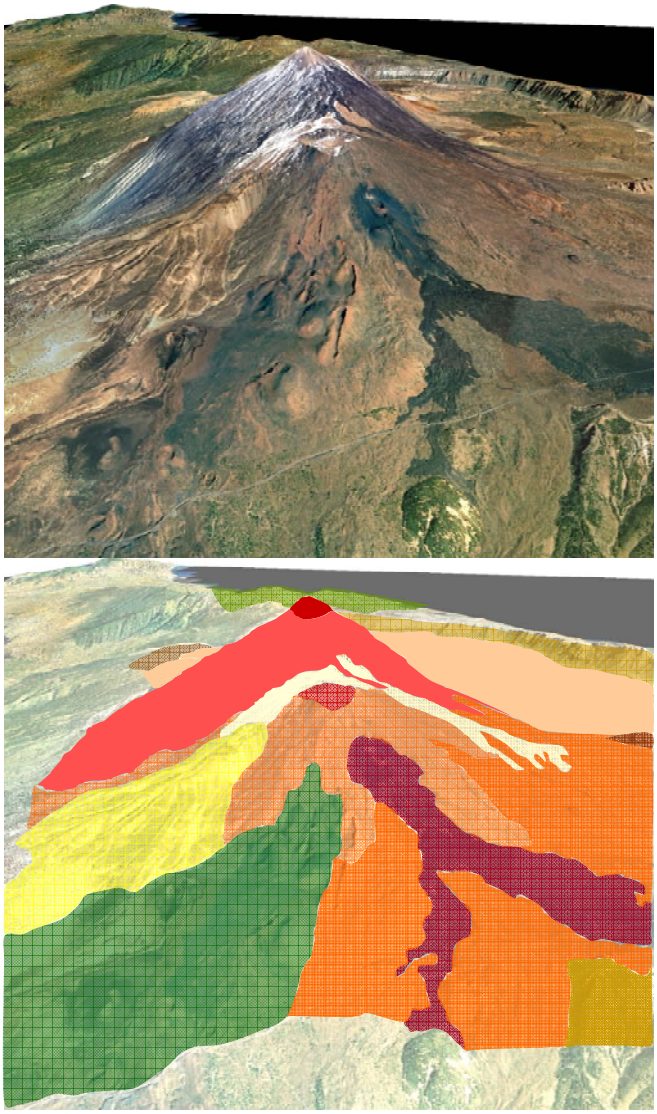


Llano de Maja with accumulation material and open vegetation

- Uniqueness

This is the only extracaldera endorheic flat with a well-defined landscape entity. It offers magnificent views of the wall, the stratovolcano and the atrium. Due to its situation among other volcanoes, this formation helps identifying a clear gradient in the distribution of types of vegetation among volcanic cones in response to slope degree, material size and nature and intensity of morphogenetic processes. During springtime, dense accumulations of Echium aubearianum enrich the landscape with their gracious figures and their blue colours that stand out from the carpet of Descourainia bourgaeana.

# Los mosaicos de paisaje




**Mosaic of Teide landscapes seen from the southeast**

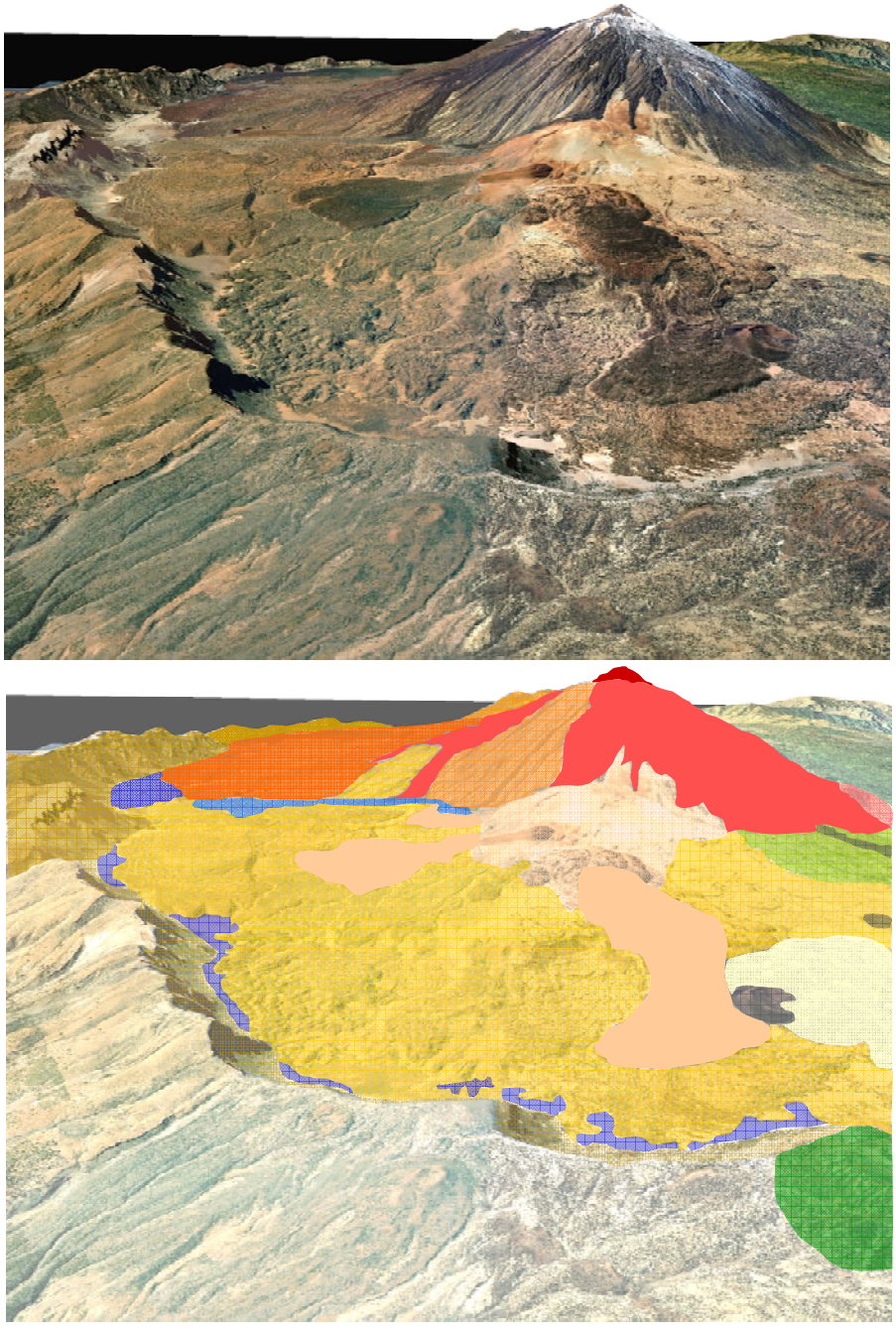



Figure 9. Mosaic of Teide landscapes seen from the east

## Synthesis of the landscape valuation of el Teide

- It is a snowed and unwonted summit which possesses all the mythical attributes gathered above the template landscapes of mankind and of the foggy forests.

- Its rapid drop from the near coast endows it with a magnificent figure and with the legend of a fantastic altitude, making it all together sky for old sailors, purgatory for the great poet Dante and hell for the natives.

- In the longitudinal strip of the globe in which it appears, there is no other similar relief from Iceland to Antarctica. If the follow-up is done from east to west, neither will it be found in this latitude from the Sinai to the Western Sierra Madre.

- It is a great solitary cone on the ocean. Its soft silhouette, very high, is suspended over a sea of clouds, over the level of meek fogs of the subtropical mountains.

- It is a great sleeping -not dead- volcanic construction which tops off the elevated island, lifted over the deep sea abysms which surround it.

- El Teide is above all the scenario of a furious history of eruptions. Its landscape is but the petrifaction of the last battles.

- El Teide has an original landscape. Even though some of its morphologic elements exist elsewhere, the exceptionality of this space is the integration of all them in a same space. El Teide is singled out with respect to other high volcanic mountains for an unrepeatable and hierarchical geography of multiplicity of worlds successively smaller within this particular cosmos.

- As a cultural model, this high subtropical volcano in the ocean, is the last one in Europe and the first one in America: the last Etna and the first Chimborazo.

- It is a remote landscape, but accessible for educational and research means; where feelings enjoy and reason learns.

# Atmospheric conditions

The Izaña Observatory (IZO) belongs to the National Meteorology Institute (INM, Spain), Ministry of the Environment, and is managed by the administrative unit called "Izaña Atmospheric Observatory" (OAI). IZO is an atmospheric station where research is carried out on the atmospheric components involved in processes that could change the Earth's climate through emissions (greenhouse gasses and aerosols) and with those that can destroy the ozone layer.

The Global Atmosphere Watch (GAW), coordinated by the World Meteorological Organization (WMO), was established in 1989 by integrating several of this organisation's atmospheric research and monitoring activities. The main objective of the GAW programme is to provide data and information on the chemical composition and physical characteristics of the atmosphere and its interactions with the oceans and biosphere. The data obtained from the observing stations in the GAW network are essential to understanding changes in the composition of the atmosphere and those in the global and regional climate. The GAW network is made up of twenty stations found throughout the world, but only six of them, among them the Izaña Observatory, provide information on the state and evolution of the free troposphere, essential for knowing the changes are occurring in atmosphere not directly disturbed by human activity.

The establishment of a globally important GAW station in Tenerife was made possible thanks to the convergence of a series of very important geographic factors: the location of the Canary Archipelago, sufficiently far away from the highly polluted continents of Europe and North America; the altitude of its location on the island of Tenerife (2,400 m) that places it above the thermal inversion associated with the trade wind, characterised by the almost permanent presence of a "sea of clouds" (Font, 1956) that provides a highly efficient natural cover which blocks the human pollution created on the island at sea level; and its location in the "pre-park" zone of Teide National Park, which ensures that it will have a clean and protected environment.

For these reasons the geographical and climatic characteristics of Teide National Park are unique in the world, allowing a world-important Global Atmosphere Watch Observatory to be established that develops atmospheric research programmes that can be divided into three main areas:

- **Monitoring and study of the effects of greenhouse gas**. Measuring base levels of greenhouse gasses (CO2, CH4, N2O, troposheric O3 and SF6) representative of the subtropical free troposphere is only possible in the area surrounding Teide National Park above the trade wind inversion and in an environmentally protected area and where the use of the land won't change in the coming decades. Barely five observatories in the entire world have a greenhouse gas measurement programme like Izaña's representative of the background free troposphere.

- **Monitoring the ozone layer**. The Izaña Atmospheric Observatory has a complete programme to monitor the subtropical region's ozone layer. The Network for the Detection of Stratospheric Change (NDSC www.ndsc.ncep.noaa.gov/) is a set of

high-quality remote-sounding research stations for observing and understanding the physical and chemical state of the stratosphere. The NDSC is a major component of the international upper atmosphere research effort and has been endorsed by national and international scientific agencies, including the International Ozone Commission, the United Nations Environment Programme (UNEP), and the WMO. In addition, the NDSC provides an independent calibration system for the atmospheric sensors on satellites that take measurements. The Izaña Observatory is a complementary station of the NDSC with four measurement and research programmes. In November, 2003 the European Regional Centre for Brewer Calibrations (RBCC-E; www.rbcc-e.org). Currently the RBCC-E is equipped with a triad of Brewer Calibration spectrophotometers that is linked to the world Brewer calibration scale defined by the Triad of Brewer instruments maintained by the Meteorological Service of Canada (MSC). Using the high-quality UV-VIS and FTIR spectrophotometers of the NDSC in the Izaña Observatory, validations of more than a dozen atmospheric components measured by ESA's GOME and SCIAMACHY/ENVISTA sensors and the NASA/KNMI OMI/AURA sensor have been carried out. All of these internationally important activities would not be possible if it were not for the excellent quality and transparency of the Teide National Park's air.

- **Monitoring of reactive gases and atmospheric aerosols**. The OAI has focused its efforts on obtaining long-term measurements under essentially reactive-gas conditions (tropospheric ozone, CO, $SO_2$, NO-$NO_2$-NOx) that are only possible in very low-polluted natural areas like Teide National Park. Since June, 2004, the Izaña Observatory is also a solar-calibration centre for equipment that reference the PHOTONS ("PHOtométrie pour le Traitement Opérationnel de Normalisation Satellitaire"; CNRS/Lille University, France; www.loa.univ-lille1.fr/photons) network. Furthermore, the Izaña Observatory has been chosen as the solar-calibration centre for RIMA (the Iberian Network of Photometric Measurement of Aerosols), a network that is made up of the Cimel solar photometers. RIMA is associated with the PHOTONS/AERONET networks. The Izaña Observatory is also integrated in NASA's Micro-Pulse Lidar Network (MPLNET; http://mplnet.gsfc.nasa.gov), which is comprised of ground-based lidar systems, co-located with sun/sky photometer sites in the NASA Aerosol Robotic Network (AERONET). All of these activities are only possible because of the exceptional atmospheric conditions of Teide National Park and because the observatory is located in a subtropical region characterised by few changes in high-atmosphere conditions throughout the year (great atmospheric stability).

There is a fourth important aspect closely related to the relationship between Teide National Park and the Izaña Atmospheric Observatory. The National Park is developing a global change project chiefly centred on the possible migration of vegetal species within its boundaries and for this it requires two kinds of technical-scientific support: it needs support establishing both a meteorological network and an air-quality network in the National Park to track its different meteorological and climatic conditions, as well as the possible impact that visitors and vehicles may have on the level of pollution in the park. In the future, these networks will also allow the park administration to control its air quality because it will be able to take measures to correct possible dangers that the network may detect and at the same time compliment the meteorological and atmospheric measurements that are already taken in the Izaña Atmospheric Observatory within the framework of the GAW

programme. These networks also allow real-time information to be given to the visitors of the park about meteorological and environmental conditions.

# The Sky

## Introduction

The sky above the summits of the Canary Archipelago, especially in Tenerife and La Palma, make our observatories among the best places in the world to study the Universe. The image quality is excellent as well as the climate and geographic conditions for observation. Today, the Roque de los Muchachos Observatory (La Palma) and the Teide Observatory (Tenerife), together with Hawaii (Mauna Kea), and the Chilean facilities at La Silla and Paranal are all references in observatories for installing the new telescopes of the future.

## Historical perspective



**Piazzi Smyth, 1856**

In the Summer of 1856 Professor C. Piazzi Smyth (Royal Astronomer of Scotland) -following the advice of I. Newton in Opticks (1730) that telescopes should be installed in the clear and stable atmospheres found above the clouds on the highest mountain summits- organised an experiment on Mount Guajara, on the island of Tenerife at 2,715 m, the highest summit of Teide located south of the Las Cañadas Caldera. In his 1857 book, Tenerife: An Astronomer's Experiment, Smyth pointed out the clear advantages that the conditions on Mt. Teide provided to measure and detect weak stars that were impossible to see in Edinburgh (Scotland, Great Britain), and the quality of diffraction rings in the focus of the telescope (seeing).

In June of 1895, Knut Angström and his collaborators initially situated themselves where Smyth had been in Alta Vista, at an altitude of 3,252 m while they made the first accurate measurements of solar radiation at varying altitudes.

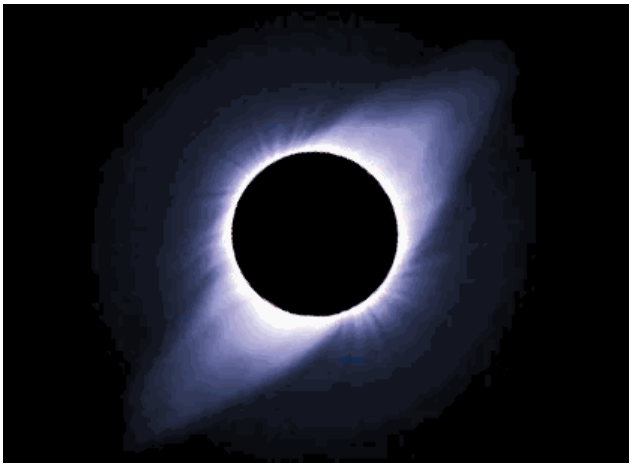
In 1910 Professor Panwitz organised a scientific mission to observe Haley's comet close to its perihelion, under the supervision of the International Association against Tuberculosis. Jean Mascart, an astronomer from the Paris Observatory (France), also took part in this expedition, later commenting in one of his books that "The situation in Tenerife is perhaps unique in the entire world…this mountain" (referring to Teide) is particularly favourable for the investigation of Physics and Astronomy" (Impressions et Observations dans un voyage à Tenerife, 1912).

In 1959, the total eclipse of the sun, visible from the Canaries, once again attracted the attention of numerous investigators and astronomers and the idea of creating an astronomical observatory on these islands resurfaced (it had previously been suggested by Mascart but set aside due to World War I). In 1960, Professor Francisco Sánchez and Professor Torroja y Romaña laid the groundwork for today's Canarian observatories. The first explorations began in the areas known today as Teide Observatory (OT) in Tenerife, and the Roque de los Muchachos Observatory (ORM), in La Palma.



**Jean Mascart, 1910**

In 1968, an informal cooperation among a number of European solar-research institutions began under the name JOSO (Joint Organization for Solar Observations). Their goal was to establish an optimal site for solar observations. After exploring more than forty sites in the Mediterranean and Atlantic coastal areas, it was concluded that "although the marine air masses in these coastal zones were quite homogenous, they were not valid for solar observation in high resolution". Consequently, while searching for high mountains immersed in highly homogenous air, two places were proposed in the Canary Islands: Izaña (Tenerife) and Roque de Los Muchachos (La Palma) (P.N. Brandt and A. Righini, Vistas in Astronomy, vol. 28, 437-1985).



**Sun eclipse, 1959**

## Why the Canaries?

The climate and geographical factors determine the excellent quality of the Canarian sky for astronomical observations.

The Canaries are located close to the terrestrial equator at a latitude of about 28º north and between 16º and 18º west. This means it has visibility of all of the northern celestial hemisphere and part of the southern hemisphere as well.

The cold ocean currents that surround the Canaries contribute to the warm air of the islands, thereby circumventing the storms that are frequent in tropical islands.

At the same time, trade winds produced by high pressure coming from the Azores, favour gentle and moderate temperatures. Another reason is that due to thermal inversion there are two layers of lower atmosphere (known as the troposphere) which are very differentiated and physically separated by what is known as a “mar de nubes” (“sea of clouds”) or strato-cumulous, typically between 1,200 and 1,600 m (I. Font Tullot, The Atmospheric Weather in the Canary Island, Madrid, National Meteorological Service, 1956). Above the layer of clouds dry winds predominate, there is considerably less turbulence, the atmosphere is more transparent and, furthermore, the “sea of clouds” largely blocks out light pollution from nearby populations.

The IAC observatories are located at 2,400 m above sea level, above the inversion layer and therefore above the “sea of clouds” (the presence of cirrus clouds at this height is also infrequent).

The proximity of the Canary Archipelago to the African coast of the Sahara Desert means that sporadically Saharan dust reaches the islands, muddying the sky over the observatories. However, the Saharan dust is only a problem (less than 0.2 magnitudes of atmospheric extinction) approximately 7% of the evenings. Also, the Saharan dust usually arrives with southern winds that bring cirrus clouds with them. Therefore, the number of nights lost are actually less (C. Muñoz-Tuñón, A.M. Varela and T. Mahoney, The Great Telescope of the Canaries. Conceptual Design -1997-). A study carried out by F. Sánchez in Urania (1970) reveals that over a period of 20 years, the presence of dust suspended in the atmosphere is only noticeable on 2.2% of the clear days in a year.

The volcanic origin of the archipelago makes one think that the incidence of tremors would be high, just as in other volcanic islands (like Hawaii). However, this does not occur in the Canary Islands; because they are 3 to 4 million years old (Anguita and Hernán, Journal of Volcanology and Geothermal Research, Vol. 103, 1 -2000-), no seismic movements have been registered that could affect the future of these facilities on the islands. In a report prepared by the Subdirección General de Geodesia y Geofísica, (General Sub-Administration for Geodesy and Geophysics) from the Spanish Seismic Data Base between 1902 and 2000 provided by the National Seismic Network, the earthquakes are of very low magnitude or intensity (compared to the results obtained in the North of Chile, for example).

Of the already high percentage of useful weather enjoyed by the IAC observatories, 80% are high-quality nights containing a clear and stable atmosphere. Similar situations

are only found in the observatories of Hawaii and in the southern hemisphere of Chile (P. Murdin, Vistas in Astronomy, Vol. 28, 449 -1985-).

## Description of the canarian observatories

The first astronomical research group (interplanetary medium) was established at the University of La Laguna, in 1964. The second group formed was for solar physics founded principally by Professor Kiepenheuer (Director of the Fraunhofer Institute). The first instrument was installed in 1964 (a Razdow 25 cm solar refractive telescope, in a 13 m tower) and became operational in 1969. From 1970 on, different telescopes and instruments designed by the IAC itself and by other institutions and foreign universities were installed.



**Panoramic view of Teide Observatory**

The Teide Observatory was formally inaugurated in 1970 and in 1973 the Astrophysics Institute of the University of La Laguna was created, the precursor to the Astrophysics Institute of the Canary Islands (IAC).

The first explorations in the areas near Roque de los Muchachos and Fuente Nueva on the island of La Palma also began in the 1960s. Formal contact among the different European institutions started in 1973 and in 1977 the International Scientific Committee (CCI) was formed to initiate the plans for the construction of what today is known as the Roque de los Muchachos Observatory.

In 1979, Spain, Denmark, Great Britain and Sweden and later Germany formalised international collaboration by signing an agreement to cooperate in astrophysics.

Presently, both observatories offer facilities for night-time study as well as solar studies, using telescopes and other astronomical instruments from 19 countries. This group, together with the technical and scientific facilities of the IAC in Tenerife, the (optical-infrared) Gran Telescopio de Canarias (GTC) measuring 10.4 m in size and the astrophysics centre in La Palma constitute the European Northern Observatory (ENO).

## The Sky Law

A dark night without artificial light shows a sky full of stars. We define light pollution as brightness or glaring in the night-time sky produced by the reflection and diffusion of artificial light in gasses and air particles. This glare does not allow the observation of weaker or dimmer objects.

This contamination is produced by the design and inadequate use of luminous objects in populated areas. This light is sent directly to the sky and largely wasted (up to 50% in spheres or globes), negatively the astrophysics community, driving safety and some animals that are overwhelmed by the light.

The object of the Sky Protection Law is to protect the Canarian skies as a natural resource. This law is a pioneer in its category that regulates outside illumination, radio-frequency levels, polluting industries and air-traffic over the Canarian observatories.

## Astronomical quality parameters

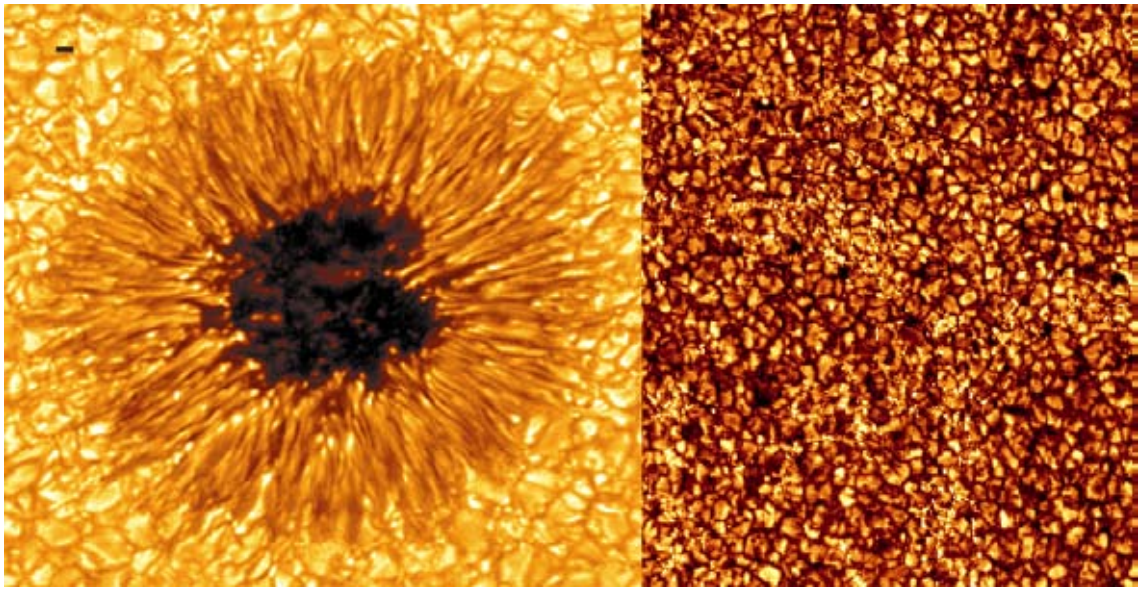
The high cost of large telescopic facilities demand optimal site selection. This was the main reason that for years the IAC Sky Quality Group carried out intense campaigns to search for optimal sites.

The objective of this group was the determination and the characterisation of the optical-infrared quality, as well as the meteorological conditions in the observatories. These studies were completed with geophysics tests that largely determined the validity and cost of the construction of the site.

Since the light received from celestial bodies changes while passing through Earth's atmosphere, it should be characterised to understand how it affects astronomical observatories. Among these changes is atmospheric extinction and its dependence with the quantity, type and distribution of dust; the background of the sky; or the limit of deepness observable during a determined exposure time. There are also other natural influences: physical processes of the terrestrial atmosphere, the lunar phases, the thermal inversion layer, etc., and other artificial influences (e.g. light pollution from nearby populations).

### *Optical Quality. Atmospheric Turbulence and Adaptive Optics*

Stars are points of light but as their light passes through the atmosphere, the light beam coming from the star is affected by atmospheric turbulence. As a result, the telescopic image of the star is seen as a circular spot whose diameter is called "seeing". The smaller its value, the better the quality of the image in an observatory, making it easier to differentiate between two points that are close together and allowing for better spatial resolution.



**Sun spot image and a sun granulation obtained by the ORM (La Palma). (M. Sobotka *et al.*, *ApJL*, 447, L133 -1995- and M. Shand y G.M. Scharmer, *New Astron. Reviews*, 42, 481 -1998-).**

Taking into consideration its good climate with a large number of useful nights, "seeing" is one of the key quality parameters of an astronomical observatory.

In order to get smaller "seeing" values (only obtained in the best locations) sophisticated techniques and instrumentation which have been developed in the last decade are needed. There are two prototype instruments in existence, one was fabricated by the ESO (European Southern Observatory) and a second one generated by the IAC in collaboration with the University of Nice (France). Both have been calibrated to each other and are producing the most convincing and modern data of the Canarian Observatories as well as those of the ESO in Chile (La Silla and Paranal).

Since 1993, intensive astronomical characterisation campaigns have been carried out in the Canarian observatories. The quality of the images improves during the summer months, favoured by the moderate trade winds typical of this season, as well as the presence of a well defined thermal inversion layer. Recent studies have revealed a correlation between image quality and wind direction, under a regimen of moderate velocity.

Techniques to measure the atmospheric turbulence have been developed at the Roque de los Muchachos and Teide observatories. The largest statistical study of

atmospheric turbulence profiles in the world were realised for the ORM. The majority of the turbulence was found concentrated at the ORM level (2,400 m). The distribution of the turbulence profiles during the course of six months presented a clear weather evolution with the turbulence concentrated in lower altitude layers in winter as compared to spring or summer. The average profiles of successive nights are similar, indicating high stability in the weather evolution. The isoplanatic angles derived from the turbulence profiles show seasonal behaviour, with higher values in February and lower ones in July (see Fuensalida et al. 2004, SPIE, 5572, 1).

Another study parameter of study is troposphere winds, in particular the wind at 200 mbar. This value was proposed as a parameter to evaluate the quality of an astronomical place for adaptive or technical optics that correct a large part of the defects through the use of optical deformation introduced by the terrestrial atmosphere in the images observed with a telescope. The comparison of statistical results of wind at 200 mbars in ORM, Mauna Kea, La Silla, San Pedro Mártir and Paranal, indicate that La Palma ranks first with an average value of 22.13 m/s, low standard deviations and a more stable behaviour of V200. We have found a clear annual periodicity of V200 in the five areas of study. A clear correlation has also been demonstrated between the high and low altitude winds, re-enforcing the idea of considering V200 as a parameter of site quality for adaptive optics, but with severe limitations imposed by a seasonal behaviour in the wind in the observatories studied.

In the high resolution techniques and the active optics, we should add the program functions of “seeing prediction”, which will allow the implementation of “flexible programming” routines to optimise the time use of the telescope in the future, adjusting the particular observation program to the atmospheric conditions at every moment.

***Infrared Quality***

Atmospheric absorption limits the observation of wavelengths in the ultra-violet range and lower that makes it limited to satellite observation. The optic range of the electro-magnetic spectrum as well as the nearest infrared, are accessible for observation from the ground, always keeping in mind that the astronomical area is well selected.

For the infrared range, it is crucial to have low water vapour content: determining its quantity in the atmospheric column above the observatory is essential for its infrared characterisation since in the spectrum range, the water presents many absorption bands. There are global models that establish that the quantity of water vapour depends exclusively on the quantity of atmosphere, making the highest summits the most ideal for observation in infrared. This was the historical reason why the summits of Mauna Kea in Hawaii (EE.UU) at more than 4,000 m have accumulated the highest number of telescope facilities with instrumentation to measure this range in the spectrum.

Nevertheless, local effects such as atmospheric turbulence can combine to give a lower altitude location characteristics that are comparable to those at higher altitudes, which facilitates all of its infrastructure.

A study of the infrared quality in the sky in high and dry mountainous places indicate that the Canaries offer the best infrared site in Europe (M.J. Selby and A. Mampaso, Astro.Lett. and Communications, vol. 28, 171 -1991-). A high percentage of nights (~39%)

is acceptable for thermal infrared observations (less than 3 mm of humidity in the zenith). This percentage goes up to 70% during the winter months. Regardless of the season, a significant percentage of time (~10%) the conditions are excellent (the water vapour column is less than a milometer in the zenith) (M. Kidger et al, New Astronomy Reviews, 42, 537 -1998-).

### *Meteorology*

It is essential to know the local meteorology and climate in the area studied: presence of cirrus clouds, dust in suspension, air temperature, relative humidity, barometer pressure, rain gauge levels, direction and velocity of the wind, etc. and its possible correlation with image quality. To do this, there are automatic meteorological stations equipped with standard meteorological sensors.

The infrequency of cirrus clouds, moderate temperatures and the semi-presence of trade winds allow for a high percentage of observation hours and contribute to the excellent quality of the astronomical images.

## International cooperation projects: OPTICON

The high cost of astronomical instrumentation and that of the construction and installation of a telescope, especially with the latest technology (a diameter larger than 8 m), and maintenance and handling, has made it necessary for the IAC to favour the realisation of rigorous studies that confirm and protect the good quality of its observatories.

This is how OPTICON was initiated, as an Integrated Infrastructure Initiative of the EU's VI Program of Research, Development and Innovation to improve the coordination of the European astronomical community in the optical and infrared fields as well as in solar physics.

The OPTICON project, coordinated by the University of Cambridge, financed by the European Commission and with a total amount of 47 contractors, was founded to promote collaboration in order to make notable progress through different joint activities, guaranteeing the re-enforcement of European astronomy through the cooperation and nationalisation of available infrastructures.

This European contract of 19.2 M euros (complemented by considerable national contributions) combine 6 different work activities in network (NAs) with another 6 joint investigation activities (JRAs) focused on technological developments. At the same time, OPTICON also has a trans-national access program that covers 22 European telescopes distributed around the world, 4 solar, and 18 night-time telescopes.

One of the main goals of this project, supported by many individual activities being carried out in OPTICON, is to prepare the scientific and technological specifications for the construction of a super-size European telescope. OPTICON has an ample work programme dedicated to the characterisation of the Canarian observatories; the Roque de los Muchachos Observatory and the Teide Observatory (both constitute the Northern

European Observatory- ENO), both clear candidates to house the new generation of telescopes.

This work program is encompassed within the work activity in the network: NA2: Coordination and integration of the ENO installations and will be prolonged until the end of 2008.

# Archaeology

## Introduction

Mt. Teide and Las Cañadas are not only a "monument" of the History of the Earth and Nature but also monuments of human history. For more than 2,000 years, different communities have formed a part of this landscape and contributed to its configuration, thereby imbuing it with an extraordinary cultural value. The figure of Mt. Teide is the physical axis of a long historical process in which two great cultural traditions intervene: the first is the North African proto-historic line of the first inhabitants of the island, the Guanches, and the second is the European cultural line that starts in the Low Middle Ages of the Renaissance; later these two lines converged reaching the present day.

The first cultural role of Teide was as a vital reference point used to navigate between the Strait of Gibraltar and the Atlantic coast of Africa ever since Antiquity; due to its importance, the mountain also acquired powerful symbolic and sacred connotations (Delgado Delgado J. A., 2001). Teide's role as a beacon was also essential in the later discovery and colonisation of America (Tejera Gaspar A., 1998).

While it was serving as a guide for ships sailing the Atlantic, Teide was also considered a Sacred Mountain by the Guanches and the other aboriginal populations of the archipelago. For the Guanches it was the Axis of their world (Axis Mundi), the support of the sky and the earth, but also a refuge for evil spirits linked to volcanic eruptions; when the conquest of the island took place Teide (called Echeide by the Guanches) was covered with sinister connotations similar to that of the Christian notion of Hell (Tejera Gaspar A., 2001).

New ways of understanding Mt. Teide and its surroundings were generated after the conquest of the island by Castilians in 1496. For a long time the summit was a refuge for aboriginal populations who did not want to be integrated into the new social hierarchy (los alzados). European colonisation also introduced different ways of exploiting the mountain's resources that were related to the new social and economic interests (sulphur, snow, firewood, coal, honey, etc.). Many of these practices would continue until the creation of the National Park, when they were either regulated or prohibited. The most important use was as a pasture for sheep and goats, considered to be an example of the symbiosis between aboriginal and European customs. At the time, these usages, which would be configured with particular characteristics over time, were essential for the economies of the regions near Teide and have left a lasting imprint on the landscape that increases its archaeological and ethnographic value.

In the end, the superstitious medieval concept of Teide as a dangerous place was replaced by its scientific value, converting the volcano and its surroundings into a unique reference point for the History of Science.

## Archaeological sites

### *Prehistoric archaeological sites*

The archaeological sites around Teide can be categorised into two large groups: those corresponding to its aboriginal occupation and those corresponding to the different practices that were introduced after the conquest.

The aboriginal presence in Las Cañadas was the most prolonged in time, around 2,000 years. There is archaeological evidence that has been radiocarbon and paleomagnetic dated indicating that the aborigines were present in these places in the 13th Century (Diego Cuscoy, L., 1960; Soler V. et al., 1992).

Until today, the most prevalent idea about the presence of the Guanches in Las Cañadas has to do with their herding customs. They regularly moved their flocks in order to take advantage of mountain pastures. It is thought that these movements from the coast to the summit were seasonal (Spring-Summer) -like the later movements of traditional herders- and that exploitation of these pastures was communal (Diego Cuscoy, L., 1968).

There are many other ways to explain the presence of the Guanches in the proximities of Mt. Teide: the exploitation of obsidian, trade and communication between the two slopes of the island, the sacredness of the space, their desire to separate and hide themselves from the Europeans, etc.

Despite the existence of various reasons for their presence (which archaeological research tries to connect in time and space and understand its symbolic and social complexity) the aboriginal presence in Las Cañadas was intense and continuous and its particular archaeological characteristics have left a lasting imprint that is the only record of the Guanche way of life and their adaptation to the volcanic insular environment existing in the world today.

The archaeological remains that are characteristic of Teide mostly indicate temporary, seasonal human occupation. Innumerable structures have been conserved that are the remains of their modest and simple homes -huts, refuges and shelters- the majority of which were found in Las Cañadas. These sites give a unique insight into the way of life of these societies. The most common structures are related to their old living compounds (huts) that extend throughout the territory of the National Park with greater or lesser concentrations in certain areas depending upon the habitability of the surroundings or its resources. This is why the concentration of archaeological sites is greater along paths that naturally connect with others or in the proximity of water sources or near strategic lookout points. Due to these concentrations, some areas of Teide National Park can be regarded as outstanding archaeological sites. Some examples are Cañada Blanca, Cañada de La Grieta, La Angostura, Cañada de Pedro Méndez, Chafarí or Cañada del Cedro (Arnay de la Rosa, M., 1992, 1995,1996).





**Remains of the walls of ancient huts**

Today we can find the remains of the walls of their living compounds which they built with dry stone, without any kind of mortar. They used various building techniques, but the structures always were able to support a covering (vegetation or animal skin) that delimited its protected and habitable interior space of varying sizes. These ancient huts were oval or circular and generally built near rocks or natural formations of the environment. By integrating their homes into the environment, the Guanches were able to make them more solid and give them better protection from inclement weather. These structures can be found isolated from each other or connected in a large group, forming a small village or camp, as is the case in La Cañada de La Grieta, Cañada Blanca or El Sanatorio (Arnay de la Rosa, M., 1992, 1995, 1996). In the interior and exterior of these

sites it is easy to see the vestiges of the Guanche way of life, with numerous remains of ceramic plates and lithic utensils.



**Ceramic, obsidian and bone remains in the interior of a hut**

Other structures that have been given different names (stations, pastorals, ergonomic complexes, activity areas) have also been found; despite the numerous names, they can all be defined as large, open-air accumulations of archaeological remains (ceramics, obsidians, grinding tools). These concentrations of materials indicate that these spaces were used repeatedly by the aborigines during a long period of time. Occasionally the remains can be related to very specific activities, for example the fabrication of grinding tools (Pedro Méndez, Montaña Cruz de Tea, Lomo de Chío), or the existence of an ancient route or path (Montaña Reventada) (Diego Cuscoy, L., 1968; Arnay de la Rosa, M., 2004).



**Ceramic fragments in the interior of a hut**

Volcanic caves, crevices and tubes of appropriate dimensions were also used as living spaces or burial spots. The small hollows that are so abundant in lava flows also had their specific use, becoming a special category of Canarian archaeological sites known as escondrijos (hiding places), whose best and most representative examples have been found in these areas. The escondrijo is a very particular way of using the crevices and hollows of volcanic flows to deposit and protect utensils for magic-ritual reasons or simply for domestic reasons (Arnay de la Rosa, M. 2000; Tejera Gaspar, A. 2001). This custom, initiated by the aborigines was later imitated by traditional herders (Lorenzo Perera, M., 1990). The lavic flows in Las Cañadas have become a "unique refuge" for a great quantity of aboriginal and ethnographic material that today make up a substantial part of the different museum collections on the island.





**Escondrijo with ceramics**

The escondrijos appear most often on the edges of lava flows or in the lateral walls of rocky watercourses and are often associated with surface sites. The natural hollows were used without any major transformations, once they had deposited the object they buttressed it so that it wouldn't move or they carefully covered it with rocks to protect it. Escondrijos have been discovered throughout Las Cañadas but there are areas with a surprisingly abundant concentration, such as in Cañada Blanca, Cañada del Cedro or Pedro Méndez (Diego Cuscoy, L., 1968; Arnay de la Rosa, M. 1982).

Ceramic cups, circular hand grinders, sundry stone tools and wood utensils have been found within these escondrijos. The abundance of these sites around Teide have allowed for the creation of collections of perfectly conserved Guanche ceramics that are unique in the world. These ceramic containers are characterised by their simple shapes that tend to be spherical, ovoid or ellipsoid, always with convex or pointed bases. This pottery was made by hand using a careful elaboration process, from the selection of the raw materials to the finish of its surface. A distinct characteristic of these containers is the presence of appendages or other kinds of handling elements ranging from large vertically implanted handles on the edge of the pottery to small protuberances that made it easier to hold them (Diego Cuscoy, L., 1977; Arnay de la Rosa, M., 1984 a, 1984b, 1987).



**Cuscoy with escondrijo ceramics in Cañada Blanca**



**Cup with a handle and spout found in an escondrijo in Las Cañadas**



**Cup with a spout found in an escondrijo**

Another important practice of the Guanches that has left an imprint on the landscape is the use of obsidian. The absence of metals or other rocks on the island led its prehistoric inhabitants to use volcanic rocks, especially obsidians, to make their unique tools. The most common and best quality obsidian for cutting were created in some of the flows that came from volcanic edifices located on the north face of the Teide-Pico Viejo Complex. Obsidian, called tabona by the Guanches, was essential for making a large part of their tools due to its useful characteristics within stone-age industries known to distinct prehistoric societies. The best quarries and production workshops that have been studied are found around Teide and in Las Cañadas (El Tabonal de los Guanches and El Tabonal Negro/Montaña Blanca). The imprint of the following activities can be seen in these centres: the acquisition of raw materials and the different phases of the technological process of extraction and distribution. Chemical analysis (trace elements) of obsidian utensils have detected raw material that came from these production centres in sites found all over the island (Hernández Gómez, C.M. y Galván Santos, B., 1998, 2000).



**Cup with a cylindrical handle found in an escondrijo in Las Cañadas**



**Obsidian quarry-workshop in El Tabonal de Los Guanches**



**A stone chip of cut obsidian found in an escondrijo**

The discoveries in this area are also often associated with death. Important sites have been found in Las Cañadas of collective or individual sepulchres with human remains, some of which have been mummified. The bodies were deposited in caves or natural crevices whose access was partially closed off by a wall of dry stones. Inside, the ground was covered with flat rocks or vegetation before depositing the bodies and occasionally some household items were entombed with the dead.



**Sepulchre with mummified remains. Montaña de Cascajo**



**Saltpetre Necropolis**



**Mummified infant. Montaña de Cascajo**

There are two large caves that were used as cemeteries or necropolises, where the remains of numerous individuals were found. These large cemeteries are located in hidden areas that are easy to guard. Examples are found in the Llano de Maja or Salitre sepulchral caves (Diego Cuscoy, L., 1953, 1960, 1965). Also found throughout the region are small crevices or hollows that were used to deposit small numbers of individuals (La Grieta, Cañada del Capricho, La Angostura, Risco Verde, Cañada Blanca, Ucazme, Chajora). The human remains that have been recovered contain men, women and children of all ages. The mummies found in this region have provided unique specimens for world paleoanthropological research.

***Historical archaeological sites***

The processes of acculturation and transculturation that took place after the conquest of the island created peculiar social patterns. On the one hand, the Castilian model was imposed on the indigenous population, but on the other hand, aboriginal customs and practices were also adopted because they were necessary for the effective colonisation of the island. Although they established very strict rules, it is well documented how European colonisers had to use the aborigines (Canarios, Guanches and Gomeros) to take care of smaller livestock because they knew the terrain and because of their tradition in raising livestock.

In the first years of the European colonisation new ways of understanding Teide and its surrounding area were introduced. The Medieval concept of danger was quickly replaced by the “scientific” value of the mountain and by the exploitation of its resources using concepts introduced by the socio-economic interests of the new society.

This is how different traditional uses of Teide’s resources and its surrounding area emerged. These practices would develop their own characteristics and historical evolution, leaving behind their particular imprints in the landscape that would add to archaeological and ethnographic richness that had already been left behind by the original Guanche indigenous populations.

One of the most significant traditional practices -one that also shaped the general toponomy of the area (Las Cañadas), as well as the numerous spots that integrated its landscape- is pasturing goats. Research has highlighted the value of these practices; although they have their roots in ancestral aboriginal methods, they were somewhat modified by certain traditions that came from the Castilian tradition of that time period and the new modifications incorporated from the post-conquest society. This initial symbiosis between the aboriginal and European worlds is particularly interesting and took place primarily (and in its longest lasting aspects) on the mountain and summit of the island (Lorenzo Perera, M.1992; Sabaté Bel, F., 2004; Betancor Quintana, G., 2002).

Pasturing practices have left archaeological remains within the National Park, in many areas superimposed on those left by the Guanches. Among these vestiges, the most important are the same as those of the aboriginal period: the living spaces and the livestock enclosures. New behavioural patterns were incorporated over the years as can be seen in the different spatial distribution (the creation of huts or houses using more complex building techniques and with different morphology and articulation of the interior spaces); but it can also be seen that some of the older practices were maintained

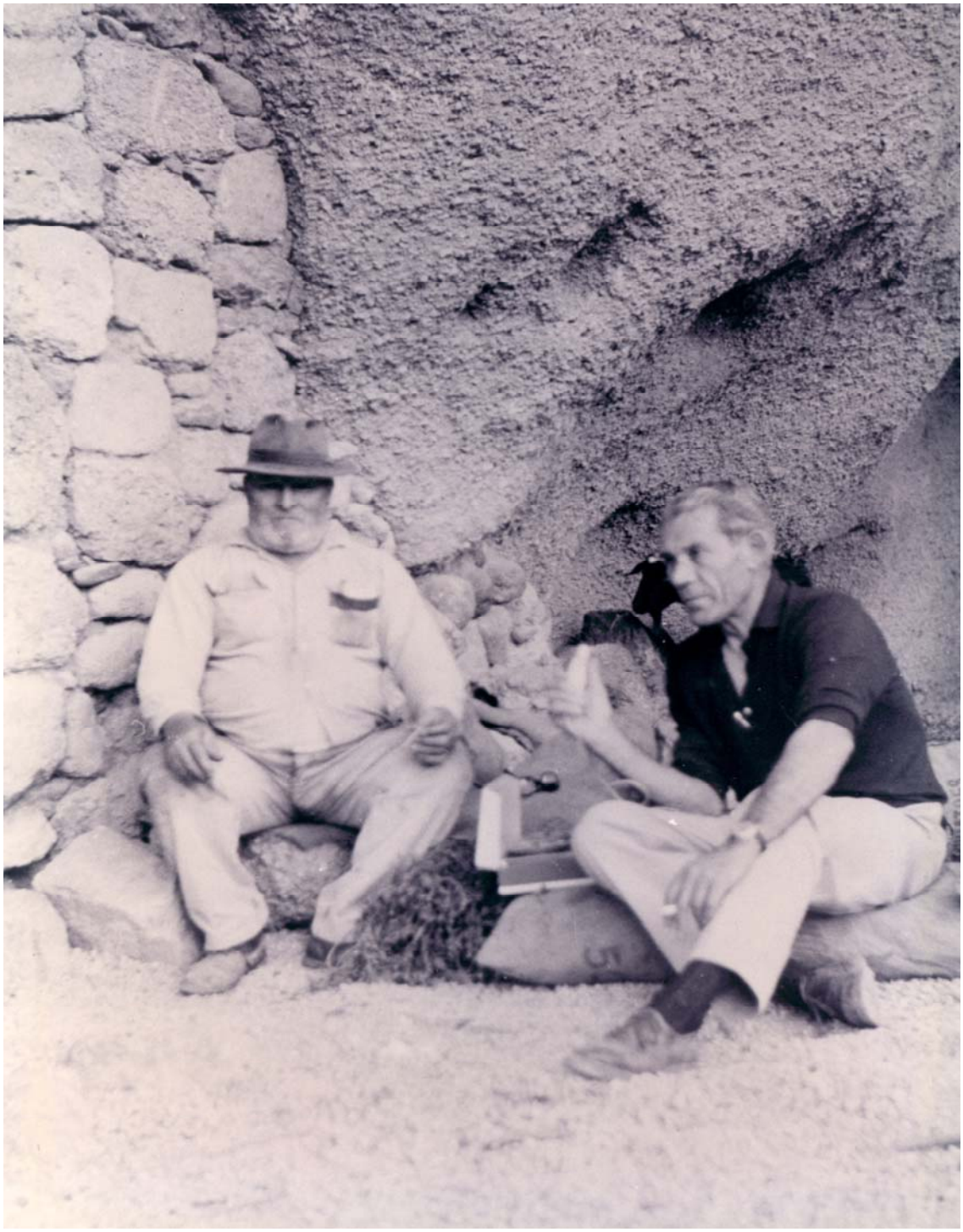
(shelters, refuges, escondrijos). This can be seen in the settlements found in la Cañada de La Grieta, Cañada del Montón de Trigo, Sanatorio and Valle de las Piedras Arrancadas. During this period, new types of material were added to the aboriginal materials, such as traditional ceramics using clays from different parts of the island or imported clays, metallic objects and wooden objects. Along with these archaeological discoveries an important line of research also collects the oral tradition of the herders and goatherds of the area, a unique testimony of a culture that has disappeared (Lorenzo Perera, M., 1991; Sabaté Bel, F., 2003).



**Historical site: herder refuge**



**Remains of historical constructions on the Guajara dorsal**



**Luis Diego Cuscoy interviewing the herder Zacarías**



**Traditional ceramic found within a historical site**

Although it is unknown exactly when apiculture started in the Canary Islands, it is documented that this practice grew during the 16th Century. The imprints left by the apiarists are easy to find because they are abundant and because the configurations of the particular structures that they used. In traditional apicultural settlements such as Lomo de Chío and Asiento de Pedro Méndez, along the stone walls built by the apiculturists to protect their hives from the wind there are also stone supports that they used to hang the hives so that they were easier to castrate (Martín Hernández, U. y Lorenzo Perera, M., 2005, Arnay de la Rosa, M. 2005).



**Apiary remains in Montaña de Chasogo**

Gathering firewood and, above all, the creation of Teide white broom (retama) coal were also habitual practices in Las Cañadas. As testimony to the collection of Spanish broom coal dust, remains of dry-stone walls that were built to more easily carry the collected dust in carts have been found. The remains of the charcoal kilns (circular spaces on flat ground cleared of rocks and surrounded by a small wall) have also been found: archaeological testimony to this no longer used method of exploiting vegetation resources (Arnay de la Rosa, M., 2005). Although these vestiges are found all over the island, they are especially abundant on the foothills of Teide Viejo.



**Remains of an old coal kiln**

The important activity of the 18th and 19th Century snow collectors (providing ice to the different cities of the island and even exporting it to Gran Canaria) also left behind considerable material vestiges. Some of the most important are the large artificial wells that they excavated. These wells can still be seen today on the slopes of Izaña and due to their special value as cultural heritage, they have been named Cultural Interest Properties (Miranda Calderón, S., 2003).

The old summit routes that cross Las Cañadas were vital for transportation and trade between the two sides of Tenerife until the 19th Century. The most important path that led from one side of the mountain to the other was the Chasna path, which connected the La Orotava Valley with Vilaflor and other villages in the south via Las Cañadas. Around the path numerous archaeological sites have been found related to the different practices given to this path. These sites are particularly abundant around Siete Cañadas. Particularly interesting are the many artificial constructions and a few large caves, like the Diego Hernández cave, that were used by the muleteers to rest (Núñez Pestana JR y Arnay de la Rosa M., 2003, 2004).



**Artificial well used for the exploitation of snow. Izaña**

## Scientific history that supports the aspects described in the archaeological report

### *Archaeological research*

### First phase of research

Before the creation of the National Park the archaeological importance of Las Cañadas was already well known. After the Spanish Civil War, excavations and archaeological research were organised and the Excavation Commissaries were created. In 1942 the Provincial Commissary of Archaeological Excavations was created in Tenerife. L. Diego Cuscoy was put in charge of the commissary and ever since most of his work has been based in Las Cañadas. In 1947 he published a long account of the archaeological sites and areas of interest and described Las Cañadas as "the largest archaeological extension on the island and the highest in all of Europe" (Alvárez Delgado, J., 1947). This researcher, who would be the Curator of the Archaeological Museum of Tenerife until his death, was then the leader of archaeological studies in the area, not only for his fieldwork but above all because he produced the first interpretation of the prehistoric inhabitants of the island and the importance that exploiting the summit had for the aboriginal society. Cuscoy's research activity focused primarily on the area between El Portillo de la Villa and Montaña Guajara in its N-S axis and from Llano de Maja to Montaña del Cedro from E-W. He didn't only make prospects but he also excavated different kinds of sites, mainly

sepulchral caves and groups of shelters and huts or “pastoral stations” (Montaña Rajada, Llano de Maja, Montaña Abreo, Cañada Blanca, Cañada de La Mareta, Cañada del Montón de Trigo, Los Roques, Llano de Ucanca, Boca Tauce and La Cañada de Pedro Méndez). His many publications describe the archaeological aspects of Las Cañadas (Diego Cuscoy L., 1953, 1946, 1947, 1953, 1960, 1961, 1965, 1968, 1971). Cuscoy also defined the different sites of settlements in Las Cañadas: he called them high-mountain pasture camps. Actually, later studies have only reinforced, completed or slightly modified his original observations: the existence of large sepulchral enclaves; the particularity of a temporary habitat made up of provisional refuges, huts and shelters that were well adapted to the environment; the presence of escondrijos containing different objects linked to the settlements, principally ceramic cups; and the existence of “quarry-workshops” to create lithic tools. But most importantly, he formulated the first explanatory model of the presence of aborigines around Mt. Teide in his book Los Guanches: life and culture of the primitive inhabitants of Tenerife in 1968: he described Las Cañadas as a large communal pasture area in Summer where herders from the different menceyatos of the island took their herds (Diego Cuscoy, L., 1968). This author’s scientific contribution has been the object of diverse historiographic analyses where his contributions to archaeology have been highly valued (Navarro Mederos y Clavijo Redondo, 2001; Navarro Mederos, 1997).

In addition to the work of Cuscoy there were other contributions between the 1960s and 80s such as those done in Montaña Mostaza, El Portillo, Montaña del Cedro, Cañada de la Grieta, Cañada de La Angostura, Cañada de La Camellita, Cañada del Montón de Trigo, Cañada del Sanatorio, Llano de Ucanca and Teide Viejo (Arnay de la Rosa, 1982).

**Second stage of research**

In the historiography of Canarian archaeology the 1980s has been generally recognised as the period where the most important theoretical and methodological changes took place in the research. These changes coincide with a renewal of studies in Las Cañadas. Different kinds of excavations took place during this period. The most important were the excavations of various sepulchral spaces, such as those in the Cañada del Capricho, Cascajo, La Angostura, La Grieta, Risco Verde, and, most importantly, the excavation of a group of huts in the Chafarí Valley (Jiménez Gómez, M.C., 1983; Arnay de la Rosa, M.1990, 1991, 1995; Galván Santos, B., 1988; Machado Yanes, M.C. and Galván Santos, B. 1997, 1998). Some of the research centred on specific aspects such as ceramics. In 1982, a monograph was written about the study of ceramics that had been found in the Tenerife highlands (Arnay e la Rosa, M. 1982). This work defined the different formal and technological aspects of aboriginal ceramics on the island with greater precision. This was possible thanks to the perfect conservation of the ceramic material found in escondrijos in Las Cañadas (Arnay de la Rosa, 1982; Arnay de la Rosa and González Reimers, 1983, 1984a, 1984b, 1987). It should be highlighted that the best collections of ceramic cups of the island, found in the Archaeological Museum of Puerto de La Cruz and in the Nature and Man Museum in Santa Cruz de Tenerife, come from escondrijos in Las Cañadas and the upper mountain (Arnay de la Rosa, M., 1982; González Antón, R. et al, 1998; Clavijo Redondo, M. and Jiménez González, J.J., 1995).

Since 1980 various lines of research have been consolidated that are still active today and who focus mainly on the different aspects of archaeology around Teide and Las Cañadas. First, the research being carried on the magic-religious world of the Guanches

based mainly on ethno-historic sources must be highlighted. This line of research was started in the 1980s. One of its principal objectives is the role of Teide as a Sacred Mountain and of the symbolic meaning of the space that surrounds it (Tejera Gaspar, A., 1988; 2001; Tejera Gaspar, A. and Montesdeoca, M. 2004). Mt. Teide has generally been considered a symbolic reference for all of the aborigines in the archipelago, playing an essential role in the Guanches' vision of the cosmos. With this in mind, research has centred on a new interpretation of some known sites, such as the sepulchres and the escondrijos (Tejera Gaspar, 1988, 2001). Secondly, research was started on different places thought to be sacred because of their characteristics, especially stations with etchings or that contained channels or bowls that seem positioned in reference to the mountain. The work most representative of this tendency is that of A. Belmonte and C. Esteban, who analysed sites found in Tenerife from this point of view, including those in Degollada de Yeje, in the area around Masca, and also in other islands like Gran Canaria or Fuerteventura (Belmonte, J.A. et al., 1994; Esteban et al., 1996, 1997; Esteban C., 1997; Esteban, C. and Delgado Cabrera, M., 2004).

Another one of the important lines of research has focused on the lithic industries in the island. The team coordinated by B. Galván and C. Hernández is responsible for diverse prospecting and excavations that help to understand the exploitation of obsidian resources. Research on lithic-production centres is part of a broader line of work that started giving clarifying results on this important socio-economic aspect of the Guanches around the end of the 1980s. At the same time it revises some of the concepts put forth by Cuscoy by considering new hypotheses with different theoretical underpinnings on the why the aborigines were on the summit. The way that lithic production was organised on Tenerife was extremely complicated, requiring specialisation and a hierarchical society. The dominant group organised the entire social system and as a consequence also controlled this activity. The principal obsidian production centres that have been studied are located in the area surrounding Mt. Teide and Las Cañadas such as El Tabonal de los Guanches (Icod de los Vinos) and El Tabonal Negro/Montaña Blanca (Las Cañadas). There is an abundant bibliography that gives a detailed look at the results of this research (Hernández Gómez C et al., 1998, 2000; Hernández Gómez C and Galván Santos B, 1998; Galván Santos, B. and Hernández Gómez, C., 1996; Velasco Vázquez, J. et al., 1999).

Chemical analyses of trace elements have detected obsidian that came from these production centres in domestic and sepulchral sites that are located all over the insular geography (Hernández Gómez y Galván Santos, 1998, 2000).

The third line of research is concerned with taking archaeological inventories and producing archaeological charts of Teide National Park. The first inventories of Las Cañadas were taken in 1982, but in the 1990s the first stable collaboration between the University of La Laguna (through its Department of Prehistory, Anthropology and Ancient History) and the Administration of Teide National Park was started and is still active today. When Spain's Central Government transferred the competences over historic heritage to the Autonomous Community of the Canary Islands, the Canarian Government committed itself to taking archaeological inventories in order to manage the transferred heritage. This process started in 1987 with the Inventory of the Western Canaries directed by J. Francisco Navarro Mederos. This work generated unified criteria on the objectives and methodology of fieldwork.

This policy of the Canarian government led to the successive inventories that have been taken in Las Cañadas since 1982. Keeping in line with new trends that are slowly combining history and nature into a single concept of Heritage, thereby requiring the management of both resources to be coordinated, Teide National Park plans to take archaeological inventories that up until now cover two periods, the first between 1982, 1989-1991/1996, and the second will start after 2004. In 1992, extensive zones of La Cañada de La Grieta, Tabonal Negro, Valle Chiñoque, El Sanatorio, Hoya del Montón de Trigo and Cañada de La Mareta (Arnay de la Rosa, M. 1991 a-c, 1992 a-i) were inventoried. In 1993 the work was done primarily in Cañada Blanca, Montaña Blanca, llano de las Brujas and Cañada de Los Guancheros (Arnay de la Rosa M., 1993 a-e). In 1995, the archaeological chart was extended to what was then still known as the "pre-park" (Arnay de la Rosa M. 1995 a; Galván Santos B and Arnay de la Rosa M, 1995- in 2004 the CICOP team finished their work in La Orotava, Rodríguez Rodríguez, T, 2004). In the same year work was also done in the areas of Cañada del Cedro, Montaña de Guajara and Valle de Ucanca (Arnay de la Rosa, M., 1995 b). Throughout 1996 areas of Pedro Méndez, Chafarí and Llano de Ucanca were undertaken (Arnay de la Rosa, M., 1996 a-d).

In 2004 a new prospecting campaign was started in order to complete the archaeological chart of some areas of the National Park, especially the areas that were incorporated when the National Park was expanded. At the moment they have been able to undertake the area of Montaña Cruz de Tea, Montaña Reventada, Lomo de Chío and Chasogo (Arnay de la Rosa, M., 2005). From a methodological point of view the work being done is based on three fundamental aspects: the different modern procedures for superficial prospecting; geo-archaeology and bio-archaeology (the evaluation of inorganic and organic archaeological contexts); and the configuration of a geo-referenced data base that can be analysed by geographic information systems (SIG).

The inventories have been an efficient tool for the planning, protection and diffusion policies that have been developed in the last ten years by the Administration of Teide National Park on its archaeological heritage. At the same time, their scientific impact has allowed us to advance in the historic comprehension of the island's upper mountains. A significant number of sites have been inventoried (at the moment a total of 1,300 sites: 725 prehistoric sites and 575 historic sites) and more importantly a large amount of information has been culled from them about how human beings interacted with this environment throughout history. The map that accompanies this report shows a distribution of the principal archaeological areas in the National Park and also all of the information that has been produced by the inventories that are cited in the bibliography.

Another one of the important fields of study that is currently being carried out in Teide National Park has to do with historical archaeology and ethnographic studies. Ever since the archaeological inventories were begun that have also included historical archaeological evidence that were left behind by the different uses made of Las Cañadas after the conquest. The idea is not only to evaluate the global socialisation of these territories and their history but also to touch upon aspects that are relevant to the research and management of their cultural properties. For example, establish on a comparable archaeological basis the questions that have been asked about the reuse of spaces and the survival of behaviours that intensely affect the sites in these areas. Social and economic changes incorporated after the conquest and colonisation consolidated the continuity of the ancient practices such as pasturing and added new ones that followed the model of exploitation of mountain resources used on the Spanish mainland. Among these

we can highlight apiculture, extraction activities related to snow, sulphur, firewood, coal , pumice-stone and mule driving in the summit routes. A large part of these traditional practices are known fundamentally through information received by oral tradition and ethnographic studies, as well as through written documents that are preserved in the Municipal Archives of the areas surrounding the park that in the past exploited the natural resources of Las Cañadas (Lorenzo Perera, M., 1983, 1988, 1991; Méndez Pérez, T., 2000, Sabaté Bel, F., 2003, 2004). During the last few years a tremendous interest in some of these topics has been resuscitated with the publication of some essays about traditional practices such as apiculture, the exploitation of snow or the summit paths (Núñez Pestano, J.R. and Arnay de la Rosa, M., 2003, 2004; Miranda Calderón S, 2003; Martín Hernández, U. and Lorenzo Perera, M., 2005). The celebration of the 50th anniversary of the National Park has sparked various publications on historical topics related to Las Cañadas and Mt. Teide that have included interesting chapters or sections about different traditional practices: Teide: representation and identity; Teide: a historical view; Teide: from geographical myth to National Park (Villalba Moreno, E. 2003; González Lemus, N. and Sánchez García, I., 2004; AAVV, 2004).

## Archaeological areas of interest in cartography

The attached map displays the principal archaeological areas of the National Park. The distribution of the sites (more than 30, between 10 and 30 and less than10 per kilometre squared) was created with information contained in the different archaeological inventories that have been carried out in the National Park (these inventories are cited in bibliography as unpublished reports). The park's Archaeological Chart is still being developed. The large areas that are not delimited on the map do not necessarily correspond to an absence of archaeological sites in those spaces but rather to the lack of pertinent studies. For the same reason the areas that are delimited may change category, as far as concentration of sites is concerned, as the studies advance. For example, this is the case of the southern slope of Teide Viejo or Montaña Blanca where fieldwork continues. The areas corresponding to the extension of the National Park still do not have adequate information because the inventories of those areas are still being carried out.

Concentrations of sits throughout extensive and continuous areas can be observed in the cartography. This is true of the unit formed la Cañada de Las Pilas, de La Angostura and de La Grieta. In these areas large settlements with surface and cave sites that correspond to living spaces or sepulchres, as well as a large number of ergonomic complexes or activity areas. Along with the prehistoric sites, this area is especially rich in remains related to the historical occupation of Las Cañadas, from the oldest activities (Chasna trail and traditional pasturing) to the most recent related to the different scientific or health investigations that were carried out around Mt. Teide.

The surface sites (huts, refuges, shelters) are also found in great quantities and well preserved in La Cañada Blanca, Cañada de Pedro Méndez y Valle de Chafarí and faldas del Teide Viejo. In La Cañada de Pedro Méndez, Cañada del Cedro, Cañada Blanca and Cañada de La Mareta, the existence of numerous escondrijos containing ceramics have been documented. The areas of Montaña Mostaza and Valle Trujillo are also notable for the presence of escondrijos, as well as for shelters and caves used as refuges. In the area of Montaña Reventada and Montaña Cruz de Tea there are large

activity areas with a great accumulation of material, as well as the presence of well-marked ancient Guanche trails. In Montaña Blanca and Tabonal Negro vestiges of obsidian work have been found along with surface sites and sepulchres. At the foot of the Fortaleza and in the Cañada de los Guancheros extensive activity areas and numerous surface sites can be found.

# History

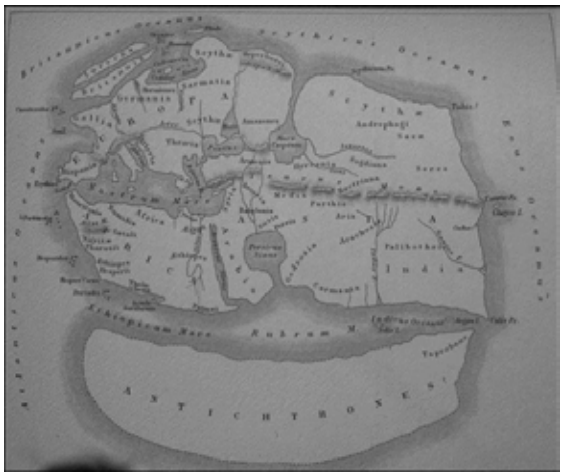
## Historic milestones

The evolution of history has greatly influenced the singularity of Mt. Teide, the pinnacle of the Macaronesian biogeographic region. Even its great naturalistic value, the uniqueness of its subtropical mountain ecosystem, has been possible thanks to the avatars of the societies that have passed through the island since the arrival of its first settlers. Since pre-Hispanic societies had little technology they were largely incapable of transforming the natural environment of the islands and therefore the summits that were inherited by following generations had hardly been altered by human activity. Far from being a passive protagonist of history, Mt. Teide has played an essential role in many events of history in general and of science in particular.

## Mt. Teide's entrance into history

The oldest known mention of Mt. Teide is from the 1st Century A.D., by the Roman naturalist Pliny the Elder: this terse description is of the island of Ninguaria (Tenerife) centres on Mt. Teide, although he does not give it a specific toponym: "From here one can see Ninguaria, covered with clouds, who was given this name for its perpetual snow". The wide dissemination of Pliny's Natural History during Late Antiquity and the middle ages, coupled with the problems of transmitting classic texts, led to the appearance of toponymic variations of the names of places mentioned in the text that were widely adopted, often displacing the original. This explains the term Nivaria, introduced by Solino, an author of the 3rd Century A.D. that was widely read during the middle ages: "Nivaria continues with its clouded and condensed skies and, moreover, always with snow". However, the alterations of the Plinian toponym began with Tolomeo, a geographer from the 2nd Century A.D. who named Tenerife Pintou(a)ría, Kentouría or Ningouaria, depending on the authors who have translated his work. In any case, it should be emphasised that the name Plinian used for Tenerife, as he himself states, is due to the snow that accumulated on the summit of Mt. Teide and not for any characteristic or property of the insular environment. Therefore, Mt. Teide was the characteristic trait that was used during Antiquity to identify and denominate the island.

Roman cartography placed the prime meridian in the Canary Islands on both the map of Agrippa as well as that of Herodotus. On these maps the islands are the finis terrae (end of the world), and since Mt. Teide is the most significant point of the archipelago, it must have been indispensable for fixing the longitudes. We don't have any direct references that this was true, but logic leads specialists to believe that it played a fundamental role in Roman cartography.



**Map of Agrippa**

When Islamic culture invaded the West it brought Hellenic cultural tradition with it, including navigation techniques and an interest in general scientific knowledge that included a revived curiosity for geography. The Arabs were the only people who navigated both the Mediterranean and the Indian Ocean at the same time. It is logical that their navigators would have known about the archipelago, although this does not imply that they would have settled on one of the islands, even sporadically.

There are Arab texts and cartography that prove that they knew the African coast to the Gulf of Guinea, the interior of the continent and the archipelagos. The only Arab text that historiography has identified with the Canaries was written by the geographer Edrisi.

According to María José Vázquez, Tenerife and Mt. Teide are identified within Edrisi's description. Edrisi also describes rocks with magic and curative powers that were found on the beaches of the island and sold for small fortunes. He was probably referring to ambergris, given the abundance of sperm whales in the waters of the archipelago during this period.



**Map of Edrisi**

Europe started to receive more reports about the island in the 13th Century. After the 1291 trip of the Vivaldi brothers, contact with European ships appears in documents, particularly ships from Genoa, Mallorca, Portugal, etc. There is evidence of voyages in 1341, 1342, 1352, 1366, 1370, 1386, and 1392, culminating with the conquest of the islands organised by Jean de Bethencourt and Gadifer de la Salle at the beginning of the 15th Century. The Genovese-Florentine expedition of Niccoloso di Recco and Angelino del Tegghia took place in 1341. Although this voyage involved various countries, it was organised and financed by Portugal and it set sail from Lisbon. The crew was made up of Florentines, Genovese, Catalans and sailors from other peninsular kingdoms. The goal of the expedition was to explore and gain knowledge of the Canaries and in this sense the voyage was a success. They had this to say about Mt. Teide: "They also found another island but they did not want to go ashore because of the wonder that it contained. They say that there is a mountain on that island that, according to their calculations, is thirty miles high, or even more, which can be seen from very far away and on whose pinnacle whiteness can be seen."

Mt. Teide had a great impact on medieval navigators when they saw it soaring up through the clouds to offer its snowy peak to the sun; they believed that they were seeing the tallest mountain in the world. It's strange that these seafarers from parts of the world where there are many summits of similar or even greater heights would believe that Mt. Teide was the roof of the world and that this belief would last for centuries.

## Mt. Teide in the history of geographic discoveries

Mt. Teide was present in the event that gave rise to the modern world, the discovery of the New World, before its conquest by the Kingdom of Castile. In Columbus' first voyage, when he made his discover, he expressly names Mt. Teide. In 1571, Fernando Columbus described his version of this voyage in his History of the Admiral: "Then the Admiral returned to the Canaries and with his work and diligence and that of Martín Alonso and the rest prepared La Pinta well; and then they came to La Gomera. They saw a great fire rising from the mountain on the island of Tenerife, which is extraordinarily tall…".

The vast majority of explorers and conquistadors passed through Canarian waters on their way to America, as well as merchant ships and pirates. For all of them, Mt. Teide was a primary reference point and all of this traffic converted the Canary Islands into the most well know archipelago in the Atlantic and a key element of nascent world cartography. As the historian Francisco Morales Padrón wrote, Mt. Teide was the beacon and guide for 16th Century navigators; as proof, he transcribed this verse from the chronicler of the Indies, Juan de Castellanos:

*They pass by the Canaries, see the peak*
*Of Teide that dominates the sunset clouds*
*Cut the sour-faced nautical waves…*

## Mt. Teide and the myth of Atlantis

Friar Bartolomé de Las Casas included the Canary Islands as one of the possible locations for Atlantis, identifying Mt. Teide as the mythical Mount Atlas. The myth survived until the beginning of modern geology, although this does not mean that the islands disappeared from the abundant body of work that later resuscitated the legend created by Plato in his Dialogues.



**Map of Atlantis**

## The Teide in the history of Science

English scientists were the first to use Mt. Teide in their experiments. The Royal Society of London was founded during the rein of Charles II of England (1630-1685), the oldest scientific academy in the world. Proposing to use the recently invented barometer to measure the height of Mt. Teide, the Royal Society asked the Spanish authorities permission to send a scientific expedition to study the great volcano of Tenerife.

The 1664 expedition was made up of a group of English and local guides. The account of its discoveries published in 1667 had an enormous impact. It was written by Thomas Sprats and was included in the first tome of the History of the Royal Society of London. This text tells the story of six British merchants who climbed Mt. Teide with the idea of studying it and doing away with the belief that Mt. Teide was one of the tallest mountains in the world. Their results were printed in one of the first publications of the scientific society that was a pioneer in the world.

### *Cartography and Geodesy*

On June 23, 1724 Abbot Feuillée (1660-1732) arrived in Tenerife. This monk of the Order of Minimums was a well-renowned astronomer, expert in cartography, good drawer and better botanist that stayed on the island until October 10. He was sent to study Tenerife by the French King Louis XIII who in 1634 ordered that all the maps in his kingdom use the meridian of the westernmost island, El Hierro, as a starting point for all longitudes, just as Ptolemy had done, and this required the coordinates of the island to be precisely fixed. But the French interest in El Hierro's meridian had nothing to do with historical tradition; in reality, the monarch's order was meant to establish areas where French ships could pirate Spanish convoys from America without it supposing a declaration of war. However, Louis' order would take years to carry out due to the permanent conflict between the Spanish Hapsburgs and the French Monarchy during the majority of the 17th Century. Later, the death of the Hapsburg King Carlos II started the War of Succession (1700-1713) compounding the delay. The different European monarchs backed the candidate that best supported their own interests and so the Spanish conflict became an international war. Once it was over, the excellent relationship between the French and Spanish Bourbon monarchies permitted the Paris Royal Academy of Sciences to prepare a voyage to the island of El Hierro and to the peak of Mt. Teide since "it would be expedient for the sciences and principally geography and navigation to send a person to the Canary Islands who is accustomed to maritime voyage and experienced in taking observations, like Father Feuillée. The King's mathematician has already proven his worth in the various voyages that he has taken to the Orient and the Western Indies and in his precise observations in Astronomy and Physics".

The Abbot Feuillée was the author of the second of the known ascents in the 18th Century, but the first that was programmed as part of a scientific project. Among other things, in his visits to the American continent he had seen mountains that were much taller than Mt. Teide and so he refuted the idea that it was the tallest mountain in the world. He measured the altitude of Mt. Teide using a barometer and trigonometric methods. The placement of Mt. Teide's longitude and latitude was essential to be able to place El Hierro's meridian and therefore, Mt. Teide was key to the French cartography school.

### *Botany*

Scientific botany was born in the Century of Revolutions and in this branch of knowledge the Canary Islands is one of the most important places in the world. Linneo and his son classified Canarian plants. For Europeans Canarian plant life was a new and unknown world, an excellent appetiser before reaching the exuberance of the tropics. Botanical gardens from all over Europe sent experts to the islands or asked for specimens for their collections. When Britain's Kew Gardens sent Masson to the Canaries, he also climbed Mt. Teide in order to collect plants at different altitudes. Broussonet's description of new Canarian plant species would serve as the basis of later studies on the flora of the island, despite the fact that his studies were never published. Other botanists that made important contributions Canarian flora included Bompland, who was part of Humbuldt's expedition to Mt. Teide, and the Bounty expedition (which would pass into history for its famous mutiny). Lamark and Poiret described various island species in the section of the Encilopédie Methodique (1783-1817) was dedicated to Canarian flora.

### *Mt. Teide and the scientific expeditions of the Age of Enlightenment*

Tenerife was a required stop for the great scientific expeditions of the 18th Century, such as those of La Condomine, de Bougainville, Cook, or La Pérouse. All of them took advantage of their passage through Canarian waters to make observations of the island. In some cases short stays allowed the scientists aboard these scientific-commercial voyages to climb Mt. Teide. This occurred in the La Pérouse expedition: the naturalists devoted their stay in the port of Santa Cruz to climb to the summit of the volcano. The experience is related in the fourth tome of the trip's history. The brief report includes barometric and temperature measurements, mineralogical analyses and a description of the botanic species, as well as a description of the crater: "The Peak's crater is a veritable sulphur mine very similar to those in Italy; it has a longitude of approximately fifty toise and a width of forty and it rises steeply from west to east. On the borders of the crater and, above all, on the lowest part, there are various vents exhaling aqueous vapours and sulphuric acid whose heat made the thermometer rise from 9º to 34º. The interior of the crater is covered with a yellow, red and white acrylic and partially decomposed blocks of lava: superb sulphur crystals were found under these blocks".

The last of the great scientific expeditions of this century was organised by the French Republic in 1791 whose objective was to find the lost expedition of La Péreouse. Two ships named La Recherche and L'Espérance carried a large group of naturalists aboard. The history of the voyage was written by Labillardière who took advantage of a fifteen day stay to climb Mt. Teide and leave us with some miscellaneous details about the society of the island and some important scientific observations, including a possible origin of Las Cañadas: "This summit ends in a crest that is tallest in the northwest. To the southeast lies a deep depression that seems to have been created by a landslide".

The placement of the longitudes via a quick and practical system was one of the most important technical goals of the 18th Century; Spain, Great Britain, France and Holland had organised competitions to see who could invent a chronometer that worked in ships. When Claret de Fleurieu passed by Tenerife in a frigate while trying to demonstrate the efficiency of a chronometer built by the watchmaker Berthoud, he took advantage of the occasion to fix various longitudes to important reference points of the archipelago; obviously, one of them was Mt. Teide.

The voyage of the frigate, La Flore, was another French expedition to test the latest advances in the naval technology of the day. The mathematician and geodesist, J. Ch. Borda travelled on board and he also organised an ascent of Mt. Teide. He wrote a monograph about the islands that gives valuable data on the population, customs and economy. The way he justifies his work is very telling: "We did not measure the peak of Tenerife simply out of curiosity but rather because of our nautical work. It was indispensable for us to know the exact elevation of that volcano in order to take advantage of the visible height observations we had taken from various points of Tenerife, Gomera and Canaria, which were to be used to fix the longitudes and latitudes of these points". The altitude of Mt. Teide was a problem that occupied an entire century and that ended the myths that circulated about its height.

### *The arrival of Humboldt*

In June of 1799 Alexander von Humboldt (1769-1859), the most well known and valued German scientist and naturalist of the Romantic period, arrived in Tenerife. His five day stay in Tenerife had an enormous repercussion on the academic world. Humboldt's approach was a radical departure from that of his predecessors in that he didn't only want to measure and classify but also understand and explain. This new natural scientific ideal broke with mathematic abstractions characteristic of the scientific revolution of the 17th Century. Humboldt wasn't satisfied with merely writing a history of his travels, he wanted to interpret, find laws and regularity in nature and thereby try to explain the characteristics of the landscapes of the places he visited. That is why his Voyage to the Canary Islands is included in the work that would make him famous in the scientific world: Voyage to the Equinoctial regions of the New Continent. He was so impressed by his visit to Tenerife that as soon as he reached the American continent he wrote a letter to a friend saying that Mt. Teide was "an immense basaltic mountain that seems to lie upon dense and secondary limestone rock. It has the same flint rocks that are found in the Black Cape of Africa, the same that lie upon the basalts of Saint-Lopu near Agdey, of Portugal. Do you see the uniformity with which the world is built!".



**Portrait of Alexander von Humboldt**

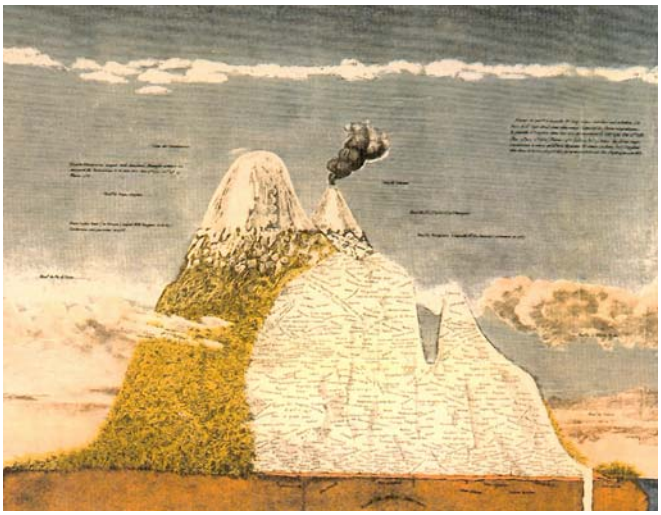
Feuillée also went to the New World, but his work in the Canary Islands was singular, with many concrete and utilitarian objectives. Humboldt's stay in Tenerife had purely scientific objectives that were not fuelled by economic or political interests: he looked at Mt. Teide strictly through the lenses of science.

The wise Prussian described the moment he arrived on the island with these words: "We cast anchor after sounding the depths a number of times, because the fog was so thick that we could hardly distinguish objects at a distance of a few cables; but the moment we arrived at the plaza the mist entirely disappeared: Mt. Teide Peak revealed itself in a clearing above the clouds and the first rays of the Sun, which we hadn't yet seen, lit up the summit of the volcano". From that moment Mt. Teide became the permanent point of reference of his trip to Tenerife.



**Humboldt and Bompland in Las Cañadas**

Humboldt's meticulousness and literary talent allowed him to link his notes perfectly with the contributions of other authors that visited the island after him. Such is the case of Bory de Saint Vicent or that of his friend Leopold von Buch, who are repeatedly cited by the German naturalist and in a few cases he used their observations to rectify some of his own affirmations, which is a testament to his great intellectual honesty. Humboldt studied a broad spectrum of natural sciences: geology, mineralogy, meteorology, climatology, botany and geodesy and he proved to be one of the most important experts of his era in each of these fields. He was also interested in the history and ethnography of the society of the islands and he devoted an entire chapter to height measurements of Tenerife and especially Mt. Teide.



**The vegetation belts (Humboldt)**

Unlike botany, geology was not very systematic at the end of the 18th Century. This was reflected in Humboldt's comments about Mt. Teide; he rejected the idea that the goal of volcanic geology was to "classify lavas, examine crystals contained within them and describe them". On the contrary, he proposed to answer questions about the origins of volcanic activity. Unfortunately, the questions he asked were based on mistaken premises -those of his era- so the answers that he came up with were, obviously, incorrect. For example, he wondered what substance fed the "combustion" of the internal fires that sustained the volcano. He himself complained that the few advances in chemistry and

geology hindered his analysis as a naturalist. Despite these limitations, Humboldt deduced some correct conclusions, even some that were contrary to the dominant ideas of his time; for example, he said the following about obsidian: “To me it seems very probable that obsidians are vitrified masses that cooled too quickly for them to become lithoid lavas”. The absence of the time variable in geology of his era led him to believe that the volcanic glass must have been extremely old.

Hulmbodt saw Mt. Teide as the culmination of a great volcano. He wasn’t sure if the mountain was formed by the accumulation of volcanic material or if this material only covered a nucleus of primitive rocks. He even admitted the possibility that “the Peak of Tenerife and the other volcanic summits of the Canary Islands were the remains of a submerged mountain range”. Although he admitted that these were but conjectures, he leaned toward the belief that it was created by material emitted during eruptions. He believed the volcano was active because of the fumaroles and historic eruptions, especially the one that had occurred in the slope of the Pico Viejo the year before he arrived.

The measurements of air temperature, barometric pressure, the direction of the winds, etc. allowed him to make sensible commentaries about the climate, the meteorology or the lower temperatures at higher altitudes: “The steepness of these mountains allow us to compare the temperature of two layers of atmosphere that lie in almost the same perpendicular plane; in this way observations made in a trip to the volcano of Tenerife are similar to those made during an aerostatic ascent”. On the summit he found a cold environment, his thermometer measured 2.7º C and the west wind blew so hard that he could hardly keep himself on his feet. He compared this temperature with the one he obtained in La Orotava and calculated the temperature drop with altitude. An interesting fact is that he was able to correctly explain the reasons why the summer temperatures among insular mountains were cooler and less variable than mountains found in the interior of continents. According to Humboldt the “ocean returns less heat than the plains; therefore the summits that are surrounded by the sea are colder in the summer than the mountains that rise up in the interior.” And, like others before him, he gave his impression of the ocean and clouds: “A layer of white clouds drew our eyes from the ocean and the lower regions of the island. This layer seemed to be no higher than 800 toise; and the clouds were spread so uniformly, sustaining themselves at such a perfect level, that they seemed to be a vast snow-covered plain”.

Humboldt’s most interesting contributions to science were in the analysis of vegetation landscapes. Once he had finished his geological work he decided to examine “how these melted masses were slowly covered with vegetation; the distribution of plants on the steep slope of the volcano, and the physiognomic aspect of the vegetation in the Canary Islands”. From this perspective he described for the first time the levels of vegetation on the island, grouping them in five sets: the Vines Region, the Laurels Region, the Pine Tree Region, the Tiede White Broom Region and the Highest Region where grasses dominated. In this level he included a plant that was classified for it: the Teide violet, although the first botanic description of this plant was made by Feuillé. Humboldt relates how he was aided by his travelling companion, the expert botanist A. Bomplant, and with the written notes of the botanist Broussonet, which he called a great naturalist. At the suggestion of his friend Leopold von Buch, he subdivided the first region in two, adding the African form region for the lowest level.

In November of 1800 the last great scientific expedition of the Enlightenment spent a week in Tenerife. J.B.G.M. Bory de Saint-Vincent, one of its 24 scientists, took advantage of his brief stay in the Canaries to prepare a book that would become very important: Essay on the Fortunate Islands and Old Atlantis or Compendium of the History of the Canary Archipelago. The goal of the expedition, led by Captain Baudin, was to study the austral regions by order of Napoleon, although "our essayist" could not complete the journey because he had to disembark on the island of Mauricio due to illness.

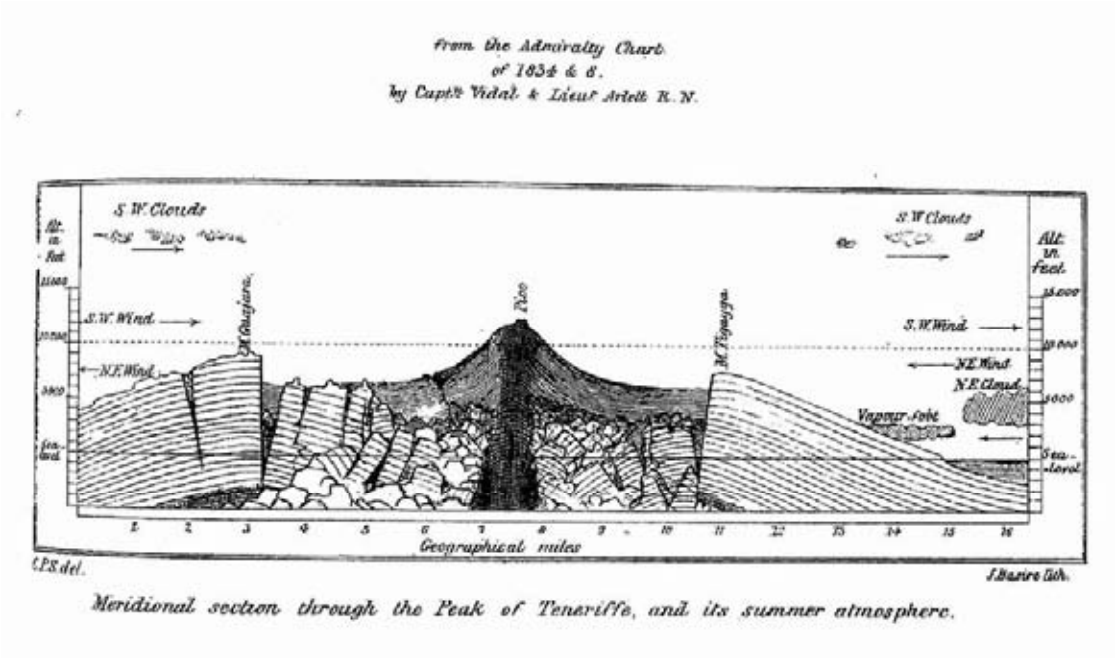


**Eruption of Chahorra (B. De Saint Vincent)**

Based on the work of Viera, Bory de Saint Vincent identified the Canaries as Atlantis and Mt. Teide as the Atlas. In addition to his ideas about the history of the Canary Islands, the French scientist contributed the first printed account of the plants and animals of the islands. Logically, he didn't do the entire inventory; a large part of the catalogue was given to him by the botanist Broussonet. The French scientist botanised in the gorges close to Santa Cruz and in the proximity of La Laguna. The catalogue included 467 species, almost all of them endemic of the Canaries.

### *Mt. Teide and 19th Century Science*

The founder of scientific volcanology, Leopold von Buch, visited the islands in 1815. During his stay he conducted the first geological and climatological work on the archipelago. His effort gave rise to the commonly used terms in the Canaries that are in part based on scientific language, such as the "caldera". His theory was the first to try to explain the formation of Las Cañadas and was accepted until well into the 20th Century. This "elevation craters" theory was accepted as a general explanation of the origin of the great volcanic calderas. Moreover, for the first time Buch attributed the creation of the La Orotava to a giant landslide: "When this valley enclosed between two walls is viewed from a high vantage point, one involuntarily thinks that it was caused by part of the Island collapsing, thereby exposing the two mountains that formed the sides of the part that was dragged down. The proximity of a volcano as active and violent as that of Tenerife makes this supposition realistic".




**Elevation craters theory**

The study of Canarian nature by two important researchers, S. Berthelot and Ph. P. Webb, resulted in a French publication of one of the most important naturalist studies of the 19th Century: The Natural History of the Canary Islands. Las Cañadas is one of the main focuses of this work, everything from the 1798 eruption to entomological studies is included in the book published in Paris between 1839 and 1850. In its section covering miscellaneous facts about the Canaries, Berthelot narrates his second ascent to Mt. Teide: “The whole archipelago appeared like a relief map; and under our feet Tenerife with its solid mountain masses and its deep valleys. What a glorious panorama!”

As he relates in his autobiography, the great English naturalist Charles Darwin was also influenced by the islands because ever since his adolescence he had always wanted to travel to Tenerife; but, unfortunately, he and his crew were not allowed to disembark in Tenerife because of a suspected outbreak of cholera on the ship.

Many of the greatest geologists of the 19th Century were interested in Tenerife and particularly in Mt. Teide. Lyell, one of the fathers of geology, visited the island and included his work on Tenerife, Mt. Teide and other places in the Canaries in his magnum opus. The German scientists, Fritsch, Hartung and Reiss elaborated the best study of the century on the geology of Tenerife. Their geological map of Tenerife, published in 1866, is still valid in its basic lines and their diagrams of Las Cañadas and Mt. Teide are still admired for their great scientific quality and aesthetic.

The visit of Ernst Haeckel, the founder of the science of ecology is of special interest because of his importance. As a result of his stay he published the book, “From Tenerife to Sinai”.



**Ch. Lyell**

### *Astronomy*

Astronomy has always been closely related to Mt. Teide. Its excellence as an observation point had been highlighted by naturalists and astronomers of the 19th Century. In the 1850s the great astronomer Charles Piazzi Smyth and his wife Anne Duncan, also an excellent scientist and an even better photographer (she was the author of the first stereoscopic photographs of Mt. Teide and the island), arrived in Tenerife. During the summer of 1856 they spent two months on the Guajara summit (2,715 m) and Altavista (around 3,300 m); they installed their telescope next to the cabin used by the sulphur and ice collectors. This long stay attracted the attention of the travellers of that period, such as Charles Edwards who wrote a travel book entitled Excursions and Studies in the Canary Islands. In this book Edwards gives his impressions of the inhospitable place where his countrymen had lived: “The house belongs to a sulphur company [...] A few years ago, Piazzi Smyth, who was doing his laborious study of the characteristics of the Peak, pitched his tent close to this house and lived for a period in the extreme cold and heat”. The results of this work had a great repercussion among astronomers and in recognition of Piazzi Smythe, the astronomer who wanted to be closer to the heavens, they baptised lunar irregularities with the name Teide and Tenerife. The importance this astronomer had on Mt. Teide is highlighted in the introduction that José Luis García Pérez, the great specialist on the history of English travellers in the Canaries, wrote in his book: “It has been almost 145 years since the great astronomer Charles Piazzi Smythe wrote his book Tenerife: An Astronomer’s Experiment, a fantastic work the was read around the world for its scientific importance. The actual event, a beautiful experience on the summit of Teide, along with the first stereoscopic photos in history, made this a very special adventure. Tenerife, a strategic point in the Atlantic throughout the 19th Century for so many travellers, reached its greatest popularity in 1856, not only for its landscape but also for its sky”. This tradition continued in the 20th Century with the studies of Halley’s Comet carried out by the astronomer Jean Mascart. He installed his telescope on the highest point of Guajara, the third highest on the island after Teide and Pico Viejo. In the last few years Las Cañadas has become one of the most important places in the world for astronomy with the installation of various observatories by the Canaries Astrophysics Institute. These facilities, along with those in La Palma, have converted the islands in a reference point for the investigation of the universe.



Charles Piazzi Smyth.



Anne Duncan Smyth.

### *Meteorology*

Atmospheric observations always appear in the written narrations of those who have climbed to the top of the volcano. Ever since the end of the 19th Century meteorological studies have played an important role in the development of the aerostation and later for the nascent aviation. It became more and more important to know and predict changes in weather. Tenerife offers the possibility of installing a mountain observatory in a very interesting area for the study of atmospheric dynamics. The French, Germans and even the Monegasques have been interested in aerological studies. The most important results were the explanation of the Alizé structure and thermal inversion that separates two air masses. The Germans were most interested in having permanent facilities in Las Cañadas. The military objective of this observatory was evident in an era characterised by rivalry and the arms race between European powers. The Spanish government knew of the Germany's intentions so it promised to build the meteorological station in Las Cañadas where scientists of other nations could work. Meanwhile, the Germans managed to install pre-fabricated houses donated by the German Emperor in the Cañada de la Grieta, but the start of the Great War and the 1916 inauguration of the Izaña Observatory left Las Cañadas on the margin of international conflicts. Currently this observatory is housing various international atmospheric research projects as well as contributing with its meteorological prediction data in the area of the Canaries.

### *Nature tourism and Mt. Teide*

The Canary Archipelago is a pioneer in the creation of tourist centres outside of Europe and whose attraction does not depend on their history or archaeological remains, as is the case in Italy or France, but rather on their volcanic nature, the uniqueness of their fauna and flora and, above all, the mildness of their climates and the purity of their air; in an era when the atmosphere of the industrialised cities of Europe was filled with soot causing lung diseases more and more frequently, the monied classes vacationed in places with mild winters and an exotic landscape but where they didn't have to be bothered by smothering heat or the possibility of catching a tropical disease. The Canary Islands was the perfect place, especially Tenerife because it added the possibility of following in the footsteps of many famous naturalists and travellers who visited the great volcano. As González Lemus says, "… the desire to experience an ascent of Mt. Teide corresponded with the romantic spirit of the age, attracting, as a consequence, a great number of adventurers. Even knowing that climbing Mt. Teide was difficult during the winter, the time of the year that most travellers arrived in Tenerife, they were game to try. Travellers like

Richard Francis Burton, Charles Edwards, John and Olivia Stone and many others withstood the most adverse conditions and managed to reach the cone, thereby satisfying their “picomania”.



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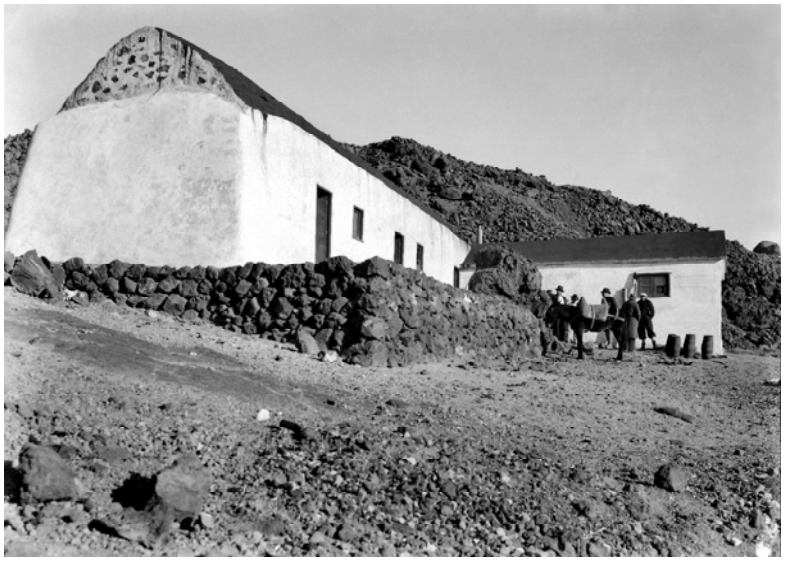
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This interest led to the publication and great success of the first tourist guides of the archipelago such as the guide and catalogue of photographs published in 1891 by the photographer J.H. T. Ellerbeck that had two editions and, above all, the 14 editions of the guide published by Alfred Saled Brown between 1889 and 1932. In the words of Uwe Riedel: “Up until 1885 not many tourists visited the Canary Islands. (…). But a few years later the guide was published: in 1889 Brown published his guide for invalids and tourists. The publication in the same year of the stories of Stone’s trips was another key contribution to the increase in the number of visitors in the last third of the 19th Century. The publication of these two books spread the knowledge of the Canaries in wide circles of the European population, principally in England. The archipelago, with its wonderfully balanced climate and its incredible nuances was the most appropriate winter home for people suffering from illnesses who needed to rest. It’s no wonder that large English colonies settled both in Gran Canaria and Tenerife. Moreover, the birth of tourism

coincided with the construction of the ports in La Luz and Santa Cruz de Tenerife and also with the start of the exportation of bananas, tomatoes and potatoes to Europe, particularly the United Kingdom. Many English families settled in Tenerife and Gran Canaria to work in agricultural commerce, as boat consignees, merchants or hotel businessmen. George Grahan-Toler was one of them; he organised the public subscription to build what after 1892 would be called the Altavista refuge. This refuge is the first building in Tenerife dedicated exclusively to tourism; it replaced a smaller building that Piazzi Smyth had built in August of 1856 in order to spend the fifteen days he needed to make his astronomical observations. It had a room with an iron stove and a separate structure with three rooms, one for ladies, the other for gentleman and the third for the animals and the guides.



**Altavista refuge**

## Conclusions

A key element in the comprehension of the naturalistic value of Mt. Teide lies in its history, first and foremost because its current state of conservation is the legacy of past generations and their economic and social circumstances.

The proximity of Europe, the fact that Teide lies at a crossroads between ocean routes, its exotic ecosystems and its accessibility explain why so many naturalists and scientists were attracted to the great volcano. These many visits have cemented the importance of Mt. Teide in the history of scientific knowledge. In this regard its contribution to volcanology is especially important, and specifically to the understanding of how volcanic calderas are created.

The summits of Tenerife not only attracted scientists but also the sophisticated elites of Europe. The “peak-mania” of the second half of the 19th Century converted Teide in one of the first nature tourism centres. This interest caused it to be recognised as a National Park 50 years ago, with the goal of conserving this unique cultural and natural heritage.

# Teide in the arts

## The Teide in the literature

Few volcanoes in the world, if any, have had such an influence on the history of mankind as Mt. Teide, especially for Europeans. Mt. Teide was irremediably destined to play a leading role in the cultural and scientific history of Europe and the Canary Islands to such an extent that its presence in the islands attracted leading travellers, sailors and naturalists to Tenerife.

Its legendary history could have started in classic times if we consider that the references of some Greco-Roman authors to the Atlas could have referred to this mountain. Homer talked of a Mt. Atlas that explored the very depths of the sea and which supported the grand columns of Hercules that separated the heavens from earth. Hesiod, another poet, also talks of the Atlas in the 8th century B.C., and he assumes that it is a neighbour to the Hesperides nymphs. He places the Elyssean Fields on the western edges of the Earth, calling them the islands of the Fortunate Ones. Popular traditions and poets represented Mt. Atlas as a very high mountain, on the western edge of the World, and they believed that it was to be found on the west coast of Africa. In the first century A.D., when the Roman armies penetrated the interior of Numidia and Mauritania, they introduced the custom of using the name “Atlas Mountains” for the chain of mountains that crossed North Africa from west to east, running almost parallel to the Mediterranean coast. This is where geographers later placed it, including Strabon and Ptolomy. But, as no high mountain standing alone was found in North West Africa, it proved to be extremely difficult to accurately determine the exact position of Mt. Atlas. Pliny the Elder, and later Solino, realised that the descriptions of the Atlas Mountains given by Greek and Roman poets did not refer to these mountains. They firmly believed that the Atlas of Homer and Hesiod was the Peak of Mt. Teide. Jose Viera y Clavijo, Alexander von Humboldt, Bory de Saint-Vincent are just some of those who ratify this belief.

Although the first references to Mt. Teide are to be found in classical times, the real history of Mt. Teide starts with the historic landmark of when man went beyond the Columns of Hercules. This is the moment in which Mt. Teide turns from myth into reality. The imaginary aspect of the great mountain of Tenerife was eclipsed when the first sailors venturing out into the Atlantic approached land in the form of islands, and these became a part of recorded history. But this first contact was full of reluctance and hesitancy, in line with the terror and superstitions that surrounded mountains at the time.

It captivated the attention of Dante Alighieri when he went beyond the barrier of the Straits of Gibraltar, the furthest that Hercules permitted, on his imaginary journey to the three kingdoms beyond the grave.

It also caught the attention of humanist Giovanni Bocaccio (1313-1375), when he recounts the journey made by Angiolino del Tegghia de Corbizzi and Niccoloso de Recco to the Canary Islands in 1341, published in Latin in Italy.

Venetian traveller Alvise da Ca' da Mosto (1432-1480) highlighted the violent character of Mt. Teide when he visited the Canary Islands in 1455, because of the gases and vapours that constantly issued from its crater

It appears on the first port charts and cartographic representations of the Atlantic islands, such as those of Pizigani (1367), Bartolomeo Pareto (1455) and Grazioso Benincasa (1470), on which Tenerife was known as "Hell's Island" because of the constant stream of gasses and vapours rising from its crater.

In turn, Mt. Teide "oriented ships on route along the coast of Africa", claimed French botanist Michel Adanson. Renaissance travellers and sea-farers (including Richard Hawkins, Thomas Herbert, John Barbot) highlighted the ample knowledge of the mountain of Tenerife, especially among the sea-faring nations (England, Holland, France and Spain), because of the role of beacon played by the volcano of Mt. Teide in the early years of Atlantic sailing, giving it a cultural category among European nations.

Its impressive height created a new myth to surround Tenerife's mountain: it was considered the highest mountain in the world. Its appearance, towering over the clouds like a sugar loaf and its dominant position in the ocean were sufficient reason to be considered the highest mountain in the world in the early days of ships sailing south from Europe. For this reason, it was the most frequently marked on Renaissance and Baroque maps and etchings, appearing in the illustrations of some of the most popular geography and travel books of the time, like John Ogilvy's book, A*frica* (1670) and Oliver Dapper's book, *New description of the islands of Africa* (1676).

In the first history of the London *Royal Society,* published in 1667, just five years after the society was founded by Royal Order of King Charles II, Thomas Robert Sprat, later to be Bishop of Rochester and Dean of Westminster, included the first excursion to Mt. Teide, made by a group of Englishmen who described the mineralogical wealth of the mountain in detail. Hence, the Canary Islands, and Mt. Teide in particular, entered the annals of the most prestigious scientific society of the age. Mt. Teide would always maintain a presence in the *Royal Society* of London, above all in the study of its natural resources (sulphur and nitrous (potassium nitrate) conducted by chemist Henry Cavendisish and Doctor William Heberden, a London doctor of wide spread repute who was the first to use the medical term angina of the chest in 1772.

Mt. Teide was the first active volcano to be climbed by Alexander von Humboldt, and it not only helped him to start drafting the geography of the local plants, it also helped to feed the Neptune theory, to embrace the Pluto theory defended by Scottish geologist James Hutton, laying the foundations of scientific vulcanology.

Most foreign expeditions heading for the East, Africa or to explore the Pacific and the southern continent stopped over at Tenerife to climb Mt. Teide from the second half of the 18th century onwards. The naturalists that climbed Mt. Teide in the Century of Enlightenment included:

- Borda, Jean Charles (1771, 1776) engineer, ship's master, section head of the Ministry Navy, member of the Paris Academy of Sciences and the Emminent Institute and the greatest French geodesic scientist to measure the exact height of Mt. Teide.

- La Pérouse, Jean François de Galaup, Count of (1785), famous French sailor
- Lamanon. Robert de Paul, Lord of (1785), French naturalist.
- D'entrecasteaux, Antoine-Raymond-Joseph de Bruni (1791), French sailor.
- La Billardiére, Jacques-Julien Houton de (1791), French traveller, naturalist and botanist.
- Barrow, John (1792), English traveller.
- Baudin, Nicolás (1796, 1800), French sailor and explorer.
- Bonpland, Aimé Goujand (1799), French doctor and naturalist who accompanied Humboldt on his expedition to the Spanish colonies, told in his book *Voyages aux régions equinoctiales du Nouveau Continent.*
- Humboldt, Alexander von (1799), undoubtedly the most important of all the naturalists who climbed Mt. Teide. In fact, Tenerife's mountain is as bound to him as much as the German naturalist is to Mt. Teide.
- Bory de Saint-Vincent, Jean Baptiste (1800), French biologist, zoologist and botanist.

In the 19th century, advances in the study of vulcanology and climatotherapy made Mt. Teide the favourite mountain of naturalists and scientists, due to its proximity to Europe.

In 1855, it was the site for Charles Piazzi's Smyth's astronomy project, with the participation of the *British Association*, from Glasgow, the *Royal Astronomical Society*, the *Ordinance Survey* and the *Admiralty.* From Altavista, the British astronomer observed 56 double stars for the first time, when only large patches could be distinguished, taking measurements of the distance between them, and noting the colours of their components. He also saw telescopic images of planets, particularly Jupiter, close to the zenith, "a very different view from any view obtained by European astronomers for many years". Piazzi Smyth's sketches of Jupiter were the most accurate to date. It was suggested that he make observations of the sun spots, but, as it was almost the low point for these spots, he was unable to make any observations. Piazzi Smyth tried to photograph the surface of the Sun, to show the decline in brilliance of its disk, from the centre to the rim, a phenomenon that was well known since the early days of telescopes, but which had never before been photographed.

These astronomy experiments validated Newton's theory: the stars could be observed far better from the mountain peaks. This had enormous repercussions, as, from then on, observatories were built in the mountains, and his observations from Mt. Teide are considered the precursors of modern astronomy. As a tribute to his work, an isolated and pointed mountain on the Moon was named "Pico", after "Pico del Teide", and a nearby range of mountains was named "Tenerife Mountains". Tenerife and its emblematic Mt. Teide have had a place on the Moon ever since.

In 1878, William Marcet, President of the *Royal Meteorological Society* of London (RMS) chose the Atlavista explanade to spend the night; the spot built by Charles Piazzi Smyth 18 years beforehand, for his geographic observations. He was the first scientist to study the climate of Las Cañadas and Mt. Teide for therapeutic purposes. Mountain "tourism" started to become fashionable at this time in Europe, as it was believed that the cold and the clean air of highland climates above 1200 m were beneficialy for curing tuberculosis and other diseases like anaemia and neurasthaenia. This triggered a genuine

invasion of tuberculosis patients from all over Europe, flocking to the sanatoriums built in the Swiss mountains. The antisceptic power of cold dry atmospheres in these high mountain spots could also be found in Pico de Teide, but Marcet revealed ther variations in temperature, thus ruling the site out as a cure clinic.

But Mt. Teide was visitied by many other naturalists in the 19th century, such as:

- Cordier, Pierre-Louis-Antoine (1803), French mineralogist and geologist.
- Buch, Christian Leopold von (1815), German geologist and vulcanologist.
- Smith, Christian (1815). Norwegian botanist.
- Dumont d'Urville, Jules Sebastien Cesar (1826), French seafarer.
- Webb, Philip Barker (1828), English botanist.
- Wilde, William Robert Wills (1837), Irish doctor, father of writer Oscar Wilde.
- Sainte-Claire Deville, Charles (1842). Leading French geologist and meteorologist.
- Hartung, Karl Georg Friedrich (1854). German naturalist and geologist
- Bolle, Carl August. (1858), German botanist.
- Fritsch, Karl Georg Wilhelm (1862). German geologist and paeoleontologist.
- Haeckel, Ernst Heinrich Phillipp (1867). German naturalist, founder of the term "ecology".
- Noll, Karl Friedrich (1872). German botanist.
- Marcet, William (1878). Prestigious English ear, nose and throat specialist.
- christ, Herman (1884), Swiss botanist.
- Mouquet de la grye, Jean-Jacques-Anatole (1885) French hydrographer, engineer and astronomer.
- Simony, Oscar (1888-90). Austrian naturalist and mathematician.
- Mascart, Jean (1910), French astronomer.

But, for 19th century travellers, reaching the summit of a mountain became both the culmination of a dream come true and a fashion for the "fin de siecle" tourist. Two of the best known adventurers of all time that reached the summit were:

- Burton, Richard Francis (1863), English traveller and explorer of Arabia and Africa.
- Meyer, Hans Heinrich Joseph (1894). German explorer and geographer.

There is probable no other mountain in the history of mankind that has attracted such a flood of distinguished visitors, including the possible records set in the 20th century.

The singularity of Tenerife's famous mountain galvanises the imagination of the traveller, it intensifies his literary creativity and even draws the attention of writers, engravers and the most famous artists to immortalise it in their etchings.

## Mt. Teide in etchings and pictures

The first news of Mt. Teide is to be found in Classic times. Some Greek and Roman writers and geographers imagined Mount Atlas or Mount Atlantis in Hesperia (which was the same as Canaries). But the real story of Mt. Teide runs in parallel with the historic event of man going beyond the Columns of Hercules. From that moment, man shifted from mythological to a real knowledge of Mt. Teide. The imagery of the great mountain of Tenerife was eclipsed when the first sailors to venture into the Atlantic approached these island shores and these lands entered recorded history. This first contact was full of hesitation however, in consonance with the fear and superstition that surrounded mountains at the time. A deep fear took over Italian poet Dante Alighieri when he crossed the barrier of the Gibraltar straits, the limit allowed by Hercules, in his imaginary journey to the three kingdoms beyond the grave. Mt Teide was then considered the highest mountain in the world, a belief that lasted into the early 18th century. The idea of Mt. Teide being the highest mountain in the world had marked the start of a highly singular representation of the mountain in Renaissance and Baroque iconography, as a "pointed mountain in the shape of a diamond that is always burning", according to Ca' da Mosto: Guillaume Coppier (1645) considered it similar to a steep rock, which is why the Tenerife mountain was inaccessible, or like a "load of rocks piled up in the shape of a pyramid", according to John Atkins, almost one century later. This form of representing Teide as a high rock was fairly widespread in the 16th and 17th centuries, and it figured as an etching in the illustration of some of the most popular travel books of the time, such as John Ogilvy's, A*frica* (1670) or Oliver Dapper's book, *New description of the islands of Africa* (1676). Dapper is supposedly the author of one of the several models that circulated in Holland, England and Italy. This pointed mountain went beyond the sub-lunar region of the universe according to the prevailing cosmological idea of Aristotle. Mt. Teide "guided ships on their route along the coast of Africa", claims French botanist Michel Adanson.

The English made the first major excursion to Mt. Teide. The date of the climb remains unclear however. According to *Register I, page. 36* of note 200 of the *History of the Royal Society*, the climb took place in August 1646. Wölfel situates it in 1650. Charles Edwardes indicates that this excursion took place in the times of Charles II. Regardless of the date, their testimonies were highly interesting, as we find ourselves among the first travellers that talk of large quantities of loose blue stones in the crater, from the sulphur, known by the name of nitron, the base for sulphuric acid, considered the universal acid («universal» in the sense of being the main acid to be found in all substances that showed acid properties). Sulphur, nitrus and vitriol were to appear as chemical elements that would mark an interest in Mt. Teide. The excursion to Mt. Teide by these merchants is written into the history of the London *Royal Society*, by Thomas Robert Sprat, later Bishop of Rochester and Dean of Westminster, in the first history of the *Royal Society*, published in 1667, just five years after it was founded by Royal Order issued by Charles II.

The texts included in the great travel books, together with printed maps, were to be sources of information for European artists and engravers of the 19th century. Their etchings, which initially reflected the image of Mt. Teide from the sea and later from Las Cañadas plateau, were to become visual testimonies during the Romantic period. The romantic view of Mt. Teide accounted for much of its history (Tenerife and the silhouette of its peak was an image used by most artists and engravers of the time) and most of the

travel literature. The romantic worshipping of the Canary Island mountain can be found in a large number of illustrators and travellers like Pierre Brunet (1803) who never "tired of admiring this imposing mass that rose over the seas from the depths of the abysses, it seems to touch the skies", or in Pierre-Louis-Antoine Cordier (1803). In 1799, Mt. Teide was to be crowned by the visit of one of the greatest travellers of all times; Alexander von Humboldt, who used the Tenerife mountain for his great revolutionary study of vulcanology and made some etchings.

The attraction of Mt. Teide among foreign sailors, travellers and tourists was so great that it aroused the admiration of part of the local population for a component of the natural environment that had not been appreciated until that time. Mt. Teide has acted as inspiration for countless foreign writers and travellers for centuries, thus accounting for several thousand pages in literary history. Many of these writings are poetic figures in which the climate, the landscape and its outstanding beauty have turned the spot into a literary geography. Mt. Teide displayed such an outstanding series of natural charms that it became a highly fashionable place in the 18th and 19th centuries. The arrival of these foreign visitors awoke an awareness of and an appreciation for Mt. Teide among some of the island naturalists.

It had a special impact on island graphic imagery from the 19$^{th}$ century onwards. At this time, some painters appropriated the outsider's aesthetic idea and incorporated it into Canary Island scenic aesthetics. For centuries, Mt. Teide played a very minor role in Canary Island imagery and painting, so it is hardly surprising that it does not figure very largely, or even as an anecdote, in the history of Canary Island painting. For example, in the 18th century, it appears in the background of the painting *Patricio Murphy Meade* by Luis de la Cruz y Ríos. But, in the 19th century, painters like Alejandro Ossuna y Saviñón or Gumersindo Robayna, took an interest in the mountain. Puerto de la Cruz resident Alvarez Rixo, with some sketches, and resident British inhabitants Alfred Diston and Charles Smith also took part in this timid approach to Mt. Teide. In the early years of the 20$^{th}$ century, there was a more accentuated break away from the apathy and lack of interest in Mt. Teide. According to Fernando Castro Borrego, it was to be the surrealists who would break the taboo and make Teide visible again in paintings. Their views of the mountain and the Canary Island landscape modified the way in which the Canary Island people started to perceive and aesthetically value the volcanic geology of the islands. We can clearly see that Francisco Bonnin, like his contemporary Manuel Martín González, had, at the time, started a systematic approach to the mountain.

The maximum representatives of painting in the Canary Islands now whole-heartedly partake in this attraction for Mt. Teide and, in general, for the volcanic landscape of the islands, as seen in the works of some of their best representatives, such as Pepe Damaso, Juan José Gil, Carlos Tatafiore, Gonzalo González, Carlos Matallana and Pedro González, the greatest of the contemporary Canary Island painters.

# Statement of Outstanding Universal Value

Teide National Park occupies the summit of Las Cañadas volcanic edifice, on the island of Tenerife, Canary Islands, Spain. This stratovolcano makes up the central part of the island and is the third tallest volcanic structure in the world, rising more than 7.5 km from the ocean floor (3718 m asl). At the summit is an elliptically-shaped caldera approximately 16km SW-NE and 9km NW-SE, the spectacular and colourful walls of which to the NE,E, S and SE rise as much as 600m from the caldera floor. The walls of the caldera are not visible in the NW and N, either because they had not formed there, were destroyed, or were buried by later volcanic products. Nested within the caldera are the two more recent stratocones of Pico del Teide (3718 m) and Pico Viejo (3103 m). The boundary of the National Park embraces all of the caldera and its associated volcanic structures and is the area to be nominated as a possible future World Heritage Site.

This report examines the claim of Outstanding Universal Value of the candidate site by comparing its special values with those of other similar volcanoes around the world and especially those currently inscribed on the World Heritage List.

## Statement of Outstanding Universal Value

The site is the best represented and most accessible in the world for viewing and studying a mature stratovolcano in an ocean island, slow moving, intra-plate setting. The Cañadas volcano is the tallest in the world after the volcanoes Mauna Loa and Mauna Kea on Hawaii Island. The site is particularly important because compared to other ocean-floor intraplate volcanoes it exposes for study an especially long geological history (20 million years), a petrological suite derived from a magma that evolved chemically through geological time, and all the major features associated with volcano growth, including a rift system, a caldera, and sector collapse, as well as a large variety of subsidiary landforms developed from the diverse eruption styles of both mafic and felsic magmas. The site is further especially important because it has exceptionally high air quality, exemplified by the location of world-class astrophysical and meteorological observatories on the caldera rim.

While many of these features may be present individually on other of the world's volcanoes, no other ocean-island intra-plate stratovolcano displays such a complete assemblage of features and is so accessible for scientific study and viewing by the general public. The great caldera is one of the world's, and certainly Europe's, greatest geological spectacles, hosting an estimated 3.5 million annual recreational visits. This is fitting because the term 'caldera' is a Canary Island word and was first introduced into the geological vocabulary by von Buch after visiting La Palma and Tenerife in 1815. Furthermore, no other World Heritage Site ever likely to be inscribed can justifiably claim that its outstanding air quality is a feature of its outstanding universal value.

## UNESCO advice on the preparation of the comparative analysis

In April, 2005 UNESCO convened a Special Expert Meeting in Kazan, Tartarstan (Russian Federation) to debate and clarify the meaning of Outstanding Universal Value (OUV). Participants at this meeting reiterated the importance of the comparative study for substantiating OUV and made the following recommendation, which in due course would be transmitted to state parties.

The expert group commented that the Global Comparative Analysis in many nominations was poorly developed and often focused on a national or regional, rather than a global level. The meeting advised that: “the comparative analysis of the nominated property should be done in relation to similar properties, whether or not on the World Heritage List, both at the national and international levels. The comparative analysis should explain the importance of the nominated property in its international context by comparing it to other similar properties. There are two basic requirements that flow from this concept: (1) the comparative analysis needs to be global in scope, thus comparing the propoperty with similar properties that exist around the world based, where possible, on a global classification system, and; (2) the nominated property should be compared not only with properties already inscribed on the WH List but also with other similar properties world-wide”.

## Justificatory arguments

The arguments used to justify Outstanding Universal Value of the Teide National Park nomination are as follows:

- The site is located at the summit of one of the largest, most accessible and most studied active volcanoes in the world, providing a volcanic site in Europe and the Atlantic region.

- The site is especially important to science because it promotes a genetic model that challenges the classical hot-spot theory based on the geology of the Hawaiian Islands.

- The site has been key in the historical development of ideas about Volcanology, starting with early observations by Alexander von Humboldt (1799), Leopold von Buch (1815), Charles Darwin (1831) and Charles Lyell (1858), and continuing today with a succession of modern studies in petrology and physical volcanology.

- The site encapsulates a superlative and comprehensive range of volcanic landforms generated from varying eruption styles, which in turn have been the products of a fractionating magma chamber that has erupted both mafic and felsic volcanic products.

- The site, with its huge caldera and soaring stratocones, is one of the greatest geological spectacles on Earth and one of the most visited volcanic geotourism sites in the world.

## Scientific argument

### *Ocean floor intra-plate volcanism*

Volcanoes are typical features of the ocean floor and occur at varying distances from the mid-oceanic ridges, where they form seamounts and/or volcanic island groups and chains. The origin of ocean island groups has long been held to be exemplified by the Hawaiian Islands and Emporor seamount chain, where it is thought throughout the recent geological past volcanic activity has occurred over the position of an ascending mantle plume or “hot spot”. As the ocean plate has moved across the position of the hot spot, volcanoes have been successively rafted away from the active zone, so that today the volcanic structures of the island chain are seen to become progressively older with increasing distance from the hot spot.

Most recently geologists meeting to consider the evolution of ocean island volcanoes (Geol. Soc. of America, 1998) noted that while the Hawaiian hot-spot model is commonly considered the basis for comparison of all other ocean islands, 'volcanism there is probably best viewed as an extreme end-member - i.e., the most vigorous hot-spot on Earth.'

The formation of the Canary Islands archipelago and its relevance to the hot-spot model has been the subject of long study and debate among geologists. Such studies have revealed marked differences between the evolution of the Canary Islands and the Hawaiian Islands, principally because the Canary Islands are located on relatively old, rigid crust at a passive continental margin, rather than on thin, fast moving ocean floor as occurs under the Hawaiian chain. According to Carracedo (1999), Anguita and Hernen (2000), Carracedo et al. (2002), Vinuela (2004) and others, the important differences between the geology of the Canary and Hawaiian islands are as follows:

- The age and spatial lineation of the Canary Islands is far less regular than that of the Hawaii Islands;

- Volcanism has occurred on all islands except La Gomera in the last 5000 years, implying that in place of a single dominant mantle plume as envisaged beneath Hawaii, there is a more dispersed melting anomaly beneath the Canaries archipelago;

- While the Hawaiian Islands formed on a thin, fast-moving ocean plate, the Canary archipelago developed at a passive continental margin, on more rigid, slow moving lithosphere of Jurassic age;

- There is no significant ocean-floor topographic swell beneath the Canary Islands, suggesting a less powerful heat source than exists under other similar archipelagoes;

- The nature and evolution of magmas are quite different in both archipelagos;

- The Canary Islands possess large, central stratovolcanoes which do not occur in the Hawaii Islands.

Because of subsidence, only the relatively young parts of the Hawaiian islands (less than 6 Ma years) are exposed to observation, while on the more rigid lithospheric plate beneath the Canary Islands subsidence has been negligible and so volcanic formations over 20 Ma may be observed and studied; There is a more complex tectonic structure, including ductile shears and compressional structures, associated with the Canary Islands.

The Canary Islands have therefore been discovered to be equally as important as the Hawaiian Islands in helping scientists to understand mantle processes and ocean island formation. Indeed, in addition to providing an alternative theoretical model of ocean floor intra-plate volcanism, Carracedo (1999) has noted that the Canary Islands are one of the best places in the world to study ocean island intra-plate volcanism, because unlike on other oceanic island volcanoes all stages of island growth -from seamount to mature stratovolcano- are exposed sub-aerially and accessible to scientific study.

As the most spectacular of the Canary Island volcanoes the Cañadas volcano on Tenerife is the most important manifestation and exemplar of this special form of intra-plate volcanism. The site can therefore justifiably claim to be of outstanding scientific importance. There are many other intra-plate volcanic island groups on the floor of the world's oceans -including Galapogos, Kerguelen, Cook-Austral-Marquesa, Line Island groups- and while some are similarly located at passive continental margins (e.g., Cape Verde Islands)- very few island groups have been studied, and certainly none as well studied as the Canaries or Hawaiian groups.

One particular feature of the Canary Islands is that they have grown on very slow moving, rigid lithosphere. This is thought to have been contributary to the greater degree of maturity of the volcanic forms, such as the Cañadas volcano, which most unusually exhibits all stage of ocean-island evolution. Not only has the Cañadas volcano grown beyond the basaltic shield building stage, typical of the Hawaiian volcanoes, but the magma chamber has fractionated silicic trachytic and phonolitic materials which have been responsible for the more explosive vulcanity that built the stratocones of Teide and Pico Viejo. Another most unusual feature of the Cañadas volcano is that the fractionation products appear to be stratified within the magma chamber, enabling on occasions both basaltic and phonolitic lavas to be erupted simultaneously.

There are other ocean intra-plate stratovolcanoes (another European example is Pico do Pico (2351 m), Pico Island, Azores), but generally the chemical evolution of their magmas and maturity of their volcanic form has not reached the stage of the those of Cañadas volcano. An exception might be the Halla volcano (1950m), Jeju Island, Korea, which has been built over a hot-spot on virtually stationary crust, and which in the most recent geological past has erupted trachytic lavas and pyroclasts.

### *Stratovolcanoes*

A stratovolcano (sometimes also known as composite volcano - Davidson and De Silva, 2000) is one that builds a cone with a summit crater from repeated eruptions of explosive and effusive activity. They are generally distinguished as having upward- facing concave slopes and may have beautiful symmetrical forms. Stratovolcanoes contrast with shield volcanoes and volcanic domes, and they are the type volcano of subduction zones. According to Francis (1993) from his work in the Andes, such edifices may be simple or composite in form, the latter testifying to a complex eruption history even though activity appears to have remained over a single magma source. Examples of a simple cone are Mt Mayon (Philippines) and El Misti (Peru), while other strotovolcanoes such as Mt Fuji (Japan) or Vesuvius (Italy) are of the composite variety. Of the 1500 active Holocene volcanoes listed in the Smithsonian Institute's Global Volcanism Program, about 60% (900) are stratovolcanoes.

The Cañadas volcano, Tenerife, is one of the largest composite stratovolcanoes in the world. However, while most stratovolcanoes are built over relatively felsic magma sources along subduction zones (e.g., Merapi, Java; Bezymianny or Karymski, Kamchatka; Tongariro, New Zealand; Soufrière Hills volcano, Montserrat), it is rarer for such large composite edifices to form in ocean floor intra-plate environments, where basaltic fissure and shield type volcanism are more typical. Such ocean floor intra-plate stratovolcanoes are the product of a fractionating magma supply, so that over time an original basaltic magma may chemically evolve and erupt more felsic varieties. Indeed, the Cañadas edifice is built on the remains of three former basaltic shield volcanoes and its more felsic lavas and pyroclastic products have superimposed a structure at least 2500 m high.

### *Calderas and gravity slides (sector collapse)*

The great caldera of Las Cañadas is the dominating feature of the proposed candidate site. It is outstanding for its scale and form, and while there are many other volcanic calderas in the world, most are smaller and less imposing, while none are as accessible for mass public viewing as the Cañadas caldera.

Calderas are large volcanic craters usually formed by violent exlosions and collapse - of particular relevance with respect to this nomination it is also a Canarian word, meaning a cauldron. Volcanologically, there are a number of different types of calderas ranging from those formed after the paroxysmal (plinian) eruption and foundering of the summit of a stratovolcano (e.g., Crater Lake, Idaho, or Tambora, Java, in 1815), to the nested subsidence calderas at the summit of shield volcanoes (e.g., Mauna Loa, Hawaii), the great resurgent calderas (e.g., Yellowstone, Idaho, or Campi Phlegraei, Italy), and clusters of calderas known as caldera complexes (e.g., San Juan volcanic field, Colorado).

There is considerable debate regarding the origin of the Cañadas caldera. One interpretation of the geology is that the caldera is of the subsidence type, and plinian-type fall deposits in association with ring dykes and the elliptical shape of the great depression suggest explosive events which caused the summit of the Cañadas volcano to founder and subside, perhaps on more than one occasion. An alternative interpretation is that the caldera depression formed as a result of a large gravity slide (or sector collapse) that

carried away the higher part and northern slope of the Cañadas volcano - the caldera walls representing the headwall of the giant landslip. There is also the possibility that the caldera formed by a combination of the two processes, although the evidence for caldera formation is currently more heavily weighted towards a gravity slide.

Notwithstanding the particular mode of origin of the caldera of Las Cañadas, calderas and gravity slides are common -indeed ubiquitous- features of stratovolcanoes, and very often they have a linked formation (in some cases a caldera-forming explosive event may trigger sector collapse). The 1980 eruption of Mt St Helens and collapse of its northern slope brought home to geologists the importance of sector collapse in the wasting of volcanoes, and this phenomenon is now recognised as a major volcanic hazard. Thus, debris aprons or lobes of ancient gravity slides have been mapped on the ocean floor around the shield volcanoes of the Pacific Islands, the volcanic islands of the Lesser Antilles and especially the Canary Islands. In Europe one of the best known examples of sector collapse is the Valle del Bove, on the eastern slope of Mt Etna. Especially important, recent work on mapping gravity slides in the Canary Islands has shown that while collapse of other ocean-island volcanoes has occurred mainly in the submarine environment, ancient slides on the Canary Island volcanoes have involved significant sub-aerial portions of the volcanoes, raising hitherto unrealised concern that future collapses could generate catastrophic tsunamis.

Thus, while the phenomena of subsidence calderas and sector collapse are not especially unusual on the world's stratovolcanoes, one or both of these phemonena have been important on Tenerife for creating one of the most spectacular volcanic craters in the world. Irrespective of the origin of the caldera, the gravity slides that have scalloped the slopes of the Cañadas volcano are themselves some of the best defined and studied in the world.

### *Scientific study*

As a result of its diverse range of features and rock types, the unusually long history well exposed in its volcanic stratigraphy, and its great accessibility, the Cañadas edifice is one of the most studied volcanoes in the world. Early interest in the volcano by nineteenth century scientists like Humboldt, von Buch, Darwin and Lyell helped to articulate fundemental ideas in geology, and through von Buch's writing the new term and concept of 'caldera' was brought into the geological vocabulary. The great geologist Sir Charles Lyell visited Tenerife in 1858 and his ideas had profound influence both with his contemporaries and into later years, setting in train a succession of scientific studies of the Cañadas edifice that were to follow over the next 200 years. As the bibliography that will accompany the nomination document will show, there remains today a very great interest in Tenerife and the Cañadas volcano among geological scientists and the island's intensive study by an international scientific community has spawned many new ideas in volcanology and the formation of ocean-floor lithosphere. Tenerife and the Cañadas edifice can therefore justifiably claim to be one of the great geological laboratories of the world.

### *Volcanic landscape argument*

The nominated site contains an unrivalled diversity of volcanic landforms. These landforms are a comprehensive assemblage representative of both felsic and mafic volcanic products and unusually are all contained within the relatively small area of the caldera of Las Cañadas. The large diversity of well-preserved landforms is a major strength of the nomination site.

Most spectactular is the caldera itself. Not only is it of large size (with dimensions of 16 km by 9 km, and walls rising 600 m in elevation, it is much bigger than most calderas associated with stratovolcanoes), but it is of high altitude and contains the subsidiary stratocones of Pico del Teide and Pico Viejo, with the colourful lava domes and flows that cascade off them. The varied deposits and structures exposed in the walls of the caldera are outstanding for the evidence they hold of the evolution of the Cañadas volcano and the caldera itself.

Fundemental to the triangular shape of Tenerife and the landscape of the Cañadas volcano is the volcanic rift system. This is arranged in a symmetrical three-armed (Mercedes) star pattern which has an origin (focus or centre) within the caldera depression. The north-east and north-west rifts are particularly clearly defined by the clusters of mainly basaltic scoria and tephra cones that lie along the ribs, or 'dorsals', of the island. Many other volcanoes display such rift systems, but rarely have they so clearly defined the shape of the volcanic edifice or given rise to such obvious surface landforms.

The site also exhibits several types and scales of volcanic cones. The stratocones and their craters are nested, like chinese dolls. At the largest scale is the gigantic Cañadas volcano itself, while soaring 1600m and 1034 m respectively above the floor of Las Cañadas caldera are the imposing cones of Pico del Teide and Pico Viejo. A further small stratocone, El Píton, about 150m high, hides the summit crater of Teide (in fact El Piton hides other earlier nested craters). In addition, monogenetic scoria and tephra cones up to 100m high are associated with the rift zones.

The most impressive landforms developed from lava effusions are the phonolitic domes and lava flows associated with Teide's many satellite vents, of which Montana Blanca and Montana Rajada are important examples, rising approximately 300 m and 250m respectively from the caldera floor. The site also contains basaltic, as well as more viscous trachybasalt or phonolite lava flows. The diversity of flow chemistry provides many different flow forms and surfaces, ranging from basaltic aa and pahoehoe, to the thicker and stubbier (higher aspect ratio) felsic lava flows with aa or blocky surfaces. The basaltic lavas may possess lava tubes and hornitos, while many of the trachybasalt and phonolite flows display a surface channel with levees. Some flows are distictly coulee-like in form. The emplacement of some of the more viscous flows generated lava balls, which in places litter the surface of the caldera.

Explosive (volcaniclastic) deposits are also diverse, ranging from basaltic scoria, lapilli and tephra, to pumice and ignimbrite. Many of these types of deposit are spectacularly exposed in road cuts or in the walls of the caldera, while a particularly distinctive feature of the floor of the caldera are the lapilli and pumice plains (these are known as “Las Cañadas” and were originally important as livestock grazing areas).

While all of these features may be found in other volcanic terrains world-wide, rarely are they grouped so comprehensively in such a small area and are so accessible for education and research. They are particularly instructive in their record of and future analysis of eruption mechanisms.

***Aesthetics and education argument***

The nominated site is impressively impactful on the senses, both for the large scale and grandeur of its landscape, its primeaval appearance, and the special quality of the light that enhances the unusually bright and diverse colours of the rocks. In Spring the colours and forms within the caldera are further enhanced by the flowering plants and in particular the majestic, tall spike of the Teide Bugloss (*Echium wildpretti*).

Introducing the caldera of Las Cañadas in their book Volcanoes of Europe Scarth and Tanguy (2001) write:

"The Caldera de las Canadas harbour some of the most striking volcanic landforms in Europe, where the crystal- clear atmosphere, the brilliant sunshine and the absence of any continuous vegetation combine to emphasise the varied colours of the rocks, displayed in almost pristine splendour like a painted desert. Here steel-blue, brown, or black and glassy lava flows, and grey or yellow pumice piles and dark red cinder cones decorate the base of the grey Pico del Teide and its black companion, the Pico Viejo ....." (p. 104).

Volcanic landscapes rarely have such a range of colours or are as diverse and imposing. In most case the rocks are hidden by vegetation, or in basaltic provinces such as in Iceland or the Red Sea coast of Saudi Arabia blacks are only infrequently relieved by the reds and brown of scoria deposits. The greatest quality of the site is the clarity and intensity of the light and the purity of the air, with its negligible human pollution. In addition the visitor cannot be but impressed at the large scale of the great amphitheatre and the soaring volcanic cones rising from the flat floor of the caldera.

In their recent paper entitled Volcanoes and Tourism, Sigurdsson and López-Gautier (2000) wrote 'Thanks largely to the existence of the [Hawaii Volcanoes National ...] park, Kilauea has become the world's most visited and most photographed volcano.' As it shows above, this statement is far from the truth, and with an estimated 3.5 million recreational visits in 2004, the Caldera de Las Cañadas represents the second most visited volcanic site in the world after Mt Fuji, Japan. However, when one considers that the estimated 22 million annual visits to Fuji are mainly for religeous or spiritual objectives, rather than mountain recreation or geotourism, Teide National Park might justifiably claim hat it is the world's most important site for volcano getourism. The Lists of the number of the recreational visits in 2004 to some of the world's best known volcanic sites and shows that only Vesuvius National Park compares with Teide National Park in popularity as a recreational destination on the world or European scale. It might also be noted that the number of annual visits to the Teide National Park also exceeds the total number of tourists that visited Iceland in 2004. The nomination site therefore represents one of the greatest geotourism sites of the world.

| ANNUAL RECREATIONAL VISITS IN 2004 TO THE WORLD'S MOST POPULAR VOLCANIC GEOTOURISM SITES | |
|---|---|
| NAME OF SITE | ANNUAL NUMBER OF VISITS |
| **Teide National Park**, Spain<br>Source: pers.comm.park admin. | 3,540,195 |
| **Vesuvio National Park**, Italy<br>Source: Report by Park Director in the Journal Iniziativa Meridionale per il Mezzogiorno Del Europe, nov. 2001. | 1,000,000 |
| **Aeolian Islands WHS** (Vulcano, Stromboli, etc.), Italy<br>Source: UNEP/WCMC WHS datasheet | 200,000* |
| **Mount Etna Provincial Park,** Sicily, Italy<br>Uncertain source: local web-site | 240,000* |
| **Giant's Causeway**, UK<br>Source: Northern Ireland Tourist Board | 500,000* |
| **Yellowstone National Park**, Wyoming, USA | 2,868,317 |
| **Mount Rainier Nacional Park,** Washington, USA | 1,217,750 |
| **Haleakala National Park**, Hawaii, USA<br>Source: US NPS Public | 1,455,477 |
| **Hawai Volcanoes National Park**, Hawaii, USA<br>Source: Use Statistics Office | 1,307,391 |
| **Crater Lake National Park**, Oregon, USA | 417,066 |
| **Lassen Volcanic National Park, California**, USA | 379,667 |
| **Galápagos Islands**, Equador<br>Source: UNEP/WCMC WHS datasheet | 60,000* |
| **Geysir,** Iceland<br>Source: pers. comm. | 122,000* |
| **Tongarira National Park**, New Zeland<br>Source: UNEP/WCMC WHS datasheet | 1,000,000* |
| **Monte Fuji**, Japón<br>Source: these are unofficial figures from http://web-japan.org/atlas/nature/ nat25.html. N.B. - 1) the larger figure is the number of visitors to the Fuji-Hakore-Izu National Park, which is a popular holiday destination with lakes and resort villages; 2) Fuji has spiritual significance and it is the intention of every Japanese citizen to visit it at least once in their lifetime - therefore visits are not specifically made for geotourism. | 103,000,000* |

**(*) Aproximated number of visits**

### *Comparable volcanoes on the WH List*

Currently there are 788 sites inscribed on the World Heritage List (WHL)(July 2004). Of these, the Draft Global Strategy for Geological World Heritage Sites (March 2004) lists 17 under the category Volcanoes/Volcanic Features. Nevertheless, an analysis of the WHL by this writer has identified 26 sites located in volcanic terrains. However, most of these sites were inscribed to protect their important biological or cultural values, not their geological values (i.e., their volcanic features, whilst interesting, are incidental or secondary to their inscription). Only 10 of the 26 sites have been inscribed specifically because of their important volcanic features and/or processes. These are listed below, succeeded by a list detailing the remaining sites, inscribed for their biological or cultural values.

| SITES INSCRIBED FOR THEIR OUTSTANDING VOLCANIC LANDSCAPES AND ACTIVE VOLCANIC PROCESSES | | | |
|---|---|---|---|
| **Name of World Heritage Site** | **Country** | **Type of volcanic features** | **C*** |
| Giants Causeway | UK | Columnar basalt | |
| Hawaii Volcanoes NP | USA | Kilauea and Mauna Loa volcanic shields, calderas, basaltic volcanism. | ✓ |
| Galápagos Islands | Equador | Whole archipelago, basaltic lavas and shield volcanoes, some with summit calderas | |
| Isole Eoliae (Aeolian Islands) | Italy | Stratovolcanoes Stromboli, Vulcano, Lipari, sector collapse | ✓ |
| Pitons Management Area | St. Lucía | Dacite domes, collapsed stratovolcano, sector collapse | ✓ |
| Sanguy NP | Equator | Stratovolcanoes Tungurahua, El Altar, Sanguy, caldera | ✓ |
| Tongariro NP | New Zeland | Stratovolcanoes in two groups, with other vents, domes and craters: In N group -Kakramea, Tihia, Pihanga; in S group -Tongariro, Ngauruhoa, Ruapehu. | ✓ |
| Ujong Kulon NP | Indonesia | Stratovolcano and caldera Krakatoa | |
| Virunga NP | Congo | Stratovolcano Nyamulagira, shield volcano Nyiragongo | ✓ |
| Volcanoes of Kamchatka | Russian Fed. | As many as 300 volcanoes, most being stratovolcanoes with all associated features represented | ✓ |
| Yellowstone NP | USA | Resurgent caldera. | |
| **OTHER INSCRIBED SITES NOTABLE FOR THEIR VOLCANIC INTEREST** | | | |
| **Name of World Heritage Site** | **Country** | **Type of volcanic features** | **C*** |
| Central Eastern Rainforest Reserve | Australia | Dispersed (serial) site with dissected Tertiary basaltic structures, incl. the Tweed shield volcano. | |
| Gough and Inaccessible Islands | UK | Eroded summit of Tertiary volcano | |
| Heard and McDonald Islands | Australia | Basaltic stratovolcanoes incl. active Mount Mawson | ✓ |
| Komodo NP | Indonesia | Volcanic bedrock | |
| Kahuzi-Biega NP | Congo | Part of W mountains of Gt Rift Valley - Mt Kahuzi and Mt Biega are Tertairy volcanoes | |
| Lord Howe Island Group | Australia | Eroded shield volcano - part of 1300 km seamount chain | ✓ |
| Mount Kenya | Kenya | Tertiary volcanic complex | |
| Mount Kilimanjaro | Tanzania | 3 large stratovolcanoes | ✓ |
| Morne Trois Pitons NP | Dominica | Dissected Tertiary stratovolcano, with domes and fumaroles | |
| New Zealand Sub-Antarctic Islands | New Zeland | Basaltic lavas and shields | |
| Ngorongoro Conservation Area | Tanzania | 17km diameter Tertiary caldera | ✓ |
| Pico Island, Azores | Portugal | Walled vineyard landscape on basaltic lava flows (site does not include Pico stratovolcano) | |
| Rapa Nui (Easter Island) | Chile | Basaltic shield and lavas | |
| St. Kilda | UK | Volcanic bedrock | |
| Thingvellir NP | Iceland | Holocene basaltic lava field, graben | |

**C*: inscribed volcanic properties that have characteristics similar to those of Teide National Park**

The above table lists the sites with volcanological interest inscribed on the World Heritage List. From this it can be seen that there are features comparable to those described in this nomination, as follows:

- Stratovolcanoes: A large number of imposing stratovolcanoes are listed ranging from the enormous Kilimanjaro to classical Tongariro, New Zealand and Bezymianny, Kamchatka. These display the usual range of subsidiary landforms. However, none of these are ocean-floor intra-plate volcanoes: all have formed over subduction zones.
- Calderas: The WHL contains several examples of calderas. These range from the large resurgent caldera at Yellowstone, USA, to the extinct and degraded 17 km diameter Ngorongoro Crater, Kenya, to smaller calderas associated with stratovolcanoes such as the beautifully symmetrical nested calderas of Krasheninnikov, Kamchatka. Nevertheless few have the dimensions of, or are as imposing or as publically accessible, or as extensively researched, as the caldera of Las Cañadas.
- Ocean island volcanoes: There are also representatives of ocean island groups on the WHL - e.g., Lord Howe Island Group, Aeolian Islands, Heard and McDonald Islands, Galapogos Islands, Rapa Nui, Gough and Inaccessible Islands, NZ Sub-Antarctic Islands. With the exception of the Aeolian Islands and Heard and Macdonald Islands, these are all basaltic shield volcanoes (or the eroded remains of), while the volcanoes of the first two sites are both located over subduction zones.
- Sector Collapse: Sector collapse is ubiquitous on stratovolcanoes and while collapses will be present on most, only one (St Lucia Pitons) is specifically mentioned. Even here there has been minimal research on the gravity slides from St Lucia's Qualibou volcano.
- Regional significance: There are three existing World Heritage volcanic sites in the European/North Atlantic region: Aeolian Islands, Italy; Pico Island vineyard culture, Azores; Thingvellir NP, Iceland. The last two were inscribed for their cultural values, and although both have terrains characterised by basaltic pahoehoe lava flows, neither include a major volcanic vent (however, the Pico site is located on the flanks of the Pico do Pico startovolcano). The WHL does not therefore contain any of the great European or Atlantic Ocean volcanoes.

Thus, while there are many stratovolcanoes inscribed on the world heritage list, with the exception of Pico do Pico, Azore (although the boundaries of this mixed cultural/natural WHS does not embrace the main volcano peak), none are representative of ocean floor intra-plate volcanism. There is therefore no competitor on the existing list to the Teide National Park nomination. However there are many well-developed stratovolcanoes on the list and many examples of calderas and sector collapse. Particularly notable is the Pitons Management Area, St Lucia, where a controversy similar to that on Tenerife rages over the origin of the Qualibou caldera - i.e. is it a subsidence caldera or a gravity slide?.

Summary of weakness and strengths in the nomination arising from the comparative analysis

***Weakness of the proposed nomination***

- Stratovolcanoes are the most common form of the world's volcanoes and there are many excellent examples of the type already on the World Heritage List - although none of these are geologically significant ocean-floor intra-plate examples.
- None of the nomination site's subsidiary landforms are particularly unique - individually they can all be found in other volcanic sites.
- Calderas come in many shapes and sizes, some as large as, if not larger than, the Cañadas depression, and the formation of many is well-researched.
- Many other volcanoes show a similar complex history to the Cañadas volcano.
- There are 26 sites located in volcanic terrains already on the World Heritage List: The European/North Atlantic region already has three WH Sites in volcanic terrains, although only one of these sites (Aeolian Islands) contains volcanic edifices.

***Strengths of the proposed nomination***

- The site features the world's tallest volcanic structure after those of Hawaii Island.
- The Cañadas edifice is the largest and most complex of the European volcanoes.
- The site has played a significant role in the development of scientific thought in volcanology and the formation ocean islands and ocean lithosphere.
- The geology of the Canary Islands represents an alternative model of ocean island intra-plate volcanism that challenges the Hawaiian mantle-plume or hot-spot theory.
- Tenerife and the Cañadas edifice is of outstanding value to geology because it exposes all stages of ocean-island growth from early seamount stage, through shield building, to mature stratovolcano.
- Over the long history of the Cañadas volcano progressive differentiation of the magma supply has produced a range of effusion and explosion products that is as comprehensive as that seen on any other volcano and which is superbly recorded in the volcano's rocks and structures. A particularly significance discovery has been that stratification of differentiates in the magma chamber may account for the volcano's propensity to erupt both basalts and phonolites. In its comprehensive petrological suite and variety of volcanic structures, the site superbly meets the condition of geological integrity.
- The site has one of the most imposing calderas and most complete range of ancillary landforms in the world.
- The site has inspiring aesthetic qualities, supported and enhanced by the outstanding quality of its light and air.
- Representatives of all the significant features of the volcano are enclosed within the caldera rim, which coincidentally is the boundary of the National Park.
- This is the most accessible of the large European volcanoes and is possibly the most visited volcanic geotourism site in the world.
- There exists a very good education and interpretation programme that explains the geological significance of the site.

### *Sources*

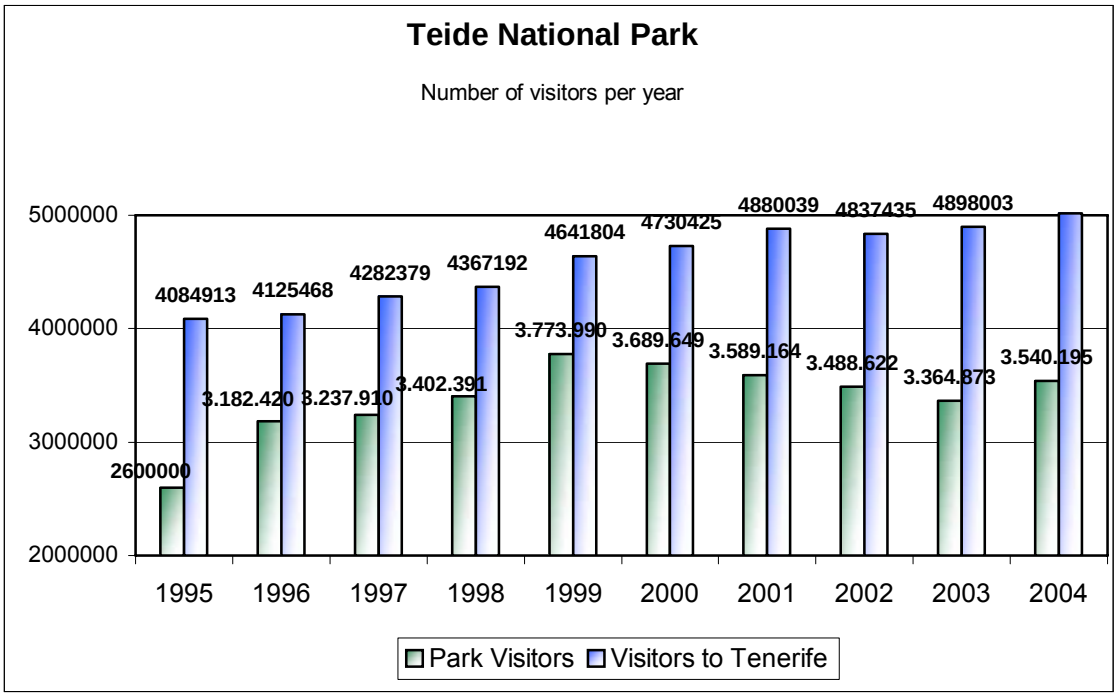
The preparation of this report has entailed the extensive use of three on-line international databases and archives:

- UNESCO World Heritage List. Avalailable from: http://www.whc.unesco.org/ -with links to site data sheets at UNEP/WCMC: http://www.wcmc.org.uk/protected_areas/data/wh/.
- Global Volcanism Program. Database and archive of Holocene volcano and eruption information, hosted by the Smithsonian Institute, Washington, USA. Available from: http://www.volcano.si.edu/.
- Seamount Catalogue. Digital archive for bathymetric seamount maps, hosted by Earth Reference Data and Models, Scripps Institute, UCSC. Available from: http://earthref.org/cgi-bins/sc-s0-main.cgi.

# Public Use

## Statistics of Public Use

### Comparative table of visitors to Teide National Park and the island of Tenerife (1997-2004)




### *El Portillo and Cañada Blanca Visitor Centres*

The following table displays the number of people that have used the El Portillo Visitor Centre between 2000 and 2004:

| YEAR | NUMBER OF PEOPLE |
|---|---|
| 2000 | 90,697 |
| 2001 | 94,839 |
| 2002 | 115,014 |
| 2003 | 112,093 |
| 2004 | 119,076 |
| Total | 531,719 |

Of the 119,076 people who used this facility in 2004 half were Spanish and the other half foreigners (59,539 and 59,537, respectively) and the number of private visits was higher than that of groups (travel agency, tour operators, schools, etc.), 65% or (77,713) and 35% (41,363).

The following table shows the number of people who used the Cañada Blanca Visitor Centre between 2000 and 2004:

| YEAR | NUMBER OF PEOPLE |
|---|---|
| 2000 | 94,607 |
| 2001 | 95,901 |
| 2002 | 81,565 |
| 2003 | 186,882 |
| 2004 | 166,190 |
| Total | 625,145 |

In 2004 166,190 people used this facility, of which 102,310 were foreigners (61.5%) and 63,880 were Spanish (38.5%). The vast majority of visits to this centre were private (149,200 people, practically 90%) and the rest were organised in groups (16,990, almost 10%). In 2002 the Cañada Blanca Visitor centre was closed for renovation for three months.

***Emilio Fernández Muñoz Nature Activities Centre (CANEFM). Users during 2000-2004***

| YEAR | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| Total number of users | 2,931 | 2,580 | 2,640 | 3,396 | 2,857 |
| Real occupation* | 13,532 | 11,581 | 10,857 | 13,855 | 11,619 |
| Institutions that used the CANEFM | 46 | 50 | 51 | 65 | 56 |
| Number of days that it was occupied** | 200 | 217 | 201 | 257 | 222 |
| Average group size | 63.72 | 51.6 | 51.76 | 52.25 | 51 |
| Average stay for groups (days) | 4.34 | 4.34 | 3.94 | 3.95 | .96 |

Among the users, those that came from learning centres were more common than other types of groups (municipal, social, youth, NGOs, religious, etc.).

(*) The real occupation is obtained by multiplying the number of people in each group by the days that each was in the facility.

(**) For the number of days occupied, the days that each group occupied the CANEFM was counted; days where one group left and another entered were counted twice.

***General Information on the users of the Environmental Education Support Service in Tenerife learning centres during the last five years.***

| YEAR | Talks | Students | Teachers |
|---|---|---|---|
| 2000* | 105 | 6,260 | 275 |
| 2001 | 136 | 7,529 | 354 |
| 2002 | 136 | 6,920 | 340 |
| 2003 | 130 | 7,063 | 687 |
| 2004 | 147 | 7,518 | 803 |

| YEAR | Excursions | Students | Teachers |
|---|---|---|---|
| 2000 | 51 | 2,864 | 140 |
| 2001 | 116 | 5,523 | 372 |
| 2002 | 107 | 4,872 | 343 |
| 2003 | 109 | 5,358 | 360 |
| 2004 | 111 | 5,457 | 340 |

The 2000 numbers are significantly smaller than those of other years, especially those related to excursions, because of the labour conflict between the teaching staff and the Council of Education of the Canarian Government that led to a decrease in the number of extra-curricular activities.

In addition to these talks, each year many more are given to different associations and delegates, both in the locales of the groups (on the island and in other places) and in the National Park. A few examples are the Association of Friends of the Nature and Man Museum (Santa Cruz de Tenerife), the 7th International Conference on Renovation of Architectural Heritage and the Art of Building (Yaiza, Lanzarote), Technicians of Protected Habitats in Central America (Agreement between the OAPN and the Central-American Commission on Environment and Development), environmental associations from the island, 2nd Biodiversity Forum (Logroño), course on planning held in Valsaín, anniversary of the Caldera de Taburiente (El Paso) National Park, students working on masters programs, etc.

The following tables give more details on the talks and guided excursions for students in 2004:

| Summary of 2004 | |
|---|---|
| Total number of students: | 7,689 |
| Number of talks: | 140 |
| Centres visited: | 92 |
| Total number of teachers: | 487 |

| Number of students and percentages by level of education (official and non-official education) | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Preschool:* | 92 | 1.20% | *Adult Education:* | 40 | 0.52% | *Social Services:* | 100.13% |
| *Primary:* | 3215 | 41.81% | *Teacher certification:* | 6 | 0.08% | *University:* | 0.00% |
| *ESO* | 3700 | 48.12% | *Special:* | 60 | 0.78% | *Other:* | 0.00% |
| *Bachillerato:* | 544 | 7.08% | *Workshops:* | | 0.00% | | |
| *Training Cycles:* | 0 | 0.00% | *Guilds:* | 22 | 0.29% | | |

| Number of students and percentages detailed by the grade of obligatory education | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1st year Bachillerato: | 469 | 6.10% | 1st year Primary: | 420.55% | | Intermediate T.C.: | 0.00% |
| 2nd year Bachillerato: | 75 | 0.98% | 2nd year Primary: | 73 | 0.95% | Superior T. C.: | 0.00% |
| 1st year ESO: | 820 | 10.66% | 3rd year Primary: | 243 | 3.16% | | |
| 2nd year ESO: | 884 | 11.50% | 4th year Primary: | 400 | 5.20% | | |
| 3rd year ESO: | 1,047 | 13.62% | 5th year Primary: | 1,353 | 17.60% | | |
| 4th year ESO: | 949 | 12.34% | 6th year Primary: | 1,104 | 14.36% | | |

### *Summary of talks given to municipalities*

| Number of municipalities attended: 25 | | |
|---|---|---|
| **Municipality** | **Total number of talks** | **Number of centres** |
| ADEJE | 2 | 2 |
| ARONA | 2 | 2 |
| CANDELARIA | 2 | 2 |
| FASNIA | 1 | 1 |
| GARACHICO | 2 | 2 |
| GRANADILLA DE ABONA | 7 | 3 |
| LA GUANCHA | 1 | 1 |
| GUÍA DE ISORA | 2 | 2 |
| GÜÍMAR | 3 | 2 |
| ICOD DE LOS VINOS | 1 | 1 |
| LA LAGUNA | 40 | 23 |
| LA MATANZA DE ACENTEJO | 2 | 2 |
| LA OROTAVA | 9 | 5 |
| PUERTO DE LA CRUZ | 2 | 1 |
| LOS REALEJOS | 11 | 7 |
| EL ROSARIO | 1 | 1 |
| SAN MIGUEL DE ABONA | 2 | 1 |
| SANTA CRUZ DE TENERIFE | 31 | 22 |
| SANTIAGO DEL TEIDE | 1 | 1 |
| EL SAUZAL | 3 | 1 |
| SANTA ÚRSULA | 3 | 1 |
| TACORONTE | 6 | 4 |
| TEGUESTE | 4 | 3 |
| LA VICTORIA DE ACENTEJO | 1 | 1 |
| VILAFLOR | 1 | 1 |

### *Data related to the Guided Excursions Service during the last five years and extra details on 2004*

| YEAR | Guided Excursions | Users |
|---|---|---|
| 2000 | 433 | 5,118 |
| 2001 | 554 | 5,924 |
| 2002 | 564 | 7,630 |
| 2003 | 540 | 7,404 |
| 2004 | 617 | 6,843 |

| 2004 Summary |
|---|
| Total number of students: 5,519 |
| Total number of teachers: 347 |
| Total number of excursions: 111 |
| Number of centres attended: 78 |

| Number of students and percentages of different levels of education (official and non-official education) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Preschool: | | 0.00% | Adult education: | | 0.00% | Social Services: | 0.00% |
| Primary school: | 2752 | 49.86% | Teacher certification: | | 0.00% | Other: | 0.00% |
| ESO: | 2241 | 40.61% | Special: | 54 | 0.98% | University: | 0.00% |
| Secondary education: | 434 | 7.86% | Workshops: | | 0.00% | | |
| Training cycles: | 38 | 0.69% | Guilds: | | 0.00% | | |

| Number of students and percentages broken down by year in obligatory education | | | | | |
|---|---|---|---|---|---|
| 1st year Bach.: 278 | 5.04% | 1st grade Primary: 631.14% | | Intermediate Training Cycle: | |
| 2nd year Bach.: 156 | 2.83% | 2nd grade Primary: | | Superior Training Cycle: 38 | 0.69% |
| 1st year ESO: 505 | 9.15% | 3rd grade Primary: 781.41% | | | |
| 2nd year ESO: 604 | 10.94% | 4th grade Primary: 4167.54% | | | |
| 3rd year ESO: 592 | 10.73% | 5th grade Primary: 120121.76% | | | |
| 4th year ESO: 540 | 9.78% | 6th grade Primary: 99418.01% | | | |

| Summary of centres by municipality | | |
|---|---|---|
| **MUNICIPALITY** | **Total number of excursions** | **Different centres** |
| ADEJE | 2 | 2 |
| ARONA | 2 | 2 |
| CANDELARIA | 2 | 2 |
| FASNIA | 1 | 1 |
| GARACHICO | 2 | 2 |
| GRANADILLA DE ABONA | 6 | 3 |
| LA GUANCHA | 1 | 1 |
| GUÍA DE ISORA | 1 | 1 |
| GÜÍMAR | 2 | 2 |
| ICOD DE LOS VINOS | 2 | 1 |
| LA LAGUNA | 37 | 23 |
| LA OROTAVA | 2 | 2 |
| PUERTO DE LA CRUZ | 2 | 1 |
| REALEJOS, LOS | 9 | 6 |
| EL ROSARIO | 1 | 1 |
| SAN MIGUEL DE ABONA | 2 | 1 |
| SANTA CRUZ DE TENERIFE | 22 | 17 |
| SANTIAGO DEL TEIDE | 1 | 1 |
| EL SAUZAL | 3 | 1 |
| SANTA ÚRSULA | 2 | 1 |
| TACORONTE | 4 | 3 |
| TEGUESTE | 3 | 2 |
| LA VICTORIA DE ACENTEJO | 1 | 1 |
| VILAFLOR | 1 | 1 |

## *Routes open to the general public (YEAR 2004)*

| 2004 Summary of routes open to the general public | |
|---|---|
| Total number of people: | 6,843 |
| Total number of routes: | 617 |
| Average: | 11.09 |

| On foot | | | |
|---|---|---|---|
| Total number of people on foot: | | 4,077 | 59.6% |
| Total number of walking excursions: | | 377 | 61.1% |
| Walking itineraries: | Number of excursions | | Number of people |
| Arenas Negras: | 86 | | 587 |
| Roques de García: | 191 | | 1,482 |
| CANEFM: | 34 | | 942 |
| Siete Cañadas: | 2 | | 33 |
| Special: | 13 | | 157 |
| Jardín Botánico: | 26 | | 636 |
| Guajara: | 2 | | 16 |
| Montaña Blanca: | 1 | | 20 |
| Fortaleza: | 4 | | 57 |
| Risco Verde: | 0 | | |
| Climb to the Peak: | 1 | | 2 |
| Teide - Pico Viejo: | 0 | | |
| Rambleta Pico: | 4 | | 19 |
| Roque del Peral: | 4 | | 96 |
| Cañada del Cedro: | 1 | | 22 |
| Reconocimiento: | 8 | | 8 |
| **Mechanised** | | | |
| Total number of people on mechanised: | | 2,766 | 40.4% |
| Total number of mechanised excursions: | | 240 | 38.9% |
| Vehicles used: | Number of excursions | | Number of people |
| L-300: | | 182 | 1,081 |
| URO: | | 7 | 103 |
| Visitor's vehicle: | | 51 | 1,582 |
| Intinerary of mechanised excursions: | Number of excursions | | Number of people |
| Special: | | 72 | 523 |
| 7 Cañadas: | | 24 | 160 |
| Entire Park: | | 139 | 2,050 |
| Montaña Blanca: | | 3 | 14 |
| Fortaleza: | | 2 | 19 |

| Number of people by nationality | | |
|---|---|---|
| Spanish* | 2,850 | 41.65% |
| Canarian** | 503 | 7.35% |
| Tenerife*** | 2,872 | 41.97% |
| English | 34 | 0.50% |
| French | 115 | 1.68% |
| German | 77 | 1.68% |
| Italian | 0 | 0.00% |
| Other | 392 | 5.73% |

* Resident of the Spanish mainland or the Balearic Islands.
** Resident of one of the Canary Islands other than Tenerife.
*** Resident of Tenerife.

# Regulations

## LAW 5/1981, March 25th, on the reclassification of Teide National Park

(BOE, nº 90, April 15th, 1981)

### *Article 1. Objective.*

1. The objective of this law is to establish a special legal regime for Teide National Park (Tenerife Island), and its reclassification as such, in accordance with the Law 15/1975 of May 2, on Protected Nature Reserves.

2. The goal of this special legal regime is to protect the integrity of the geology, fauna, flora, vegetation, water and atmosphere, as well as the archaeological value and, in short, the entirety of the National Park's eco-systems for their educational, scientific, cultural, recreational, tourist and socio-economic importance.

### *Article 2. Territorial scope.*

1. Teide National Park covers a total area of thirteen thousand five hundred and seventy-one hectares (13,571), affecting the municipalities of Guía de Isora, Icod de los Vinos, La Oratva and Santiago del Teide, in the Province of Santa Cruz de Tenerife. Its geographical boundaries are defined in Annex I of this law.
2. Notwithstanding, by an agreement of the Council of Ministers, the Government can incorporate the land adjacent to this park that meets the necessary requirements if any of the following is true:
   a) That it is property of the State or of one of its Organisations.
   b) That it is expropriated for this purpose.
   c) That its owners contribute it for this purpose.
3. The Government must adopt the measures and provide the means necessary to ensure that the land included in this National Park whose owners do not endorse the agreements regarding indemnifiable limitations, become property of the State.

### *Article 3. Protection.*

1. All activity that can alter the elements and dynamic of the National Park's eco-systems are prohibited.
2. In each case, the exercise of traditional customs - agriculture, water activities, hunting wild rabbits with dogs; regeneration, as well as the way existing installations must be used - will be regulated by the management and usage administration plan.
3. The terrain included in this National Park is classified in all respects as land under special protection that cannot be developed.

***Article 4. Periphery protection zone.***

1. A continuous and peripheral external protection zone is delimited to guarantee complete protection of the natural resources that warranted the creation of the park and to avoid possible impacts on the ecology and scenery originating from the exterior. Its geographic boundaries are delimited in Annex II of this Law.
2. To achieve this objective, the competent Organisations will classify the terrain in this zone as non-buildable land under special protection, prohibiting all construction except that which serves the public interest and only with a favourable report by the Patronage. These Organisations will also adopt the necessary measures to protect the geology, flora, fauna, landscape, water and all other natural elements, impeding the introduction of exotic animal or vegetable species and the transformation of the woodlands that must be maintained in their natural state.

***Article 5. Management and usage administration plan.***

1. In a period no greater than one year from the enactment of this law, the Ministry of Agriculture will create an administrative plan for the management and usage of Teide National Park through the National Institute of Nature Conservation; the information contained in this plan will be made public and, after it is approved provisionally by the Patronage, it will be sent to the Government to be approved definitively.
2. This administrative plan will be valid for four years; after this period it must be revised, or it may be revised earlier if necessary. The plan will include:

   a) The general directives of organisation and use of this National Park.

   b) The regulation of the management and actions necessary to conserve and protect its natural aspects and guarantee the goals of research, interpretation of the phenomenon of Nature, environmental education and its use and enjoyment by visitors.

   c) The zoning of the National Park, delimiting areas for different uses, including those assigned to services, specifying the development restrictions and the comprehensive or directed reserve areas.
3. All construction, works or utilisation that is not specified in the management and usage administration plan, or in its revisions, considered necessary must be duly justified within the framework of the directives of the plan and authorised by the National Institute of Nature Conservation, after first receiving a favourable report from the Patronage of the Park.

***Article 6. Special plans.***

The ICONA will prepare special plans that develop the regulations in the management and usage administrative plan that will be approved by the Patronage and whose validity will be limited by the same administrative plan. Special plans will have to be prepared for at least the following:

a) The measures meant to eliminate the exploitation of the National Park's natural resources, with the exception of those activities referred to in article 3, section 2.

b) The administrative activities necessary to maintain existing biological balances and the applied research that determines them.

c) The organisation of the interpretation and information of the National Park so that its visitors will be able to enjoy it more and the promotion of their environmental education.

***Article 7. Collaboration.***

1. In order to better achieve the goals of the National Park, the ICONA will manage the collaboration of other national public Organisations and, to the degree possible, that of individuals and national or international private Organisations, whether they are government-based or not.
2. Public Organisations, in particular the Cabildo of the island, must contribute technical assistance when it is solicited of them in agreement with this article.

***Article 8. Restriction of rights.***

1. The reclassification of Teide National Park is coupled with the certification of all of its land for public use so that the affected property and rights can be expropriated.
2. In relation to the provisions in article 3, section 2 of the Law 15/1975, May 2nd, and given the importance that its landscape has for the declaration of this National Park, searching for and exploiting minerals and the clearing of species of vegetation that have not been introduced by man is prohibited, within the limits indicated in Annex I of this Law.
3. Property limitations on how non-buildable land can be used will be indemnified.

***Article 9. Patronage.***

1. For administrative purposes, the Patronage of Teide National Park referred to by Protected Natural Spaces Law is assigned to the Agriculture Ministry and is made up of the following members:

- One representative of each of the following Government Departments: the Presidency, Public Works and Urban Development, Education, Agriculture and Culture.
- One representative of the pre-autonomous or autonomous entity of the Canary Islands.
- Two representatives of the Cabildo of the island.
- Two representatives of the Municipalities that lie within the Park, one of whom is elected by the Municipal Government who has the largest surface territory within park boundaries and the other by the rest of the Municipal governments.
- One representative of Canarian Associations who, according to their statutes, are dedicated to the Conservation of Nature, elected by them.
- One representative of the University of La Laguna.

- One representative of the National Institute for the Conservation of Nature.
- One representative of the Superior Council of Scientific Research.
- The Director-Curator of the National Park.

The President will be designated by the Government from among the members of the Patronage.

2. The commissions and functions of the Patronage are:

a) To ensure the fulfilment of the rules that are established, to promote possible expansions of the National Park, to promote the construction and conditioning of the necessary access points, to administer the funds produced by use of the Park's services or from the aid that any type of entity or individual donates to the Patronage, to propose rules that more efficiently protect the values and the uniqueness of the National Park, to make proposals and to take whatever actions that it deems necessary for its own benefit.

b) To provisionally approve the maintenance and usage administration plan and its revisions, ensuring its fulfilment, and the Annual Account of the activities and results that the Park's Director-Curator will have to elevate to the National Institute for the Conservation of Nature.

c) To approve specific plans that are referred to in article six of this Law.

d) To evaluate the projects that develop the aforementioned plans and the research that is carried out in the reserves.

If two-thirds of its members confirm their disagreement with one of the propositions evaluated in the compulsory report issued by the Patronage alluded to in this section d), the President will return said proposition to its origin for reconsideration.

e) To evaluate any kind of work, project, utilisation and research plans that is being considered, whether or not they are included in the administrative management and usage plan.

If two-thirds of its members confirm their disagreement with one of the propositions evaluated in the compulsory report issued by the Patronage alluded to in this section e), the President will return said proposition to its origin for reconsideration.

f) To delegate as many functions that it deems necessary to the Permanent Commission, which has to answer to the Plenum for its management.

g) To elaborate, approve and modify its own Internal By-Laws, in which the functional structure of the Park's administration will be determined.

***Article 10. Adjustment of the Patronage's composition.***

When administrative changes or modifications occur in the Entities represented, the Government will adjust the composition of the Patronage and, if necessary, of the Permanent Commission, in accordance with these changes or modifications through an agreement approved by the Council of Ministers.

### *Article 11. Permanent Commission.*

A Permanent Commission, whose President will be that of the Patronage, will be created within the Patronage and comprised of the following members:

- One representative of the Cabildo of Tenerife.
- The representative of the Municipal Government with the largest territory within the Park.
- The representative of the pre-autonomous or autonomous entity of the Canary Islands.
- The representative of the Agriculture Ministry.
- The Park's Director-Conservador.

The Cabildo of Tenerife will designate which of its two representatives will serve on the Permanent Commission.

### *Article 12. Director-Conservador.*

1. The administration of the National Park will be the responsibility of a Director-Curator designated by the director of the ICONA, with the previous approval of the Patronage, and who must be a public official with an advanced university degree.
2. The Patronage will establish the amount of time that the post requires and the incompatibilities.

### *Article 13. Evaluation and retraction.*

The State Administration, through the ICONA, has the right to evaluate and retract all of the onerous transmissions of inter vivo property and rights over land located in the interior of the National Park, in the way that the By-Laws dictate.

The right to evaluate must be exercised within the three months following the notification of the transmission project made be either of the parties involved. The Notaries and Registrars will not authorise or register, respectively, the corresponding written documentation without previous accreditation that the notification was made.

In lack of notification, or when the conditions described in the notification do not coincide with the actual transmission, the State can exercise its right to retract within six months from the moment that either the ICONA or the Patronage of the National Park become aware of the real conditions of the transmission. The right to retract expires after ten years, counting from the moment that the transmission is formalised in an authentically dated document.

### *Article 14. Economic means.*

The ICONA will pay for the necessary expenditures involved in carrying out conservation activities, jobs and works, improvements and research and, in general, the proper administration of the Park from its own budget.

To this end, the following are considered income:

a) Items included in the General State Budget with this objective.

b) Taxes that may be established for access to the Park and the use of its services.

c) Any kind of contribution and grant from public and private Entities as well as from individuals.

d) All income that can be obtained from concessions and authorisations of use of the National Park's services, in the manner that the maintenance and usage administration plan or the special plans determine.

***Article 15. Participation of Local Governments.***

1. The Municipal Governments of the municipalities included within the National Park will have preference in obtaining concessions and authorisations to provide public-use establishments and services foreseen in the maintenance and usage administration plan or in the special plans.
2. The norms that execute this Law will determine the amount of the taxes that are established for public access to the Park's installations or other purposes that correspond to these Municipal Governments.

***Article 16. Penalty regimen.***

The inobservance or violation of the regulations applicable to this National Park will be penalised according to the Protected Natural Spaces Law and Royal Decree 2676-1977, March 4th, that approves the applicable By-Laws and according to the specific legislation that is applicable in accordance with the type of infraction.

***Article 17. Public legal actions***

The public will have the right to exercise the legal action to demand the strict observance of the protection regulations of this National Park before administrative Organisations and Courts of Civil Law.

***Article 18. Concession and exploitation of water***

In order to protect the integrity of water sources (established in article 1 of this Law) the concession and exploitation of surface or subterranean water within the area of the Park cannot be transmitted without a favourable report from the Park's Patronage.

***Transitional provision.***

When this Law enters into force, all extraction of volcanic material within Teide National Park will be suspended.

***Additional provisiones.***

1st. In a period no greater than nine months from the entrance into force of this Law, the Government, after consulting with the Patronage, will dictate the necessary norms to develop and execute this Law.

***Annex I***

**Limits of Teide National Park.**

North: Promontorio de Bonilla, Pico Cabras, Risco de la Fortaleza, Cabezón, Montaña del Pino (at kilometre 33.770, county road 821, from La Orotava to Vilaflor) and Vértice del Cerrillar.

East: Vértice del Cerrillar, Llano de Baja, Montaña Colorada, La Angostura, Topo de la Grieta, Roque de la Grieta, and Montaña de Pasajirón, following the crest of the Circo de las Cañadas.

South: Montaña del Pasajirón, Degollada de Guajara, Montaña de Guajara, Degollada de Ucanca and Crestería de Ucanca, following Roque de Almendro, Sombrero and Sombretiro points until the Boca de Tauce.

West*:* Boca de Tauce, Roques de Chavao, Montaña del Cedro, Roques del Cedro, Montaña de Chasogo, Volcán de la Botija, Mojón de los Tres Términos and Promontorio de Bonilla.

***Anexo Ii***

**Limits of the protective buffer zone.**

**North*:*** From Montaña Cascajo, located where Pinar de Chío (Guía de Isora) meets Pinar de Santiago del Teide, following a straight line through Pico Cruz de La Vieja, la Piedra Gallega, Montaña Roja and Montaña de la Negrita, in the divide of the valley of La Orotava.

**East*:*** From Montaña de la Negrita, following a straight line through Montaña de Corchado, Montaña de Siete Fuentes, Barranco de Pasajirón to Lomo Báez.

**South*:*** From Lomo Báez, in a straight line to Montaña de Las Lajas.

**West*:*** From Montaña de Las Lajas, in a straight line through Vértice Erques to Montaña de Cascajo.

## Master Plan for Use and Management of the Teide National Park.

(DECREE 153/2002, dated 24th October)

PREAMBLE

The Teide National Park was created in 1954. It was re-classified as such through Act of Parliament 5/1981, dated 25th March, in order to safeguard the National Park's integrity of geological features, fauna, flora, vegetation, water resources and atmospheric quality, as well as its archaeological assets and the ecosystems, bearing in mind its educational, scientific, cultural, recreational, tourist and socio-economic value.

Article 19 of Act 4/1989, dated 27th March, on Conservation of National Areas and wild flora and fauna, following the wording in Act 41/1997 dated 5th November, established the principle by which Master Plans for Use and Management of National Parks will be approved by the relevant Regional Government, following agreement of the Joint Management Committee commissioned to draft them.

Section 4.5.B of the National Parks' Network Master Plan, approved by Royal Decree 1803/1999, dated 26th November, outlines the procedure to be followed to secure approval of the said Master Plans. The most noteworthy steps in the procedure are mandatory approval by Decree of the Council of Government, after duly informing the public; report issued by the National Park's Trust (Patronato) and reports from the relevant Town Councils.

In the light of the above, upon completion of legal procedures and a priori agreement of the Joint Management Committee, following the proposal raised by the Minister for Territorial and Environmental Policy, and having heard the views of the Government at its meeting on 24th October 2002,

I DECLARE THE FOLLOWING:

1. To approve the Master Plan for Use and Management of the Teide National Park, regulations pertaining to which, together with area maps, are contained in the present Decree as Annexes I and II respectively.

2. The so-called "Mapping of the Master Plan for Use and Management of the Teide National Park" will be archived at the Regional Ministry for Territorial and Environmental Policy, registered with the Canary Islands Network for Protected National Areas.

FINAL PROVISION

The current Decree will come into force on the day following its publication in the Boletín Oficial de Canarias (BOCA, Canary Islands' Official Bulletin).

Signed in Las Palmas de Gran Canaria, on 24th October 2002, by

THE PRESIDENT OF THE CANARY ISLANDS REGIONAL GOVERNMENT
Román Rodríguez Rodríguez

THE MINISTER OF TERRITORIAL AND ENVIRONMENTAL POLICY, signed in his absence by
THE MINISTER FOR EDUCATION, CULTURE AND SPORTS´
(Decree 209/2002, 24th October, signed by the President)
José Miguel Ruano León

A N N E X I
MASTER PLAN FOR USE AND MANAGEMENT OF THE TEIDE NATIONAL PARK

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## 1. AIMS OF THE TEIDE NATIONAL PARK

The general aims of the Teide National Park are as follows:

I. To protect its landscape, integrity of its endemic fauna, flora and vegetation, i.e. its biodiversity, geological assets, water resources and its atmosphere; in short, to ensure sustainable dynamics and functional structure, as well as the environmental services relevant to the different ecosystems encompassed by the Park.

II. To protect the integrity of its archaeological resources and significant cultural assets.

III. To provide ecological stability and diversity, perpetuating biotic communities and genetic resources as far as possible in their natural habitat, paying special attention to those that are under threat of extinction.

IV. To promote scientific research and analysis of the Park's resources, as well as to conduct volcanic eruption surveillance and prevention operations.

V. To promote enjoyment by the public bearing in mind the Park's assets in a way that is compatible with their conservation.

VI. To promote environmental protection and public awareness of the ecological and cultural assets of the Park and their meaning.

VII. To promote socio-economic development of the surrounding communities, especially by encouraging sustainable development programmes and activities.

VIII. To annul as soon as practicable, and avoid in the future, real property rights and customs that still remain within the Park and which are incompatible with the above objectives.

IX. To promote co-ordination of activities which are carried out within and beyond the Park's boundaries but that may still have an impact on the Park or vice versa, with the aim of achieving the best possible synergy of all activities since this will benefit the Park and the Island.

X. To contribute to the National Parks' Network with a sample of general interest to Spain, which is highly representative of the volcanic processes and ecosystems, associated to high altitudes in the Maccaronesia Region.

XI. To contribute to European and World heritage with an extremely valuable sample of Spanish Maccaronesian nature; to promote and maintain recognition abroad, and to take part in international programmes for nature conservation.

Management of the Park is guided toward accomplishment of these objectives, which are established in accordance with Act 4/1989, dated 27th March, on Conservation of Natural Areas and wild flora and fauna, which was amended by Act 41/1997, dated 5th November, Act 5/1981, dated 25th March, on re-classification of the Teide National Park, the internationally accepted National Park concept defined by the IUCN in Buenos Aires (1994) and policy pertaining to the National Parks' Network, laid out in the Master Plan of the National Parks' Network.

## 2. OBJECTIVES OF THE MASTER PLAN FOR USE AND MANAGEMENT

Goals to be accomplished during the period of validity of the current Master Plan are as follows:

A. IN RELATION WITH CONSERVATION OF NATURAL AND CULTURAL RESOURCES.

1. To improve the survival rates of flora and fauna species under threat, and to develop an ecological follow-up programme as an integral diagnostic tool to assess the state of biodiversity and the effect of management activities on the environment.

2. To establish a progressive control plan to monitor mouflon sheep, wild rabbits and other introduced mammals, aimed at eradicating the former and maintaining the latter two groups at levels that do not pose a significant threat to the Park's flora.

3. To outline the necessary measures to ensure integral protection of the archaeological and ethnographical resources of the Park, warranting adequate co-ordination of the relevant bodies and institutions.

4. To adopt the measures required to include in the National Park any privately owned land in the hill tops of Vilaflor, the Caseria de El Portillo and the "Las Cumbres" Estate, which are currently under ownership of the Ministry of Defence, in accordance with the Council of Ministers Agreement on 2nd July 1999.

B. IN RELATION WITH PUBLIC USE ACTIVITIES AND THEIR REGULATION.

5. To regulate and organise mass visits to ensure compatibility with conservation of the Park's resources and public awareness of its assets.

6. To regulate the practice of outdoor sports to ensure compatibility with the Park's aims.

7. To regulate the use of roads TF-21 and TF-38, along the segment located within the National Park, to ensure compatibility with the Park's aims.

8. To raise public awareness of the resources, services and rules governing the Park to achieve greater understanding of the Park and involve users and the public in its conservation.

C. IN RELATION WITH RESEARCH ON THE PARK'S ASSETS AND OUTREACH ACTIVITIES.

9. To obtain the necessary information in order to achieve greater efficiency in management of the Park's resources, especially in so far as biological and phytosanitary data on threatened flora species; ditto for basic knowledge on invertebrate populations; ditto on basic issues regarding biology and impact of introduced mammals and on archaeological and ethnographical resources, as well as to lay the foundations for environmental and visitor follow-up, and research required to design the best quality indicators to assess the ecosystems encompassed by the Park.

10. To promote research and, in general terms, educational, scientific and cultural actions to ensure that knowledge on the Park's assets and aims, and its dissemination, will serve to strengthen accomplishment of the objectives laid out in Act 5/1981, on re-classification of the Teide National Park.

D. IN RELATION WITH USE OF THE PARK AND TRADITIONAL USES.

11. To regulate use and exploitation of natural resources to ensure compatibility with conservation.

E. REGARDING INFRASTRUCTURE, EQUIPMENT AND FACILITIES.

12. To reduce any infrastructures and installations located within the Park which are incompatible with the Park's aims.

13. To put in place the necessary measures to promote greater integration and to reduce the impact of infrastructures, equipment and facilities that may exist within the Park's boundaries.

14. To co-ordinate management infrastructures on the part of their owners and/or tenants to ensure compatibility with the Park's aims.

F. REGARDING THE PARK'S INTERACTION WITH ITS SURROUNDINGS.

15. To integrate Park management with that of surrounding areas of land, especially with that of public property under State ownership.

16. To promote co-operation between institutions, organisations and individuals in order to minimise impact from beyond the Park's boundaries.

## 3. MANAGEMENT CRITERIA

3.1. GENERAL CRITERIA.

1) All interventions and activities to be conducted must comply with compatibility criteria for conservation of the Park's resources.

2) No further building work, and new activities will not be authorised, save for those foreseen in the current Master Plan, bearing in mind the waiver provision in Art. 5.3, Act 5/1981.

3) To facilitate adequate management of the Park, an integral data-base including all the Park's resources, must be designed and regularly up-dated.

4) All the plans and projects to be developed within the Park, whether or not they are being promoted by the Authorities, must be subject to careful analysis in terms of environmental impact, in order to ensure full consideration of any environmental implications during decision making processes. Furthermore, existing facilities will be overhauled in order to minimise their possible impact.

3.2. IN RELATION TO NATURAL AND CULTURAL RESOURCES.

1) Natural resources within the Park will be managed on the basis of minimal interference with natural processes, in order to guarantee perpetuation of natural evolution of the environment and associated species. Moreover, endeavours will be made to confer to the Park conditions that would prevail naturally in the territory were it untouched territory.

Whenever active intervention is required, preference will be given to the use of techniques that reproduce natural processes as closely as possible.

2) The Park's natural diversity will be maintained, to prevent the disappearance of native breeds and their communities, while favouring the re-introduction of those that were endemic in the past but have disappeared over time for historical reasons, ensuring that there will be no undesirable impact on other plant or animal species, and that no grave problems will be posed to traditional uses of land and the environment. In any case, appropriate scientific advice will be required.

Endemic or native species are defined as those that inhabit or used to inhabit the Park as a result of natural processes. On the contrary, non-native or exotic species are any of those inhabiting the Park as a result -direct or indirect- of human activities, whether deliberate or accidental.

As a rule of thumb, interventions will target existing natural populations.

3) Purity of biodiversity will be ensured by preventing the introduction of exotic species, and by avoiding propagation or development of existing populations. The principle that all exotic species should be eradicated is enshrined in The Master Plan for the National Parks' Network and likewise in the current Master Plan.

At any event, detailed follow-up of the ecological impact and effectiveness of control mechanisms - which must be reasonable in social and economic terms - will be necessary. Avoiding cruelty with animals and ensuring visitor safety must always be considered as pivotal factors when introducing new control mechanisms.

4) If evidence emerges to suggest that proliferation of a given species is due to anthropic causes and that significant damage is caused to other species, communities or biological processes, control mechanisms may be applied, but in the case of native or endemic species in the Park, under no circumstances will they entail total eradication. At any event, control mechanisms to be implemented will be selective in nature.

5) Surface and underground water resources will be perpetuated as far as possible, as an integral component of ecosystems. Their consumptive use will only be justified when they are regarded as essential for Park management, or in the light of consolidated third party rights, provided that they do not imply significant alteration of natural processes; in this case, endeavours will be made to suppress detrimental usages.

In any case, water that has been used in any way must first undergo treatment before it is returned to natural water sources and the environment in order to minimise possible negative effects.

6) Landscape is considered as one of the major natural assets of the Park, so it must be preserved in its integrity. Any structures that have a negative effect on landscape will be modified; the minimal impact criterion will be applied to all building projects that may have an impact.

7) Given the critical importance of the Park's air quality for the visitor's experience, for human health and safety, panoramic tours, and preservation of natural and cultural resources, endeavours will be made to guarantee air quality, by conducting relevant analysis on negative impacts and their underlying causes. Furthermore, efforts will be made to preserve the tranquillity and natural sounds associated with physical and biological resources (e.g. the sound of wind, birds singing, etc), thus eliminating sources of artificial sounds or, at any event, minimising their effect. Likewise, the presence of artificial light in the Park at night will also be minimised, given the role of the night sky in the visitor's overall experience, its effect on certain animal communities and the need to protect the astronomical quality of the Canary Islands' sky.

8) Natural catastrophes will be considered as yet another ecological process in the Park's dynamics, so preventive or corrective measures will only be implemented when the public's safety is compromised, or if anthropic factors arise that may aggravate further the situation. An exception is forest fires, given that more often than not they arise as a result of artificial causes, so they will be extinguished even if they have broken out due to natural causes. In the case of forest fires due to volcanic eruptions, they will not be extinguished provided they keep within close proximity to volcanic activity.

9) Appreciation of the Park's cultural resources on behalf of the public will be preserved and encouraged, via adequate research, treatment, protection, information and interpretation programmes. Given that research on cultural resources invariably requires physical intervention and gathering of samples, this type of field work will be kept to a minimum, also endeavouring to use non-destructive methods and avoiding the withdrawal of elements from the largest possible areas.

10) An inventory and data-base will be put together, containing descriptive data on the Park's natural resources. Follow-up studies will be carried out at regular intervals in order to predict or detect changes that may require active intervention and also to lay the foundations for comparative studies with other, more highly altered ecosystems.

3.3. IN RELATION TO PUBLIC USE AND VISITOR SERVICES.

1) Public enjoyment of the Park's assets will be encouraged, in a manner that makes it compatible with conservations of the Park, while endeavouring to guarantee that visitor's gain as profound and positive experiences as possible in the Park. Special attention will be devoted to cultural, aesthetic, educational and scientific assets, awarding them greater priority than the merely tourist or recreational aspects.

Hiking activities and contemplation of the area will be promoted by making available to visitors areas where they can enjoy the solitude and integrity of the natural environment as the best way to understand and enjoy the Park. Furthermore, groups of school children, and other groups committed to raising awareness on nature issues will be especially encouraged to visit the Park.

2) All visitors will be welcomed and attended to. A variety of circuits will be established, with different degrees of difficulty, all offering opportunities to enjoy nature, especially for those with some degree of disability; endeavours will be made to ensure that this particular group have the same opportunities at their disposal as those who do not suffer from disabilities. Any type of discrimination between categories of visitors will be avoided.

3) Intensity of use of the area will be harmonised with the ability to carry the burden of attending to visitors, and if necessary other complementary services will be established. In general, in order to control and guide users, preference should be given, as much as possible, to induction and dissuasion techniques rather than to bans and imperative rules.

4) Access to the Park and its basic services will remain free of charge. These services include information, protection and guidance, as well as basic interpretation, in order to encourage full understanding and appreciation of the Park's resources, its management policy, governing rules and action programmes. However, in accordance with current

legislation, fees may be established for the provision of other types of services, considered as non-essential or merely accessory services by the Joint Management Committee.

5) Interpretation is considered as an educational activity aimed at revealing meanings and relationships using original objects, first hand experience and artificial illustrated tools to ensure that the Park's activity be based on interaction between its resources and the visitor. Premium quality is of paramount importance, so adequate development of research; planning; technical qualifications; and appropriate management, with permanent follow-up appraisals will be called for.

Given the flexibility and one-to-one interaction that characterises personal services, these will be a cornerstone in qualified interpretation of the Park, although they may be complemented or replaced by non-personal means in the appropriate measure and under certain circumstances.

6) Visitor centres and the necessary facilities and infrastructure will be created and maintained in order to efficiently organise and control public use, combining two requirements, namely to provide visitors with the best possible experience and the maximum degree of protection for the Park's resources.

7) Although individuals are first and foremost responsible for their safety, the Park will take all the necessary, reasonable precautions with the aim of improving safety and visitor protection, by encouraging public awareness of the dangers associated with use of the Park. In the interest of public health, special attention will be granted to protecting water flows from contamination, treatment of lavatory water and garbage collection bins.

The use of biodegradable material and material re-use and recycling will be encouraged, together with other appropriate methods to minimise solid waste production as much as possible. Incineration of solid waste is prohibited.

8) Special use of the Park is defined as any activity that is conducted within its boundaries that may display any of the following features: intensity, multiplicity, profitability, danger, exclusiveness or other similar categories. Any type of special use will require written authorisation from the Park's Board of Administrators before activities can be carried out.

Authorisations for special use will not be issued if the activity is: a) in breach of the Park's governing rules or policy; b) detrimental to the Park's assets or objectives; c) has reasonable potential to trigger disease, is harmful or dangerous to people or property; d) or if it interferes negatively with the Park's daily activity, with protection of resources or visitor use.

In accordance with current legislation, the Joint Management Committee may propose the establishment of fees or tariffs for any special activities that they deem relevant. The tariffs or fees will be established to cover expenses incurred by granting permits, and for monitoring of the activities which have been authorised.

9) Tariffs or fees that may be established in accordance with current legislation, for use of services, or sale of products should be roughly comparable to those applied beyond the Park's boundaries to similar products and services. However, in the case of services which on account of their abusive nature may affect conservation or management of the National

Park, or the quality of users' visits, higher rates may be established as a dissuasion method.

10) Monitoring of public use activities within the Park will be carried out, with special attention to effects on the natural environment. If necessary, corrective measures may be proposed including modifications and changes in visitor's attitudes.

3.4. IN RELATION TO RESEARCH AND FOLLOW UP OF RESOURCES.

1) The National Park will promote and, if necessary, conduct scientific research regarding natural phenomena, public use and impact of the latter on nature, with the aim of contributing to protection, planning, interpretation, development and management of the natural area. Even if research may not be essential for management, conducting investigation programmes will widen human knowledge and contribute to strengthening the Park's role as an essential pillar for ecological investigation and for studies on the effects of modern technology on natural resources.

2) Under no circumstances will scientific investigation leave a permanent mark on the Park, in detriment of its assets or public use.

3) All research projects, sample collection missions or acquisition of scientific data to be carried out should be appropriately justified, explained and reasoned. Independent scientific assessment may be sought before authorisation is granted.

4) Research projects to be carried out within the Park's boundaries will require a priori appraisal, before approval by the Park's Board of Administrators. Given that the capacity of the Park's resources to accommodate research projects is limited, priority will be given firstly to projects outlined in the Master Plan; secondly, to those targeting resolution of management problems that may arise; and thirdly, those that, given their intrinsic nature, cannot be carried out beyond the Park's boundaries or those that require environmental conditions that cannot be found elsewhere.

5) In general, scientific activities that involve manipulation or destruction will not be authorised. However, authorisation will be granted if a) effects are short-term; b) research in itself is of greater value than the affected resource; or c) results are essential for resource management.

6) The dynamism inherent to the Park's ecosystems and their reaction to any kind of human influence, including management and public use activities, call for the necessary establishment of environmental monitoring programmes to allow rapid detection of negative changes that may arise, as well as early prediction - whenever possible - of changes that may require intervention.

7) Results of research activity should be made public, and publication in scientific journals will be promoted. At any event, the Park should also reap the benefits of research projects conducted, so it will urge authors to submit to the Park the results obtained. When appropriate, research activities and results will be disseminated and interpreted with the aim of improving overall knowledge on the environment by the public. However, for safety reasons, information on the location of extremely fragile resources that may be vulnerable to vandalism may not be disclosed on the grounds of confidentiality.

3.5. IN RELATION TO USE OF THE PARK AND TRADITIONAL RESOURCES.

1) Traditional types of use and exploitation which have been practised historically by the local population, or those that play a positive role in ecological processes, may be maintained and continued, although if necessary, intensity and methodology of these practices will be harmonised to ensure compatibility with conservation criteria.

2) With the aim of ensuring that evolution of natural systems remains untouched by any possible human influence, endeavours will be made to suppress any forms of exploitation for consumptive use which have been carried out to date within the Park's boundaries. However, precautions must be taken to avoid irreparable social damage by any such suppression. When appropriate, suppression may be replaced by transferring activities to outside the Park's boundaries.

3) Game hunting, whether in the form of a recreational activity or killing of wild animals, is incompatible with the spirit and the aims of the National Park, given its repercussions on fauna populations and public use. However, in the light of special circumstances, the use of certain killing methods may be authorised as a tool to keep non-native, introduced species under control.

3.6. REGARDING INFRASTRUCTURE, EQUIPMENT AND INSTALLATIONS.

1) The Park will provide the necessary infrastructure, facilities and equipment to ensure protection of its assets, for public use and enjoyment and for management. In all cases, they will be in harmony with the Park's resources, compatible with natural processes, pleasant from the aesthetic point of view, functional, as accessible as possible to all segments of society, energy-efficient, and at a reasonable cost in terms of construction and operation.

2) All Park facilities and infrastructure should adapt as far as possible to natural surroundings, will minimal impact on landscape, both in terms of their shape, construction materials or finishing, avoiding competition between artificial elements and natural resources.

3) Whenever possible, endeavours will be made to ensure that new heavy weight equipment for infrastructure or facilities be located in communities in the Park's outskirts.

4) Bearing in mind that an existing installation is always less intrusive than a new one, preference will be given to adaptation of existing installations as opposed to new buildings. In any case, intervention projects requiring new buildings or significant overall of existing buildings will be drafted by interdisciplinary expert teams to ensure that all environmental, technical and programme requirements are given due consideration. The views of interested parties in the public should also be taken into account and included in the draft as early as possible from the outset of the project.

5) The road network that crosses the Park is embedded in the territory and should hence be considered both as a facility to allow visiting the Park, providing a safe and comfortable trip, as much as a speedy transportation system. Any future intervention on the road network will award priority to environmental factors and integration with the surroundings.

In the event of excess traffic, the solution should be sought in traffic limitations rather than expanding the road network, which is out of the question under any circumstances.

Interventions will be co-ordinated as far as possible with regional and local authorities that have competencies in administration of the road network within the Park, to ensure that use and maintenance be conducted in a manner that is compatible with the Park's objectives.

6) Walking paths and hiking routes are essential for use and enjoyment of the Park. Moreover, they provide access to certain areas, they are useful tools for management, and they assist in controlling distribution and intensity of use while avoiding undesirable impacts. Departure and arrival points, as well as points of access to the walking paths, will clearly be associated to schemes of use and circulation in the Park in order to promote their use and appropriate management.

7) The most heavily used walking paths in areas identified as "special use zones" may receive surface treatment if necessary to guarantee user safety, accessibility for the disabled, protection of resources or erosion control. Walking paths in the remainder of the Park will offer as primitive an experience as possible, so they will be rather modest in terms of lay-out and dimensions and, in general, will not be subject to surface treatment. If this were considered as essential, artificial elements should be avoided as much as possible and local materials will be used instead.

8) Facilities will be afforded a decent degree of maintenance and conservation. They should be sufficiently safe for all users and should meet minimum stands of health, cleanliness and comfort. Whenever possible they will be adapted for use by disabled visitors.

9) All facilities, vehicles and equipment will be managed, operated and maintained observing health and safety criteria, minimising energy consumption and non-renewable energy sources, favouring the use of non-contaminant energy sources provided that their impact on landscape is reasonably acceptable.

10) The Park should be adequately sign-posted to provide the necessary visitor information and guidance and to ensure appropriate image of the Park. On the basis of their role, signs should be as small in size as possible, as few in number as possible and with the least amount of text, ensuring minimal impact on landscape. Their location should not hinder enjoyment and appreciation of the Park's resources. All sign-posts, symbols, signs - internal and external - associated to the Park will be produced following the guidelines in the corporate identity manual of the National Parks' Network.

3.7. REGARDING THE PARK'S INTERACTION WITH ITS SURROUNDINGS.

1) Smooth, cordial communications and relationships will be encouraged with the communities located around the Park, and Island authorities and bodies in general. Priority will be given to communities located in the municipalities of Town Councils that a) hold ownership of property in the Park, b) have municipal land in the Park or c) are part of the peripheral protection zone, in this order.

2) An action plan will be designed, drafted and implemented with the aim of encouraging sustainable development of the said communities, giving special attention to those that are physically closer to the Park and whose social and economic interaction with the Park's protected natural resources has traditionally been greater.

3) Bearing in mind that knowledge on and appreciation of the Park's assets by those who most use it and live closer to it, is extremely important for accomplishment of the Park's objectives, special attention will be devoted to outreach programmes, and dissemination of the Park's assets, their importance and the indirect benefits that they carry by simply being there.

3.8. GUIDELINES FOR ADMINISTRATIVE CO-ORDINATION, PUBLIC RELATIONS (IMAGE) AND STAFF QUALIFICATIONS.

1) Special relations or co-ordination and collaboration schemes will be established and maintained with the Authorities responsible for management of the Forest Crown Natural Park, a protected natural area located partially within the Teide National Park's boundaries, as well as with its surroundings. Moreover, appropriate relations or co-ordination and collaboration mechanisms will also be established and maintained with the remaining sectoral authorities, in accordance with Art. 18.2 Act 30/1992, dated 26th November, on the Legal System applicable to Public Administrations and Common Administrative Procedure, amended by Act 4/1999, dated 13th January.

2) The Teide National Park's corporate image, including material means and staff uniforms, will follow the guidelines of the National Parks' Network. Their use is mandatory at least for those professionals who work with the public.

3) Training and complementary qualifications for professionals at the Teide National Park will be guaranteed, within a scheme of life-long learning that will include a monitoring and appraisal programme.

## 4. COVERAGE OF AREAS

In order to ensure that protecting the Park's assets and public use and enjoyment are fully compatible, and with the aim of minimising possible negative impacts, the Park's territory is distributed spatially on the basis of its capability to accommodate allowed uses. There are four types of zones.

4.1. RESERVE AREAS.

Definition: they encompass areas that require the greatest degree of protection. They contain premium natural and cultural assets as a function of their rarity, fragility or wealth in biodiversity, and they are of unquestionable scientific interest. Reserve areas may also encompass zones that do not meet the above requirements, but comprise regeneration processes or pose special dangers to the public.

Mission: to guarantee the greatest level of protection to their assets, to allow scientific study, and to avoid anthropic influence.

Restrictions: access is allowed solely for scientific or management purposes. Access of vehicles or mechanical artefacts, any type of exploitation or use, construction of infrastructure or facilities, including new dirt tracks and walking paths, as well as gathering biological, mineral or cultural material without explicit authorisation from the Park's Board of Administrators is strictly prohibited. A waiver is granted for setting up sign posts, marking of survey points, or duly authorised scientific equipment. These areas are closed to public use, save for circulation on foot along authorised walking paths, as contained in this Master Plan, and rock climbing at the Roque and Topo de la Grieta, as determined in the Public Use Plan or, when the ground is covered in snow, for transit under explicit authorisation of the Park's Board of Administrators.

Sectors: the area encompasses eight sectors: Sector I.A, La Fortaleza; Sector I.B, Llano de Maja-Pared del Filo; Sector I.C, El Riachuelo; Sector I.D, Chavao; Sector I.E, Montaña del Cedro; Sector I.F, Pico Viejo; Sector I.G, Teide Crater; Sector I.H Fasnia historical volcano.

4.2. RESTRICTED USE AREAS.

Definition: they comprise highly natural areas that may tolerate moderate public use. Natural and cultural assets are in a reasonably good state of conservation.

Mission: to guarantee integral conservation of the assets and resources they contain, while promoting intimate contact between mankind and nature, with full enjoyment of the solitude offered by the Park.

Restrictions: pedestrian public access via walking paths and tracks open to the public is unhindered. Circulation of vehicles and mechanical artefacts is strictly prohibited, except for research and management purposes following due authorisation from the Park's Board of Administrators and, in this case, circulation will be restricted to existing dirt tracks and paths. Circulation of vehicles along the roads that cross these areas will be authorised in accordance with the provisions contained in this Master Plan or in other regulatory documents associated to it. Any other activity will be regulated and monitored by the Park's Board of Administrators.

Installation of barriers, signs, instruments and artefacts which comply with control, orientation and safety criteria of visitors, or whose aim is scientific or managerial may be authorised, together with the establishment of rural pathways to be followed on foot or by livestock. Under no circumstances will construction of permanent dirt tracks, buildings or factory/industrial facilities be authorised, except for those indicated under paragraph five, point 12.5.

Sectors: this area comprises territory that is not included in any of the other three categories.

4.3. MODERATE USE AREAS.

Definition: they comprise areas where the natural environment is predominant and which are able to accommodate more intense public use that the previous case, provided conservation of resources, outdoor leisure and educational activities are compatible with the area.

Mission: a holistic approach to conservation of resources, public use in terms of interpretational, educational and leisure activities, together with traditional use, while minimising and controlling any negative impacts that may arise.

Restrictions: pedestrian access to the entire area is unhindered. Access of automotive vehicles and mechanical artefacts via roads, dirt tracks and authorised pathways, may be regulated by the Park's Board of Administrators in agreement with the provisions of this Master Plan. Permission will be granted for setting up services, building paths, minor infrastructure and other elements associated exclusively to public use, to traditional use activities, scientific research and management. At any rate, they will always hold the utmost respect for the environment, employing traditional material and typologies, minimising their impact and endeavouring to achieve full integration with landscapes. Construction works must be foreseen in the current Plan bearing in mind the provisions laid out in Art. 5.3 Act 5/1981.

Sectors: this area is formed by three sectors: Sector III.A, Llano de Ucanca; Sector III.B, Portillo-Tabonal Negro-Roques de García; and Sector III.C, Montaña del Alto or Guamasa-Montaña del Limón-Corral del Niño-Montaña de las Vacas.

4.4. SPECIAL USE AREAS.

Definition: reduced size areas for major buildings and facilities which are necessary for the Park's management, administration and public use.

Mission: to locate services and facilities required for public use, management and administration applying minimal impact and service-concentration criteria, including pre-existing installations that need to be kept and general interest services which harmonise with the Park's aims.

Restrictions: public access is unhindered, except for certain areas that could be cordoned off within its boundaries. In addition to meeting ordinary urban development requirements, buildings and construction works must also adapt to the rules included in this Master Plan and any other regulations that develop the provisions contained herein. Utmost respect for the environment is mandatory, using traditional materials and typologies, that will help minimise impact and achieve maximum landscape integration. Under no circumstances will more than one storey buildings be allowed, except for pre-existing buildings.

Sectors: they are located in the following five sectors: Sector IV.A, Ruleta-Cañada Blanca; Sector IV.B, El Portillo Alto; Sector IV.C, Visitors Centre El Portillo-Jardín Botánico; Sector IV.D, Casa de Juan Évora; and Sector IV.E, formed by roads TF-21, TF-24 and TF-38 which cross the Park within its boundaries.

Service areas and parking lots situated in the Teide National Park included in the Access Master Plan will also be considered as Special Use Areas.

Once the Master Plan is in force, future activity will have to adapt to this coverage of areas scheme, save for existing facilities and services which are permitted to remain in place by virtue of this Plan.

The Annex describes in detail the boundaries of each area, as well as the pathways where access on foot is allowed in the case of Reserve Areas, while Annex II contains the coverage of areas map.

Once the "Las Cumbres" Estate, under ownership of the Ministry of Defence, becomes a part of the Teide National Plan together with private property around the hill tops of Vilaflor, these will be considered as Restricted Use Areas. Private properties currently located around El Portillo will be incorporated to the Special Use Area of El Portillo.

## 5. RULES AND REGULATIONS ON PROTECTION

As to the protection of the National Park's inherent assets, bearing in mind also the rules and regulations established in sectoral legislation and the different sectoral plans - referred to in Act 5/1981 and the Master Plan of the National Parks' Network - that will further develop the current Plan, the following rules are established and will be applied within the boundaries of the Teide National Park:

### 5.1. USES REQUIRING ADMINISTRATIVE AUTHORISATION.

Administrative authorisation from the Joint Management Committee will be required for any type of special use of the National Park, as defined in section 3.3.8) of the current Plan. The Joint Management Committee may delegate the task of granting permission for all or some of the special uses on the Director of the Park.

Amongst others, Special Uses are considered to be the following:

A. Those related with cinematography, radio, television, publicity and others, and which are professional, commercial or mercantile in nature.

Authorisation for shooting movies or television productions and filming documentaries in general, with participation of professional artists or amateurs, will demand that no spectators be present during the filming. It may also require the deposit of a guarantee or an insurance policy in the name of the promoter. Uniforms, insignia or equipment from the Park's Administration is banned from use, as this could be interpreted as the Park's support/endorsement of the activities, unless there is explicit authorisation from the Park's Board of Administrators. Information gathering, photography and amateur video making are not seen as commercial activities and are therefore excluded from this paragraph.

B. Staging special events.

In accordance with management guidelines and in general terms, staging any type of mass audience event is strictly prohibited, whether the events are related to sports, to public shows or spectacles, or training/animation sessions.

Nevertheless, under exceptional circumstances, the Joint Management Committee - having heard the views if the Trust -may authorise the staging of special events if they meet the following requirements: a) that there is a meaningful link between the Park's objects and the proposed activity; and b) that the activity will contribute to greater public understanding of the Park. However, it will not be allowed to stage activities with the only aims of profit-making, for commercial or publicity purposes, or those that require payment

of a special entrance fee for access, except that the activity is directly related with the Park's objectives.

C. Research projects to be conducted within the Park's boundaries.

All research projects or surveys will have to be fully justified and adequately argued by presenting a research protocol containing the following data at least: a) aims of the project and techniques or methods to be used, as well as equipment to be set-up which may have an impact on the environment; b) area, and duration of the project; c) researchers involved; d) scientific programme to be carried out. Depending on the type and scope of the project, the support of a renowned, prestigious leading scientist may also be required. When and if the project may affect resources under threat, independent scientific advice may also be sought.

The authorisation will contain the conditions under which the project may be carried out. At any event, it is mandatory to deliver a copy of the research work conducted and results to the Park.

Research permits may be withdrawn in the event of non-compliance with the established conditions.

D. New commercial activities to be developed within set premises in the National Park.

E. Working as interpretational guides, tourist guides or information providers within the Park.

Given its special characteristics and legal regimen, as well as the remarkable quality of the area and visitor expectations, in order to work as an interpretational guide or tourist guide in the Teide National Park, candidates will be expected to demonstrate that they have a minimum level of knowledge on the Park. So, permission to work under these professional categories will only be granted to those who hold a certificate of proficiency granted by the Teide National Park's Trust.

This credential may be obtained after successfully passing a series of exams, to be held at least once a year.

The Park's Board of Administrators in collaboration with the Island's Tourist Board will carry out training courses as convenient and will publish a basic text book which will help candidates prepare for the exams.

Participating Administrations will publicise the requirements and conditions to be met for each round of exams.

F. Allowed traditional forms of use, specified under section 11 of this Master Plan, also include use of water sources, traditional exploitation of wild rabbits, apiculture, extraction of coloured soil and flower gathering.

G. The use of rat poison and plant protection products within the premises of buildings and facilities.

H. Organising and holding events of any sort which might mean mass concentrations of people in a given venue or area, except for provisions contained in paragraph B.

I. The following activities for nature enjoyment: speleology; mountaineering in Reserve Areas when the ground is covered in snow and in Restricted Use Areas beyond the boundaries of pathways; climbing to the Teide Crater from La Rambleta; practising bivouac, and, exceptionally, cycling in guided tours along the dirt track Pista del Filo; some types of aeronautic flights, as established in section 7.4 of this Master Plan.

J. Carrying out any type of construction work, buildings, and overhauling, adapting or improvement works in existing infrastructures.

In general terms, within the National Park - regardless of whether they are public or private in nature - any sort of construction work, setting up of installations and buildings is prohibited except for those permitted under the procedure established in Art. 5.3 Act 5/1981, dated 25th March, or those foreseen in the current Master Plan or in sectoral regulations which will be considered as facilities for public use when promoted by the Joint Management Committee. At any rate, any significant interventions will require an environmental impact appraisal report and, eventually, will be subject to strict conditions to ensure full harmonisation with the landscape and with the type of architecture prevailing in the area where they are to be located.

K. Using any denomination that includes the words “Teide National Park” for commercial purposes.

5.2. UNAUTHORISED USES. OFFENCES IN ACCORDANCE WITH ACT 4/1989, DATED 27TH MARCH, ON CONSERVATION OF NATURAL AREAS, AND WILD FLORA AND FAUNA.

In agreement with the general framework established in Act 4/1989, dated 27th March, on Conservation of Natural Areas, wild fauna and flora, to ensure protection of the National Park’s resources, and except for unavoidable managerial, safety or rescue needs, the following list includes some types of behaviour that could be seen as offences or violations:

5.2.1. In agreement with the provision contained in Art. 38.I of the above mentioned Act, waste spills are those that alter the habitability conditions of the National Park posing grave risk to it assets:

* Depositing, spilling, throwing away, burring or burning all types of bulky construction waste, materials, objects, products, substances or waste of any nature.

* Introducing or releasing hazardous chemical waste or biologically active waste, except those that have been authorised for management and control of wild life.

5.2.2. In agreement with Art. 38.II actions which alter the National Park’s environmental conditions or its inherent produce and, therefore, except for duly authorised cases - with permission granted by the Park’s Board of Administrators - the following will be considered as infringements:

* Altering land forms via excavation, silting, or other actions.

* Digging up, picking, collecting or extracting soil, aggregates, stones, mineral rocks or any other type of geological material.

* Extracting or altering any type of archaeological object.

* Research projects, exploration and exploitation for mining purposes.

* Changing the course of, retaining, deriving or collecting surface or underground water, except for those cases outlined in this Master Plan.

* Releasing detergents, soap, bleach or any other type of substances or materials in the cases not foreseen in section 5.2.1., except in inhabited buildings.

* Cutting, digging up, mutilating, destroying or damaging vegetation and taking any of their parts or collecting their fruits, shoots, or remains.

* Attracting, persecuting, disrupting, harming, capturing or killing animals and taking or collecting their offspring, remains or residues of their activity.

* Releasing, planting, transplanting, or propagating in any way, flora or fauna species whether domesticated or wild, especially introducing goats, sheep, horses, camels or any other herbivore except for management reasons. An exception is made for a) dogs and ferrets during authorised pest control exercises and they must be withdrawn from the Park at the end of each working day, and b) house plants in buildings and homes.

* Outdoor fires for any purpose, except the use of gas devices authorised in this Master Plan and under the conditions established by public use sectoral regulations.

* Abandoning, depositing or discarding paper, containers, bottles, plastics, cigarette ends, or waste of any type in cases not foreseen in section 5.2.1., unless they are disposed of in waste bins. Included in this paragraph is the disposal of plastics used during snow related activities.

* Occupying National Park grounds to park vehicles, caravans or trailer vans outside of authorised parking areas and under the conditions to be established in the sectoral regulations of this Master Plan, as well as setting up tents, make-shift cabins, umbrellas, hammocks, chairs, tables and any other type of device used during outdoor activities carried out in unauthorised areas.

* Circulation of vehicles outside roads and dirt tracks open to traffic.

* Setting up food and refreshment stalls, retail stalls, peddling, and any other type of commercial activity unless it is carried out in proper premises.

* Bathing or any other activity in waterways, streams etc.

* Installation of antennae, screens or any other salient devices that may affect harmony of the landscape.

* Throwing stones or objects or triggering rock falls.

* Using elements that may remain airborne such as balloons, kites, hang gliders, model aeroplanes, parachutes and similar objects.

* Practising skeet shooting, olympic shooting, archery, using compressed air rifles and, in general, introducing weapons of any sort, except for those used during authorised management activities or those carried by security guards, Park personnel or other authorised individuals with permission from the competent authority and exclusively for personal defence purposes.

* Landing with aircrafts or helicopters, as well as flying over the Park's territory at less than 1,000 m. over the vertical of its maximum altitude point, except for unavoidable scientific, safety, managerial or rescue purposes.

* Deterioration or destruction of the Park's infrastructure.

* Carving inscriptions, setting up or making signals, signs or drawings on the ground, in stones, rocks, vegetation or in the furniture or buildings of the Park, whatever the means used.

* Taking drinks or food outdoors in non-recyclable containers, from hotel facilities.

5.2.3.In accordance with Art. 38.III Act 4/1989, unauthorised camping anywhere in the National Park, as well as bivouac and sleeping outdoors is considered an offence.

5.2.4. In accordance with provisions contained in Art. 38.IV Act 4/1989, the following are considered as actions that disturb the tranquillity of the Park's species:

* Using loudspeakers, whistles, and musical instruments, radios, or other sound reproduction systems at a disturbingly high volume, as well as shouting, whistling, blowing one's horn or honking unless required to do so in the interest of road safety.

5.2.5. In accordance with provisions contained in Art. 38.V Act 4/1989, any forms of advertisement or publicity are prohibited. Excluded from this paragraph are the Park's information activities.

Likewise, in general terms, on building façades, facilities and artefacts it is forbidden to use fluorescent or striking colours, whites, vermillion, intense blues or greens and bright metallic objects that may cause outdoor impact, although their use may be authorised exceptionally, under well justified circumstances. The installation of outdoor lighting will require special permits from the Park's Board of Administrators. The surface colour of asphalted roads should adapt to the landscape as much as possible; preferred colours are ochre and sienna.

5.2.6. In accordance with Art. 38.XIII Act 4/1989, the following actions are considered to be non-compliant with the requirements, obligations or prohibitions established in this Act:

* In relation to Art. 13.2., Act 4/1989, any type of exploitation of the Park's resources that is not foreseen in this Master Plan as compatible with the aims that led to the Park's creation.

In relation to Art. 13.3., Act 4/1989, with the aim of guaranteeing protection of the Park, access to it or transit in the following cases:

a) In Reserve Areas and Restricted Use Areas, except for tracks authorised in this Master Plan, as well as pathways and other areas that require authorisation without having obtained or without carrying the relevant permit.

b) Carrying part or all of the following outside a vehicle:

1) Fire arms, weapons or any other means that serve the purpose of attracting, persecuting, and disturbing, harming, killing or capturing animals. This prohibition will not affect those who have the necessary permit during exercises for control of introduced herbivore populations, or those who carry legal weapons for personal defence with the relevant permit.

2) Hang gliders, kites, model aeroplanes, parachutes and similar devices.

3) Stones, rocks or minerals that resemble those in the Park, unless due authorisation has been sought from the Park's Board of Administrators.

4) Live specimens of the Park's native flora or fauna, their shoots, offspring or non manufactured remains, or residues of their activity, save for cases authorised by the Park's Board of Administrators.

c) When persons, vehicles or farming animals access, transit or park outside the itineraries or areas where this is allowed according to the coverage of areas scheme contained in this Master Plan, or when they circulate or roam via those itineraries or areas not complying with requirements. The same applies to itineraries or areas which, for managerial reasons, are temporarily excluded to the public by decision of the Park's Board of Directors.

In relation to article 19.4 e) of Act 4/1989, working as an interpretational guide, tourist guide or informant within the Park's boundaries, without the proficiency certificate granted by the Teide National Park's Trust.

5.2.7. The list of conducts that may be considered as offences or infringements does not exclude other types of behaviour which may also be interpreted as violations in accordance with Act 4/1989 or other legislation in force.

## 6. INTERVENTIONS REGARDING CONSERVATION

The guidelines for management of resources outlined in this Plan should be borne in mind at all times when managing the Park's resources. They will also be followed when planning interventions carried out to accomplish the objectives set out in sections 1 and 2 of this Plan.

In order to do so, the following conservation actions must be carried out during the period of validity of this Plan:

1. Regarding extension of the National Park:

In accordance with the Council of Ministers Agreement on 2 July 1999, to incorporate the "Las Cumbres" Estate, under ownership of the Ministry of Defence, and private property in the hill tops of Vilaflor and El Portillo.

2. Regarding geomorphologic resources.

a) To draft a project with the aim or organising, refurbishing and avoiding safety problems in the area known as "La Tarta" or "El Pastel" (ie. "The Cake") a vantage point of interest where a significant number of visitors stop, in order to include this area in the Park's public use system. Moreover, the said project will be aimed at reducing further deterioration of this volcanic structure caused by continual extraction of soil, and at protection of the species *Funaria hygrometrica*, found in areas with dripping water forming large monospecific cushions.

b) To restore natural conditions to the area of Roque de Caramujo, and to blend the area into the landscape by eliminating existing tracks and their branches, with the aim of protecting the resources located in the area.

c) To restore and organise the area occupied by the Fasnia Historical Volcano by eliminating tracks and side tracks or branches whose functionality is not well defined.

3. In relation to improving the survival rates of flora and fauna specie, especially of those under threat, and the survival or their habitats:

a) To restore the natural water flow in the Canal del Riachuelo so that it may flow through the gorge thus recovering vegetation associated to damp conditions. The only water use allowed is that contained explicitly in this Plan.

b) To continue with current work for recuperation of threatened flora species and to draft a new Plan for restoration of the Park's flora, extending the current programme to all species under threat of extinction, and rare or vulnerable species - in accordance with Council of Europe recommendations. This Plan should also analyse the ecology of each of these plants, as well as measures that need to be adopted to expand the populations of bird and invertebrate species that play a role in pollinating and disseminating plant seeds.

c) Together with the relevant Administration, to tackle the issue of dwindling populations of certain bird species which are pivotal in the Park, such as crows or barbary partridges, by drafting and implementing a Management Plan targeting stabilisation of these bird populations.

d) To establish speed limits along the roads that cross the Park, by applying specific legislation to be established by agreement with the competent authorities, with the aim of avoiding animals being run over as they cross the road, while a detailed report is prepared on the species most affected, the number of animals run over each year and the temporal and spatial distribution of incidents.

e) To track, detect and eliminate explosives in the Llano de Maja and the "Las Cumbres" Estate - after it is handed over to the Park - to avoid possible security problems that may arise. To refurbish the Llano de Maja eliminating tracks that cross it, as they pose a threat to one of the very few populations of Stemmacantha cynaroides (or silver thistle) which are found in the Park.

f) To refurbish the peak of Vilaflor area - once handed over to the Park - seriously affected by a forest fire in 1998.

4. In relation to progressive control of introduced animal species:

a) To adopt the necessary measures to control and eradicate populations of dogs that have been abandoned within the Park. Other enhancement measures may also be implemented, including the following: a) designing and maintaining a database of animals owned by those who take part in wild rabbit control campaigns; b) all animals used in this exercise must be individually marked; those un-marked will be banned from pest control campaigns.

The Park's Board of Administrators will collaborate with animal welfare and protection organisations and will hand over animals captured alive; in all cases, methods for animal capture must be as bloodless as possible.

b) Populations of mouflon sheep (*Ovis gmelini musimon*) were introduced in the early seventies and have since then grown rapidly all over the island. Their propagation within the National Park poses a potential risk for conservation of certain types of vegetation, so eradication of this animal species is necessary.

Consequently, in collaboration with the competent authorities, an Action Plan will be designed and implemented in order to eradicate mouflon sheep from the island. Nevertheless, given that intervention within the Park should be delayed no further, the Park's Board of Administrators will roll out monitoring and population control measures.

Following the recommendations of the Council of Europe and in accordance with provisions contained in section 11.1.2. of this Master Plan, a Sectoral Plan for management of introduced herbivores will be designed and implemented with the aim of eradicating mouflon sheep from the Park. The Plan will contain a detailed programme of actions to be carried out, both in terms of monitoring and approach, as well as methodology and number of captures. The plan will devote special attention to the development of bloodless methods for pest control.

In both the above cases, the provisions of the said Plan must be consistent with the Park's management guidelines, as established in this Master Plan. Although hunting, as a sport, is not allowed in the Teide National Park, under exceptional circumstances the Park's Administration may request collaboration from the local population with the aim of eradicating mouflon sheep.

c) To continue with control of the population of wild rabbits, trying to bring it down to a level that will no longer pose a significant threat to the Park's flora. Traditional use by local communities will be allowed, in agreement with specific regulations, as established in section 11.1.2. of this Plan.

In accordance with the Council of Europe, as support and control measures within the programme, while control programmes for both species are being carried out, another survey will be conducted to assess their dynamics, ethology, population density and feeding preferences, as well as damage done to vegetation. Likewise, plant populations will be protected, especially those most at risk, by setting up wire fences to avoid herbivore access.

5. In relation to protection and restoration of the Park's archaeological and ethnographic resources, adequate co-ordination between the competent institutions will be established, as well as the following:

a) Improving surveillance and dissemination of rules governing protection of archaeological heritage, restricting use of areas with larger concentrations of resources, in agreement with provisions outlined in the coverage of areas scheme section of this Plan. If circumstances are such that it is required, the Park's Board of Administrators will be mandated to implement additional protection measures upon the discovery of new resources.

b) A natural and cultural restoration project will be designed for the Cueva del Hielo, aimed at restoring natural functionality of its water system, including initial waterproofing of the bucket or trough, if necessary. The existing pipe will be withdrawn and future extraction of ice or water will be prohibited.

c) Information related with the location, nature and cultural context of cultural resources may be withdrawn from public scrutiny if it is deemed that dissemination of the data may have adverse effects on the resources.

6. In relation to landscape protection, infrastructure, facilities and equipment existing in the Park will be adapted or eliminated, using the following means, with the aim of maintaining the Park's purity and to minimise or suppress any form of landscape impact that may arise:

a) To achieve the highest possible degree of integration of the following infrastructures, facilities and equipment in the surroundings: Telephone booster in Montaña Rajada; cable car and annexed facilities; cabin in Montaña Blanca; shelter in Montaña Blanca; Casa de Fasnia; Ermita de la Cruz de Fregel; water galleries and hydraulic infrastructure located in the Barranco de Erís de Carnero, and roads crossing the Park.

b) To eliminate the following infrastructures, facilities or equipment: Casas del Sanatorio, cabin belonging to the Ministry of Public Works and mountaineers shelter, in accordance with provisions contained in sections 7 and 12 of this Master Plan; public use cabins (J. Ruiz-José el de Izaña, Choza Degollada del Cedro and Choza Montaña del Alto or de Guamasa); Choza de Santa Rita, Hut in Montaña del Limón, Casita de Medio Ambiente or Choza Risco del Capitán, gauge tank in Barranco de Erís de Carnero, and pipe in Casa de Fasnia.

c) Maintenance and, when necessary and as far as possible, strengthening cleaning services with a view to eliminating or types of waste and abandoned artefacts and devices.

d) To draft and implement the following landscape treatment plan.

Considering the extraordinary importance of landscape as an essential resource for the Teide National Park, regardless of provisions contained in the above two paragraphs - which can be implemented jointly or separately - the Joint Management Committee will draft a Landscape Treatment Plan to cover the entire National Park.

The said Plan will comprise, at the very least, analysis of the currently existing landscape issues; assessment on the basis of their importance and possibility of reversal; and an action plan including possible solutions, as well as schedule and costs for eliminating or minimising each of the problems identified. Indications must be given in each case as to the institutions or organisations affected or those responsible, and the most efficient manner to collaborate during the execution phase. Also to be borne in mind are problems beyond the Park's boundaries which may have a negative impact on the Park itself.

e) Reducing light pollution. All installations located within the National Park must dim their outside lights as from 22:00 hours (10 pm).

## 7. INTERVENTIONS REGARDING PUBLIC USE AND VISITORS

Public use of the Teide National Park is defined as the set of practices or activities carried out by those who visit it, either individually or collectively, in spontaneous or organised fashion, with the primary aim of enjoying its beauty, ecological value, natural environment and remarkable environmental quality.

Given the exceedingly high number of visitors each year - approximately 3,800,000 visitors in 1999; given its foreseeable short and medium term growth and the social and financial implications of this activity for the entire Island; in order to guarantee conservation of the Park's natural and cultural assets and to ensure a highly positive and enlightening experience for visitors; in short, in order to accomplish the established goals, it is necessary to regulate a variety of practical uses and to adapt different public use means and services.

### 7.1. PUBLIC USE SPECIFIC OBJECTIVES.

Specific goals for public use, to be achieved during the period of validity of this Master Plan, are as follows:

1. To establish regulations for use of access roads to the National Park, while improving general conditions of use and reducing environmental impact as far as possible.

2. To determine capability to absorb visitor pressure in areas most affected by high density of visitors at the National Park, adapting the areas to intensity of use.

3. To develop and maintain interpretational programmes on the different natural processes that take place, their intrinsic elements and, in general, on all those issues which are directly linked with the Park. To achieve this aim, avant-garde techniques and interpretational means will be applied, together with professionalizing guided tours, with the highest possible degree of qualifications for professionals.

4. To adapt, improve and maintain infrastructure and the Park's public use network of facilities.

5. To define, establish and maintain a network of walking paths with the aim of facilitating, organising and controlling visitor circulation, as well as to promote better contact between mankind and nature.

6. To establish regulations for outdoor sport practices so that they are compatible with the Park's aims.

7. To enhance outreach programmes and to provide information on the Park's assets, on the possibilities if offers for use and enjoyment, rules and regulations for protection of the Park and on any other issues that may be deemed convenient for better and more far reaching accomplishment of objectives.

8. To improve protection and safety conditions for visitors and users.

9. To ensure compatibility between the manner in which the Park is used and authorised traditional forms of exploitation and public use.

10. To include in the National Park's public use system all existing installations, uses and activities or those that may be developed within its boundaries and which are compatible with the Park's general aims.

7.2. OVERALL ORGANISATION OF THE PUBLIC USE SYSTEM.

The Teide National Park's current public use system poses a structural problem as a result of the increasingly high number of visitors that require services and the existence of basic infrastructure for free use, namely roads TF-21, TF-24 and TF-38 which foster growth in visitor numbers, hindering their control, thus threatening conservation of the Park's resources. Solving this problem requires going beyond the National Park's physical boundaries and the issue cannot be broached unless an innovative organisational scheme is adopted for the system as a whole, together with close inter-institutional co-operation.

The Park's Board of Administrators will promote accomplishment of such collaboration with all the Public Administrations involved and with interested parties in the public in order to design, draft and implement a new public use scheme which must be established taking on board the Council of Europe's recommendations, along the following guidelines:

a) To regulate the flow of visitors that intend to enter the Park, by setting up control points on the roads that cross it, so that access is not allowed to a higher number of visitors than can be accommodated globally in the Park, in the interest of resource protection and to guarantee a fruitful visit.

b) To keep access to the Park free of charge, although beneficial rights or public rates could be established for all or part of the public use services on offer which are not considered as being essential.

c) New availability of venues, routes and visitor services that differ from traditional, more saturated ones, as a way to absorb excess visitors and to offer alternatives to the Park's traditional main attractions.

d) To limit visitor burden in each of the venues and services indicated in the previous paragraph so that they reach their true capacity, within the general limits established globally.

e) To guarantee the right of transit to those citizens who wish to use any of the TF-21 or TF-38 roads to cross from one end of the Island to the other. Visiting the Park is not a part of this right sensu stricto, so citizens may not be authorised to use the parking areas, or other installations inherent to the visitor's experience in the Park. Any other restrictive measures may be adopted, provided that citizens' right to transit is not violated, as long as those measures enhance and make protection of the National Park's resources more effective.

Moreover, under certain circumstances -to be determined in other regulations- free access may also be granted to those who access the National Park for work, study, to provide public services, or for other well justified reasons.

f) Regulating the use of roads will also call for establishing service areas linked to access control points. Essentially, these facilities will allow two types of Park visit: visitors using their own transport, or as part of an organised tourist group arriving by bus, that gain access to the Park before the established burden capacity has been completed and will, therefore, be able to move around in the Park using those vehicles and, secondly, those visitors who cannot be allowed entrance because the quota has filled up. For the latter - as for any other visitor - the Park's Board of Administrators will create a service of organised guided tours which will allow access to various points of the Park or its surroundings. These visits will offer a number of possibilities depending on how they are carried out, duration of the tour, and other parameters. The areas mentioned above, which could be located somewhere along road TF-21 close to Boca de Tauce, Pinar de Chío and El Portillo, will offer all the necessary services to ensure adequate organisation of the tour. Services must be compatible with the National Park's objectives as well as with the objectives and rules governing the Forest Crown Natural Park - should such services be located in that area provided they are related in some way to visits at the Teide National Park.

g) Consolidating and making the most of the panoramic nature of roads TF-21, TF-24 and TF-38 as opposed to their utilisation as rapid transit routes.

Notwithstanding regulations that may be established in the Public Use Plan, the design of the said scheme will be the subject of a Master Plan for Access to be drafted by the Joint Management Committee in a period of six months as from the entry into force of the current Master Plan. Before definitive approval by the Park's Trust, it will be submitted for approval to the relevant public administrations on the basis of their respective powers in this area.

7.3. SPECIFIC USE RESTRICTIONS.

Even if in the future, different sectoral plans and other regulations to develop this Master Plan may establish other limits, this Master Plan already establishes a maximum quota of one hundred and fifty visitors at any one time, for La Rambleta, including the three hiking paths in the area. If necessary, and to guarantee protection of resources or visitor safety, the Joint Management Committee may reduce that number, as well as establish a lower quota for the Teide Peak.

Moreover, the Joint Management Committee, having heard the views of the Trust, may adopt the necessary decisions to ensure the most effective and best possible protection of the Teide cone, ranging from total closure to the general public, to a guided tour, or unhindered visits during certain times of the day, or a combination of both.

To err on the side of caution, the Joint Management Committee may place restrictions on use of all the other areas in the Park whose features call for such measures, although for permanent measures, a specific plan should be drafted and approved.

7.4. PUBLIC USE ACTIVITIES.

Tours of the Park can be divided, essentially, into two different categories on the basis of the aims of the visit:

a) A short visit, conducted in groups or individually, lasting a few hours which basically allows speedy and shallow contact with the Park's resources and services. This is the sort of visit that appeals to a short-term visitor, in general terms, tourists who focus on contemplation of nature, taking photographs to have as mementos, picnics, sunbathing and use of some of the installations, as well as short walks or hikes.

b) A longer visit, with greater contact with the Park's resources and assets, to practice - whether one is accustomed or not - a variety of nature activities, sports and outdoor activities. In general, this visit appeals to the island's resident population or longer-term visitors than package holiday tourists. Visits are carried out individually or in groups.

Activities for enjoyment of nature, that take place within the Park, will be regulated in the Public Use Plan which is outlined in section 7.8.

The following activities will be dealt with in the said Plan, as listed here.

7.4.1. Hiking, mountaineering, rock climbing. Special attention will be afforded as these sports have traditionally been practised in the Park and they are fully compatible with its spirit and aims.

The Park's Board of Administrators, in collaboration with the Canary Islands Mountaineering Federation, will propose - for inclusion in the Public Use Plan - recommendations for these sports in terms of allowed venues and itineraries, means permitted for practising the sports, times of the year, authorisations when necessary and any other conditions they deem appropriate to ensure conservation of the environment.

Rock climbing during non-winter periods will be limited to the Macizo de Guajara, Torreón Figueroa, Roques de Gracia and Roque y Topo de la Grieta at the locations, and in the manner to be established in the Plan. In order to protect bird's nest building habits, rock climbing could be banned from certain locations and periods of the year as recommended by special circumstances.

When the ground is covered in snow, specific authorisations may be granted for certain mountaineering activities whose practise would not necessarily be authorised under normal circumstances.

7.4.2. Skiing. Practising mountain skiing will be allowed unhindered in Montaña Blanca and cross-country skiing along road sections and tracks closed to vehicle circulation on account of snow.

7.4.3. Speleology. This type of sport requires explicit authorisation from the Park's Board of Administrators, in collaboration with the Canary Islands Mountaineering Federation. Those who wish to practice this sport will have to display, upon request, their credentials as members of the Federation for authorisation to be granted. Other restrictive, complementary regulations may also be established.

7.4.4. Camping. It is not allowed within the Park's boundaries.

7.4.5. Bivouac. Authorisation is required from the Park's Board of Administrators for practising bivouac. Under no circumstances can this sport be practiced at an altitude of less than two thousand five hundred metres above sea level. Outdoor fires are strictly prohibited, except for gas devices.

7.4.6. Cycling. It can only be practised freely on asphalted roads. It may be authorised in the future, with restrictions, only in terms of a guided route along the dirt track Pista del Filo. Cycling is not allowed elsewhere in the Park.

7.4.7. Air sports. In general, no air flights are allowed (hang gliding, paragliding, hot air balloons, or others) within the boundaries of the National Park, except for paragliding at km 33 on TF-24 towards the Orotava Valley. Nevertheless, after a report from the Trust, restrictions can be established in whatever form to allow special authorisations for certain sporadic, non-recurrent flights for scientific, exploration, documentary or other well justified purposes.

7.4.8. Horse or camel riding. Itineraries on horse or camel back are prohibited within the Park's boundaries.

7.4.9. Driving motor vehicles. Motor vehicles are banned from circulation in the Park except for the asphalted roads and dirt tracks outlined in this Master Plan.

7.4.10. Astronomical observation. The Park's sky is seen as one of its most emblematic resources, so observation of the night sky and celestial objects is seen as an educational and recreational use that is fully compatible with the Park's principles and objectives.

## 7.5. INTERPRETATION AND INFORMATION.

Interpretation for visitors and information to the public at large, as means to fully accomplish aims related to the Park's public use, will be subject to special attention by the Park's Board of Administrators.

Interpretational programmes must be drafted and implemented to aid the public in gaining full understanding and appreciation of the Park and its assets; to develop public support for preservation of its assets; to provide the necessary information to guarantee that the public will adapt to high altitude mountainous conditions; and to promote and facilitate more adequate, safer user, with minimal impact. At any event, programmes must be subject to permanent monitoring and re-assessment so that improvements can be introduced and to amend any mistakes that may come to light during the implementation phase.

The Public Use Plan will regulate in detail the particulars of the above, in agreement with the provisions outlined in this section.

The interpretational programme of the Teide National Park will be executed according to the provisions of this Master Plan and bearing in mind the Council of Europe's recommendations while adhering to the following criteria:

1. To achieve the highest possible number of visitors.

2. To offer a multiple and rigorous view of the National Park at the same level for all, except for special programmes targeting school children.

3. Priority will be given to the Spanish language, and whenever possible to the remaining languages of the European Union.

4. Personal services will be seen as the cornerstone of qualified interpretation given their flexibility and one-to-one interaction and because they are the most effective means to stimulate comprehension and appreciation of the Park's values given that they offer information, guidance and assistance in guaranteeing protection of resources and visitor safety.

Personalised services will be complemented, under the appropriate circumstances and to any possible degree, with non-personal measures, such as leaflets and other publications, exhibits, panels or audiovisual presentations. Moreover, when it is deemed most appropriate under the given circumstances, personal and non-personal services can be combined.

5. Special attention will be paid to visitor centres, whose mission is to provide the visitor with information and interpretational services. They will not replace personal interpretational services or self-guided systems and will only be built at venues where it is important to set up a point of contact with the public.

They may also include information services, audiovisual programmes, exhibits and other necessary elements and spaces in order to offer the visitor a high quality experience.

They may also include premises for sale of outreach and education material, as well as products related to the Park.

6. To offer an interpretational service with adequate programmes for school children who must be looked after, and mentored by Park staff, while seeking active participation of teachers.

Notwithstanding provisions established in greater detail in the section pertaining to the Public Use Plan, interpretational programmes will encompass, at the very least, the following priority topics:

1) Island of Tenerife. Genesis of the Archipelago, and of the island, together with main ecological facts and interpretation of current human geography.

2) The world of volcanoes at the National Park. Volcanoes as a natural phenomenon. Volcanic structures in the Park.

3) High altitude mountainous ecology. The life of animals and plants. Endemic species. Colonization of lava fields.

4) Mankind at the peaks of Tenerife. How aboriginals lived in the Park. The life of shepherds and recent traditional uses.

5) The National Park as an icon. Its role in caring for the Planet. Missions and objectives. Recreational use. Financial impact on the island's economy. Techniques applied. Forecasting volcano eruptions.

6) The European diploma. Relation with other Spanish and European systems and National Parks and those from other continents.

7) The world of science and the National Park. Surveys and scientific projects carried out within the Park. Renowned scientists and their climb to the top of Teide. The sky and the Universe as part of the Park's natural resources.

An information system to disseminate the Park's assets, rules and services - own or provided by third parties - will be established and developed as a vital tool to better achieve its objectives and to encourage appreciation by the public. The said system will cover, at least, the following points: a) type of information to be offered and delivery to the public - personal or non-personal means-; b) information points to be set up inside and outside the Park; c) defining the type of material to be employed - type, contents, language versions, amongst others -; d) service and schedule for supply, stocks and distribution of material.

7.6. PUBLIC USE INFRASTRUCTURE AND FACILITIES.

They will adapt to and, in some cases, improve the public use facilities in the Park, including existing buildings and outdoor installations, both in terms of structural and functional elements as well as signs, information and interpretation boards.

The Public Use system will focus on the following facilities:

7.6.1. Visitor centres.

a) El Portillo Visitor Centre. Its main mission is to provide information and interpretation, while its activity primarily focuses on interpretational services, as per points 1), 2) and 3) of section 7.5 in this Master Plan. It is also the main base for departure and beginning of school activities.

b) Cañada Blanca Visitor Centre. Essentially it is devoted to interpretational services as per points 4) and 7) of section 7.5 in this Master Plan and has professional, full time interpretation guides at its disposal. It is the main point of departure for general public activities organised by the National Park. The National Park's Board of Administrators, having reached the necessary agreements, may include relevant features of the "Casetas del Kaiser" - one of the Park's assets, currently located in Izaña - as part of the display in this Visitor Centre given its educational, interpretational, and historical importance.

c) Casa de Juan Evora. Located in the old house and stables of the Casa de Juan Evora, it will be entirely devoted to developing interpretation theme 4) under section 7.5 of this Master Plan, and it could house a museum.

7.6.2. Information points: El Portillo Information Centre and Boca del Tauce Information Centre.

7.6.3. Look-out points and parking areas.

Consolidating the Park's roads as scenic routes requires adapting and maintaining their vantage points and parking areas, to include appropriate information/interpretation boards. At least the existing panels will be maintained, and other supplementary ones will be added.

The ledge along the dirt track Pista del Filo is the best boundary area of the Park for contemplation and enjoyment of the grandeur of the Park in its entirety. Therefore, a scenic view point could be set up in that area. Likewise, along the Pista de Montaña del Limón and the existing pathway, given its prime importance from the interpretational point of view, further vantage points could be set up.

7.6.4. Network of tracks and walking paths.

A network of pathways in the Park will be set up, including all those open to the public. The most important ones will be included in the main pathway network, which will deserve higher priority, and will be subject to the publication of specific material. The Canary Islands Mountaineering Federation may collaborate actively in defining and producing the material.

The hiking paths following the routes Portillo-Teide Peak; Lomo de Chío-Teide Peak; climb to the top of Guajara and the Camino Real de Chasna will play a predominant role since they are an intrinsic part of other great routes along the Island. The Public Use Plan will outline specific regulations for use that may be deemed appropriate.

The Park's Board of Administrators will collaborate with other institutions and user groups to facilitate access and enjoyment on foot, and will foster organisation and use of the island's routes that run from the Park to beyond its boundaries. For routes requiring more than a day to cover them completely, when appropriate, the setting up of over-night shelters and their location will be promoted jointly with Public Administrations responsible for the municipalities affected.

A number of self-interpretation walking paths will be created and adapted in those areas where greater numbers of visitors congregate.

7.6.5. Mountain shelters

The Altavista hut and the mountaineer's shelter, to be refurbished, in El Portillo Alto, are the only huts in the National Park.

Regardless of ownership and management methods, bearing in mind the need to ensure the highest possible degree of protection of the Park's assets, those responsible for running the shelters/huts will establish rules for use - to be endorsed by the Trust - covering at least the following:

a) Users that have a right or are eligible to use them, order of preference if appropriate and reservation system.

b) Maximum capacity of the facility.

c) System for registering users.

d) Opening hours and maximum length of stay which can never exceed three consecutive nights.

e) Forest guards, with a description of their responsibilities and mandate.

f) If applicable, basis for establishing over-night stay rates.

g) Internal rules of operation and disposal of waste. It is mandatory to dispose of solid waste beyond the National Park's boundaries.

h) Disciplinary measures and complaint forms.

7.6.6. Picnic areas. They are to provide the visitor with areas for rest, and they can only be set up in Cañada Blanca and Montaña del Alto or de Guamasa. They will be small in size and location will be determined so that negative impact on the natural environment is avoided. Decisions on location will require a priori detailed analysis on environmental impact paying special attention to effects on soil/ground, vegetation and landscape.

7.6.7. Sign posts.

Sign-posting of the National Park will be undertaken both within and beyond its boundaries, with details on the facilities and services provided in each area, as well as

indications on how to reach them, and walking distances, so that visitors have at their disposal relevant and sufficient information.

Moreover, the Park's Public Use System - on the basis of provisions contained in the Public Use Plan and Master Plan on Access - may include other types of infrastructure to be developed.

7.7. SAFETY AND PROTECTION OF VISITORS.

Given that visitors are ultimately responsible for their own safety, they should always exert maximum caution in their behaviour and while carrying out activities in the Park. Moreover, they should always abide by conservation rules, and obtain full information on the possibilities of enjoyment of the Park, relevant recommendations and security regulations.

Nevertheless, the Park's Board of Administrators will support the relevant public administrations by adopting the following measures and initiatives:

Prevention and intervention measures.

Notwithstanding specific provisions that may be included to that effect in the Public Use Plan, the following actions will be developed:

a) Security regulations and dissemination.

A guide with rules and regulations on protection and general safety will be drafted and delivered to the public. It will also include special rules targeting hunters and mountaineers. The Park's Board of Administrators will take charge of disseminating the information and delivering it to as many users as possible, using a number of means at its disposal (i.e. visitor centres, information points, nursery and public use staff, and publications, among others).

b) Health prevention.

The Park's Board of Administrators will set up a system for collecting and disposing of solid waste generated in the Park. Likewise, it will promote control and monitoring of water quality, both at outlets and pipes, as well as adequate treatment and disposal of wastewater in order to avoid health risks.

c) Accident prevention.

The Park's Board of Administrators will ensure sign-posting, with the appropriate means, of hiking routes, walking paths, and itineraries which are open to the public, as well as possible dangers that may arise on route. At the starting point of each route, when appropriate, information will be provided on its lay-out, duration and degree of difficulty. Nevertheless, signs and indications to be installed should not interfere with the Park's natural assets, neither in terms of quantity, design or location, safeguarding the main aim of each of the areas outlined in this Master Plan.

Perfect maintenance of road safety elements will be promoted with the relevant authorities, and the roads that cross the Park must be in tip-top condition. Special attention will be devoted to the roads' surface, traffic signs, surface painting, colour and protection barriers.

As many measures as necessary - including the closure of certain segments to the public - will be taken to forecast the occurrence of rock falls and, whenever possible, to avoid them causing damage and posing risks to Park users. Nevertheless, conservation criteria will be awarded greater priority than active protection measures that may mean intervening on the environment.

d) First aid and rescue areas.

At least two first aid centres will be set up and operated: a primary centre at El Portillo Alto and a secondary one at the cable car station (at base). They can be supported by the relevant Health Authorities, the Park's Board of Administrators and the owners of commercial premises in the Park or its surroundings. In accordance to provisions contained under point 12.5, at the cable car station (point of arrival at peak) there should be at least a storage room with thermal blankets and any other material necessary to deal with meteorological emergencies, or cable car break-downs. It should also be equipped with a first-aid kit, oxygen masks and bottles and radio communication equipment.

e) Mountain huts.

The Park's Board of Administrators will be responsible for smooth operation of the huts or lodges that exist within the Park, ensuring that they are adequately equipped to confront emergency situations and provide shelter to as many users as possible. The Altavista and Portillo Alto huts should have fist-aid kits, oxygen bottles and radio communication equipment.

f) Rescue operations.

In the event of missing persons or accidents, the Park's Board of Administrators will make available to the competent authorities the necessary means for them to join mountain rescue teams.

g) Training

Rescue training courses and hands-on, first-aid practice sessions will be organised regularly, including training for dealing with accident victims. They are open to all those who may ultimately be involved in emergencies given their activity in the National Park.

7.8. PUBLIC USE PLAN.

Detailed regulations of the criteria outlined in section 7 of the Master Plan should be included in the Teide National Park's Public Use Plan. This plan should, in addition, cover other issues that are necessary for smooth operation of the public use system, such as for instance the following: a) determining the capacity of visitors centres, walking paths, view points, and areas where vehicles stop for contemplation; b) public use services and interpretational programmes available; c) programmes for school children and special groups; d) operational scheme for centres and services; e) beneficial rights, deposits in

cash, and public rates to be established when appropriate; f) procedure and requirements to obtain permits and development of special uses; and g) monitoring and assessment programmes for appraisal of the public use system.

The Joint Management Committee will submit to the Trust for approval, the Public Use Plan twelve months following entry into force of the current Master Plan. During the Plan's drafting stage, interested parties in the public will be invited to take part. The current Visitor Plan will remain in force, in those areas in which it does not contradict this Master Plan, while the Public Use Plan undergoes procedures for approval.

The above should abide by the criteria outlined in section 7.2 of the Master Plan for Access.

## 8. INTERVENTIONS REGARDING RESEARCH ACTIVITIES

In accordance with its objectives, surveys and scientific research studies will be allowed within the boundaries of the National Park, together with sample collection or data acquisition, always bearing in mind priorities, requirements and procedures established in this Master Plan to obtain permits.

In the light of specific management objectives and guidelines, as defined in this Master Plan, research projects to be conducted in the Teide National Park, are to belong to the following categories:

1) Basic facts regarding the physical environment of the Teide National Park.

2) Determining the status, biological and phytosanitary data and causes for regression of flora species under threat.

3) Basic concepts on invertebrate fauna.

4) Basic information for the design of plans to recover dwindling species.

5) Basic information on prehistoric and historic resources.

6) Impact of introduced species on endemic species, communities and ecosystems in the Park.

7) Impact of human activity on species, communities of ecosystems in the Park.

8) Studies applied to organising public use and forms of exploitation of the Park.

9) Studies applied to protection of the Park's cultural resources.

10) Studies applied to environmental integration of the Park.

Within these wide ranging research lines, the following programmes are to be awarded greater priority, and they will be developed in the Park as and when its own staff or sufficient resources become available. In addition, the Park's Board of Administrators is free to promote execution of the projects by commissioning other institutions.

a) Stratigraphic and geochronological study of the Las Cañadas del Teide crater.

b) Analytical restitution and mapping of the Teide National Park and its peripheral protection area and to make available a Geographical Information System (GIS) including all the Park's features, for management and research purposes.

c) Study of fungi and lower plants, ferns, moss and lichens.

d) Determining the current state of menaced flora and flora under threat of extinction in the Park: structure, dynamics and genetics of the populations.

e) Chorologic and phenologic analysis of the flora present in the Teide National Park and its peripheral protection zone.

f) Climate study on the Park with special emphasis on energy equilibrium, formation of "cold lakes" and occurrence of peculiar phenomena (electric storms with high winds, sand storms and others).

g) Taxonomy and chorology of certain specific species such as Gnaphalium spp., Tolpis spp., Silene spp., Mentha sp., and so on.

h) Current status and historical distribution area of cedars (Juniperus cedrus) as well as possible future evolution, dispersion mechanisms (such as for instance the role of crows) and actions necessary to restore the original vegetation cover.

i) Phenological analyses and study on the reproductive strategies of the Park's flora.
j) Reproductive biology of threatened species.

k) Analysis of the biology of broom and laburnum.

l) Study of the Park's trophic chains.

m) Study on the Park's zoochoria with special emphasis on the role of rodent populations in dissemination of flora species.

n) Basic data on ornithic communities such as reproductive success, phenology and migration patterns.

o) Basic studies on lizard biology.

p) Inventory on invertebrate fauna in the Teide National Park.

q) Delimiting unique and/or fragile areas for invertebrate fauna, for conservation management.

r) Estimates on rabbit and mouflon sheep populations, studying their dynamics and efficiency of population control systems currently in use; analysis and assessment of their impact on the environment.

s) Importance of the Park with the distribution area and status of certain bird species such as the great grey shrike (*Lanius excubitor*) and others in decline such as the crow (*Corvus corax tingitanus*).

t) Impact of wild fauna on bird and reptile species in the Teide National Park.

u) Ecological foundations for the design of protection measures aimed at bat populations in the Teide National Park.

v) Impact on certain bird, mammal and reptile species of vehicle traffic along the roads that cross the Park.

x) Archaeological inventory of the Teide National Park.

y) Analysis of the distribution and operation of shepherd shelters and sheepfolds in the Park, paying special attention to those situated in the Sanatorio volcano's southern edge.

z) Inventory of archaeological samples that have been withdrawn from the Park, indicating their location and ownership.

aa) Synthetic study on the life of aboriginals in Las Cañadas.

ab) Synthetic study on sub-recent shepherd life in the Park, with special emphasis on the ways in which they used the environment (charcoal making, medicinal plants, etc).

ac) Historical study on scientific research conducted in Las Cañadas, underlining domestic aspects.

ad) Summary of the main excursions and climbs to the Teide peak.

ae) Studies on the financial impact of visits to the Park on the Island's economy.

af) Analysis of the social, economic and environmental significance of the Teide cable car for the Island of Tenerife and the Archipelago.

Moreover, other research topics could also be addressed covering unknown or scarcely studied issues, and conducting projects on such issues would be useful for applications to management and public use:

a) Study on the eruptive events in the Park.

b) Dating geological material in the Park.

c) Detailed study and interpretation of Circo's eastern wall.

d) Summary of the different hypotheses to explain formation of the cauldron of Las Cañadas, pointing out the main elements and facts that support each of them.

e) Assessment of the Park's water contribution to the Island's aquifers.

f) Study of soils with special attention to genesis and water balance.

g) Assessment of primary productivity in the Park.

h) Study on the aerial ecosystem present at Teide's peak.

i) Assessment and ecological impact of Saharan dust storms.

j) Retrospective study on the impact of shepherding on the Park's vegetation.

k) Inventory of the caves and cavities of interest.

## 9. INTERVENTIONS REGARDING FOLLOW-UP

To develop the ecological monitoring programme, established as one of the objectives of this Plan, methodology for sample collection will be designed for the species and variables most sensitive to natural changes generation to generation, to global environmental disruptions or modifications introduced as a result of managerial practices and use of the area.

The monitoring system's prime aim will be to render more efficient and facilitate Park management. It will be designed to address specifically the way the environment is dealt with, to analysis and amend possible negative impacts that arise as a result of visitor pressure, and also to carry out surveillance and forecast environmental hazards. It will be supported especially by programmes focussing on prevention of volcanic eruptions.

In accordance with management objectives and guidelines outlined in the present Master Plan, monitoring should comprise at least the following:

a) Surveillance and volcanic eruption prediction measures. This activity is one of the most significant objectives for the Park and will be carried out in collaboration with the relevant official institutions which are already conducting research activities and surveillance of volcanic eruptions. These institutions will also contribute to educational and interpretational activities in the Park and will report to their respective Administration on any new findings or news in general.

b) Impact, colonisation and population levels of introduced species.

c) Degree of recovery of threatened species' populations and of restored areas.

d) Flow of visitors at the Park, according to different variables or classifications. Likewise, an analysis on the type of use and user satisfaction with the services offered to the public in the Park.

e) Impact of visitors on geological resources, fauna and flora, as well as archaeological and paleontological resources in the Park, especially in places where large concentrations of visitors occur (La Ruleta, areas in the vicinity of the cable car and other facilities, parking areas and visitor centres).

f) Impact of management activities.

Regardless of whether there is a specific programme centred on ecological monitoring, the various sectoral development plans will include an explicit paragraph with specific rules to be observed during monitoring and assessment.

## 10. INTERVENTIONS REGARDING INTERACTION WITH ITS SURROUNDINGS AND OUTREACH ACTIVITIES

Sustainable development principles express unequivocally the interaction between National Parks and nearby communities which have a secular connexion with the Parks on account of a number of relationships. So there is a need to consider them as a whole since these communities are taking centre stage calling for greater awareness of their needs in order to improve their standards of living.

Applying these principles requires collaboration programmes to be conceived where the Park is seen in relation to its socio-economic surroundings.

These programmes will be developed bearing in mind the following basic pillars:

a) Subsidies to be granted to communities in the Park's surroundings.

With a view to implementing provisions established in Art. 22.IV of Act 4/1989, following the wording established by Act 41/1997 of 5th November, a compensation scheme will be established as a countermeasure for the limitations imposed.

b) Sustainable development plans for the surrounding areas.

The Joint Management Committee will collaborate with the relevant public administrations in creating and later implementing sustainable development plans for the areas surrounding the Park.

Collaboration will be active, both from the technical and the financial point of view, using the National Park's financial instruments.

c) Information and support to the Park.

An essential issue in achieving greater efficacy in the Park's protection is to help the public and local inhabitants to fully grasp the Park's objectives, missions and the importance of its assets. Hence, the Park's Board of Administrators will endeavour to prepare and carry out informative, educational and outreach programmes targeting the local population. They will centre mainly on: a) activities carried out within the Park; b) conferences, seminars, exhibits and other such activities which take place close by; and c) setting up information points in appropriate communities.

d) Co-ordination with local administrations in managing the National Park.

Local administrations must necessarily take part in a wide range of aspects related with Park management; this appears evident since so many different competencies concur within the same territory. Consequently, co-ordination and co-operation between the administrations involved should rely on adequate practices to ensure full achievement of

the objectives enshrined in Act 5/1981 of 25th March, Act 4/1989 of 27th March and in organisation, image and administrative co-operation guidelines as established in the Master Plan of the Network of National Parks, as well as those outlined in this Master Plan for Use and Management.

## 11. EXPLOITATION AND TRADITIONAL USES

### 11.1. TRADITIONAL USES.

Within the scope of this plan, traditional forms of use are understood as those carried out historically profiting from the National Park's natural resources. They comprise practices or activities displayed by local communities aimed at securing material goods and which have been kept alive historically over time. Management of these practices is inspired by ensuring compatibility with protection of the Park's assets, with public use and, in all cases, should pursue sustainable use of the affected resources.

During the period in which this Plan remains valid, only the following forms of traditional use are acknowledged, and no others are authorised:

#### 11.1.1. Use of water sources

The current scheme governing use of water sources, legally established within the Park, will remain in place, with no variation of the water volumes authorised by the relevant institutions in Public Administration. No augmentations are allowed, neither in terms of the number of water captures nor water volumes established, so no new buildings will be allowed and construction permits will not be granted.

Waters that exceed the awarded volumes must run freely on the ground surface, and cannot be subject to manipulation or subsequent use for any other purpose.

The only captures currently recognised in the National Park and which are hereby authorised are as follows: a) Guajara, b) La Grieta, c) gallery Virgen de la Candelaria I, d) gallery Virgen de la Candelaria II and e) gallery Virgen de la Candelaria III. Additionally, also included are the spring galleries located in the Barranco de Erís de Carnero and surrounding area: a) El Filo or Madre del Agua, b) stream Risco de La Sabina, c) Risco de La Sabina I and Risco de la Sabina II, d) Ucanca I or El Pino, e) Ucanca IV or Sol de Los Muertos and f) Corralito.

In addition, within the boundaries of the National Park are also included the streams Tauce or Manantial Madre Vieja and Manantial Madre del Agua II, located in the Barranco de Erques. Also included are the El Cedro streams, situated at 2,150 m. in the Montaña del Cedro and that of Montaña de Las Vacas, on the side of the mountain bearing the same name.

The remainder of existing water captures or galleries in the National Park are considered as illegal, and therefore water piping or channelling is not allowed, and water must flow freely on the ground.

In accordance with provisions of Act 5/1981, administrative authorisations for extension of current water use licences or for new ones which are carried out outside the Park, but

even so may affect the Park's surface or underground hydrogeological resources, must be accompanied by a favourable report from the National Park's Trust which may request additional technical-scientific or independent advice.

11.1.2. Traditional use of wild rabbit.

Wild rabbit (Oryctolagus cuniculus) was introduced during the Archipelago's colonisation process. The species has adapted spectacularly well to the environment and is not being controlled by natural predators, so it has gradually settled all over the island. Traditionally, wild rabbit was captured with dogs and ferrets, to the point that this practice became part of Canary Islands' cultural heritage and very much remains so.

So to avoid inadmissible damage to flora, this practice is approved as a tool to help control wild rabbit populations, although it will not be categorised as a sporting activity.

Given the volcanic nature of terrain, the abundance of outflows, the virtual absence of dens or burrows and the scarce or nil secondary damage that this practice inflicts on other ecosystem components, the ferret is almost essential to guarantee some degree of effectiveness, so in agreement with the provisions in Act 4/1989 on Conservation of Natural Spaces and wild flora and fauna, using ferrets in the Teide National Park is admitted.

This traditional practice will be carried out in abidance of the "Rules for controlling wild rabbit" which the Park's Board of Administrators will establish for each hunting season, in agreement with the criteria that arise from the Sectoral Plan for management of introduced herbivores, to be drafted by the Joint Management Committee and approved by the Park's Trust within twelve months from entry into force of this Master Plan.

As far as wild rabbit is concerned, the said Plan will bear in mind at least the following:

a) The only species subject to this practice will be wild rabbit and the aim of the Plan will be efficient control of its populations.

b) The Plan will indicate those periods of the year during which this exercise can be carried out; that period may or may not coincide with the hunting season for wild rabbit in the remainder of the island. Other complementary killing methods may also be authorised if this traditional practice proved to be ineffective. The Plan will also set the number of members of the hunting team, of dogs and ferrets and number of specimens authorised for killing.

c) It will establish a register and individual identification for the proprietors of dogs and ferrets to be used.

d) If necessary, it will divide the Park into different areas for the exercise, giving precise detail as to the how each will be controlled, also establishing "security zones". It will establish the infrastructure to be used, giving indications on conditions for use of the available infrastructures, such as dirt tracks and parking areas, amongst others.

e) It will devise a control system for entry and departure of participants, specifying the type of permit and requirements for concession. Also to be established is the type of information to be supplied by participants at the end of the working day.

f) The entire content of the Plan must be compatible with general rules for use of the Park, and maximum co-operation will be expected from participants in abiding by those rules. Permits may be withdrawn, or permit requests rejected for future seasons, from those who fail to comply with the rules.

g) A system for monitoring and appraisal in order to determine the degree of effectiveness and participants' knowledge on the Park's conservation norms may be implemented on an experimental level.

h) Training grounds for dogs are considered to be incompatible with the National Park's objectives and hence their installation will not be authorised within the boundaries of the Park.

11.1.3. Apiculture.

This activity has secularly been associated to large extensions of vegetation which flower in summer, generally mountain-top bushes and shrubs - especially broom - and which has been kept alive over time. Honey produced in the Park has a reputation for its excellent quality; it is much appreciated in the Island. Moreover, bee activity is highly beneficial for vegetation.

In the light of the above, apiculture is seen as a traditional form of use and as such is authorised in the National Park.

This form of use will be developed with observance to the "Rules on Apiculture practices" to be established by the Park's Board of Administrators, and on the basis of criteria outlined in the Plan for Apiculture Use, to be drafted by the Joint Management Committee, for approval by the Trust, within twelve months from the date of entry into force of this Master Plan. The said norms – which will bear in mind the views of participants and associations - will regulate the following: a) the system for granting authorisations; b) annual periods for exercising this practice; c) time-tables for handling beehives; d) beehive settlements; e) number of beehives per settlement and apiarists; f) feeder systems; g) signalling of settlement areas; h) requirements to be meet in terms of sanitary issues (guarantees in all cases that beehives are free from disease); i) maximum number of frames; j) inclusion or exclusion of nuclei; k) identification of beehives and any other matters that are deemed appropriate, such as access regime, conditions to be fulfilled by beekeepers in order to be eligible.

During the period of validity of this Master Plan, a study will be conducted to determine the characteristics, types and properties of the honey produced in the Park, to ultimately establish a quality control system. Moreover, on an experimental basis, a system of assessment will be implemented in order to determine beekeepers' level of knowledge on the Park's conservation rules.

11.1.4. Extraction of coloured earth and flower collecting.

Traditionally, during the Corpus Christi celebrations, earth in different colours and flowers from different species have been taken from the National Park to produce artistic carpets laid on the grounds of the square of Villa de La Orotava Town Council and along the town's streets, and this is one of the most emblematic cultural expressions of the Villa.

Given that the objective of this activity is to produce the said carpets, and given its traditional character, as an expression of popular culture, and since there is no commercial activity involved, it is seen as a traditional form of use, so extraction or collecting is allowed in traditional quantities. Authorisation must be sought from the Park's Board of Administrators, which will indicate venues for extraction or collection, quantities and conditions for use, as well as control and supervision systems.

Nevertheless, to the extent possible, in order to preserve natural resources at their highest level, endeavours will be made to find appropriate soil on the outskirts of the Park and along road sides, to capitalise on natural events of ground loosening.

Extraction of earth and flower collecting of vegetation in Reserve Areas and Restricted Use Areas is strictly forbidden.

11.1.5. Other forms of use.

a) Mining. Art. 8.2 Act 5/1981 of 25th March, on Re-classification of the Teide National Park, forbids any type of search or exploitation of mineral substances.

b) Plant species. Likewise, Art. 8.2 of the said Act 5/1981 expressly prohibits taking cuttings or digging up plant species that were not introduced by humans.

c) Fire wood and dry broom leaves and branches. This practice has been abandoned over recent decades. On the other hand, given the tendency of environment conservation policy in the international arena in general and especially within the European Union, which recommend maintaining biodiversity and natural systems in their integrity, this type of use will not be authorised.

Nevertheless, given the limited use recorded in the area Llano de la Rosa-Montaña del Limón, use of fire wood and dry leaves and branches will be authorised in this area to those who had traditionally relied on it. The Park's Board of Administrators will establish a Plan of Uses to organise sustainable extraction of fire wood and dry leaves and branches. Under no circumstances can the geographical area referred to above for current use be enlarged, nor can the quantities extracted over the last few years, expressed in units of one hundred pounds, be increased.

d) Cattle rearing. As in the case of use of fire wood and dry leaves and branches and given the significant impact on the Park's botanical resources, cattle grazing or raising will not be authorised under any circumstances.

e) Gathering of pine needle. This is strictly forbidden in the grounds of the Teide National Park.

11.2. TRADITIONAL USES.

11.2.1. Astronomical Observation.

Considering the special conditions offered by the Park's sky and bearing in mind that it is one of its resources, this use is admissible provided it does not require assembly of installations or ground preparation that may involve erecting buildings or earth movement. At any event, observations will have to be carried out in accordance with conditions for use in each of the zones or areas included in this Plan, as well as with management guidelines and protection rules.

11.2.2. Heliotherapy.

The National Park has been used since time immemorial as an appropriate venue for heliotherapy practices given the extraordinary curative properties attributed to sun bathing inside the Park. Although originally it constituted a popular, traditional practice restricted to cases of necessity, the Island's development as a tourist venue and the increasing rise in dispersion of visitors call for proper regulation of this activity, to make it compatible with avoiding undesirable harm to the environment.

In general, heliotherapy can only be exercised in the area known as Cañada del Capricho.

11.3. OTHER USES.

Military exercises. Given their unquestionable impact on the Park's resources, they are strictly forbidden within the Park's boundaries.

## 12. INFRASTRUCTURE AND INSTALLATIONS

Art. 3.2 of Act 5/1981, dated 25th March, on Re-classification of the Teide National Park states that the use of existing installations will be regulated by the Master Plan on Use and Management.

12.1. ROADS.

Roads crossing the National Park – TF-21, TF-24 and TF-38 – will remain unchanged, in terms of their current use, lay-out and dimensions. Their use will be subject to the Park's conservation criteria and to the aim of adapting the number of visitors to burden capacity, as outlined in the current Master Plan.

Given current road safety problems, a draft project will be produced whose scope will include at least the following three aims: a) stabilisation of the most dangerous banks along both roads; b) general improvement of road safety along the entire asphalted road; and c) programme for road conservation, with indications of places where to dispose of material from rock falls. The said draft project, which should be prepared in a period of twelve months as from the entry into force of the current Plan - with participation of the relevant Administration for road matters - will devote special attention to suppressing negative impacts on landscape, so a priori it should not dismiss any technical solutions provided they are environmentally sound. Different solutions and their environmental impact will be analysed for each case. In the light of the draft project, the Joint

Management Committee, after hearing the views of the Trust, will select the approach to be implemented.

In any case, within the Park it is strictly forbidden to withdraw material on loan, or to dispose of bulky waste arising from road maintenance work, unless a disposal site were established – on the grounds of restoration of the natural environment – in which case the Park's Board of Administrators would set its dimensions and maximum length of time during which the site can be used.

12.1. DIRT TRACKS AND WALKING PATHS.

Dirt tracks are defined as side roads which allow transit of motor vehicles, but do not require large-scale infrastructure works.

Walking paths, pathways and lanes are defined as tracks close to the ground, with no major engineering work, that do not allow circulation of automotive vehicles so they can only be accessed on foot by persons, and by small mechanical artefacts.

Unhindered traffic is allowed along the Arico El Viejo track and the branch track to Fasnia; along the track Corral del Niño-Montaña del Limón and along the Montaña del Alto or de Guamasa track. However, if circumstances so require, following a prior report from the Trust, the Director-Curator may propose to the Joint Management Committee the adoption of additional control measures for their use.

Remaining tracks will be closed to public vehicle traffic and will be used for management of the Park or for the uses foreseen in the Plan, or in well justified cases. At any event, authorisation will be required from the Park's Board of Administrators. Guided motorised routes may only be carried out along the dirt tracks in Siete Cañadas, El Filo and Montaña del Limón, in accordance with specifications to be developed by the sectoral plan on public use.

Those dirt tracks and track branches that cannot be used for managerial means or authorised uses will be eliminated and the ground will be restored to its natural form. The Carnicería track will be eliminated, except for the side track for access to Casa de Fasnia from the Arico el Viejo and Llano de Maja tracks, the last segment of the Montaña Blanca track, from where the Altavista walking path starts up to the top of Montaña Blanca and the track joining El Portillo to the Cañada de Los Guancheros.

Access to La Ruleta, the cable car and the Cañada Blanca Visitors Centre car park will be regulated separately in the Master Plan on Access.

The main network of pathways in the park - to be established – will devote special attention to regulating use, conservation and maintenance.

12.3. CAR PARKS AND LOOK-OUT POINTS.

Notwithstanding provisions to be outlined in the Master Plan for Access and the Plan for Public Use foreseen in this Master Plan, the following installations will be maintained and, in some cases, adapted:

Minas de San José, located along road TF-21, at km 38.5.

Tabonal Negro view point, located along TF-21, at km 41.2.

La Ruleta, located along TF-21, at km 46.5.

Ucanca view point, located along TF-21, at km 48.1, in the Llano de Ucanca.

Boca de Tauce, located along TF-21, at km 53.

Chío view point, along TF-38, at km 3.3.

Zapatito de la Reina view point. Given massive demand by visitors to stop here, a car park will be set up close to Zapatito de la Reina.

Curva de La Pedrera, located at km 31 along TF-21, will be adapted as a stopping point for observation.

La Tarta or El Pastel, located along TF-24, at km 32, will be adapted so that it can be used as a stopping point for observation.

Other car parks adjacent to the Park's roads may be set up, provided in all cases it is clearly indispensable, with limited criteria as to number and size, and provided the Trust reports favourably a priori on the proposal.

12.4. BUILDINGS.

To the effects outlined herein, the following buildings are considered to be excluded from planning:

12.4.1. Parador de Las Cañadas del Teide, situated close to km 46.5 of road TF-21. It cannot be used for anything else than Parador (hotel) and/or Visitor Centre of the National Park.

12.4.2. Ermita de las Nieves, will continue to be a place for prayer. Paradores Nacionales, the company owning the church, will be responsible for its maintenance. The Park will take care of cleaning and restoration services of its grounds.

12.4.3. Altavista Hut. Situated at 3,250 m altitude, it will be kept as a mountain shelter, as at present. During the period of validity of the current plan, in agreement with its provisions and following a favourable report from the Trust, the Cabildo Isular de Tenerife (Island's Local Council), in its capacity as owner of the installation, will carry out the necessary refurbishment, cleaning and restoration works also in the shelter's grounds, guaranteeing improvement in services and landscape integration.

In collaboration with the Island's Local Council, the Park's Board of Administrators will include it in is public use system, promoting improvements in terms of safety conditions and protection of and information to users.

12.4.4. Public Works Ministry's Cabin and mountaineer's shelter. Located close to Llano de Ucanca, at km 47.5 of road TF-21, its use is two-fold: as a small storage room for tools and as a mountaineers' shelter. Given the landscape and ecology impact of the building, in the Riachuelo area, the building will cease to be operated in both cases. Demolition of the building and restoration of the area is foreseen. However, its use as a shelter may continue with relocation to the facilities available in El Portillo, at Park installations which could be adapted to this aim. Use may be granted to the Canary Islands Mountaineering Federation, and other sports institutions that may wish to collaborate, as they have also made use of this facility in the past.

Interventions foreseen in relation to the Public Works Ministry Cabin and mountaineer's shelter are as follows:

a) Ex officio re-possession of the Cabin, on the part of the Canary Islands Government, in virtue of Art. 75.1 of Act 8/1987 of 28th April, on Heritage and Assets of the Canary Islands Regional Community. The formal procedures to exercise this discretionary power will be initiated, either ex officio or by request of either party and should guarantee a hearing to discuss interests on the property.

b) Release, in accordance with Arts. 16.1 and 16.2 of Act 8/1987.

c) Demolition and restoration of the area.

12.4.5. Montaña Blanca hut. A small installation located in Montaña Blanca, it will be kept for its current use, although it will be refurbished and improved. It will also be treated pursuing greater landscape integration.

12.4.6. Casas del Sanatorio. A group of buildings in the area known as El Sanatorio, built in stone with zinc roofs, some with masonry and enclosures. Current existence and use is incompatible with the aims of the Park.

The said use will be suppressed definitively and the entire group of buildings will be demolished, restoring the grounds to their former situation. To do so, the Park's Board of Administrators will either purchase or expropriate and will proceed with urgent demolition.

12.4.7. Public use cabins (Choza J. Ruiz-José el de Izaña, Choza Degollada del Cedro and Choza Montaña del Alto or de Guamasa). Located in close proximity to Montaña del Limón, the Degollada del Cedro and Montaña del Alto or de Guamasa, they consist of three wooden cabins, built in the 1970's for public use. Given their current state of conservation, given the time elapsed since construction and since they are now essentially a focal point for disposal of waste and rubbish, the said cabins will be eliminated and the environment will be returned to its former natural state.

12.4.8. Santa Rita cabin, located at the bottom of Montaña del Limón, it is being used for activities that are incompatible with the aims of a natural protected area, so it will be destroyed, and the area will be returned to its former natural state.

12.4.9. Montaña del Limón hut. Situated on a side track to the dirt tract towards Montaña del Limón, this is a stone building with tiled roof. It is used for activities that are deemed

incompatible with a protected natural area, so it will be demolished and the area returned to its former natural state.

12.4.10. Environment hut or Choza Risco del Capitán. Located at km 41 of road TF-24, this is a stone hut with a tilted, tiled roof. It was presumably used in relation to apiculture activities, but has more recently tended to uses that are incompatible with a natural protected are, so it will be eliminated and the area restored to its former natural state.

12.5. INDUSTRIAL FACILITIES.

Cable car and adjacent facilities.

The Cable car, located on the south face of the Teide volcano, comprises the following installations: car park at the end of the access road, engine room, main building, terminal building, cable towers, canteen and La Rambleta buildings.

The cable car buildings and facilities, together with the visitor flow that it generates, interfere negatively with conservation of certain natural resources and the landscape assets of the National Park, so from that point of view, its demolition would be highly convenient.

During the period in which this Master Plan remains in force, a study will be carried out on the financial and social impact of the facilities on the Island, with a view to promoting a decision on the part of the relevant authorities on whether it should remain in future or whether results of the study may compromise its continuity.

While the said study is completed and a decision is made, the impact and use of the existing facilities will be reduced. So buildings whose finality is dubious or un-determined will be eliminated, and the surrounding landscape will be restored, thus eradicating negative impacts which arise as a result of the existence of the facilities in question.

Given the notoriously bad aesthetic features and partial uselessness of the buildings located in La Rambleta, and given the disgraceful image that they offer to National Park visitors, following the Council of Europe's recommendations, complete landscape restoration work on the area will be carried out, on the basis of a project that should include the following: a) demolition of the buildings currently not in use; b) demolition of the building for over-night stays of cable car guards – formerly used as a bar – and replacement with a fully landscape-integrated building with a usable surface area not exceeding fifty square metres, which will be used by the guards for over-night stays, for storing warm clothing and other necessary material for emergencies; and c) total restoration of the area and adequate organisation of the existing pathways in the area. Under no circumstances can facilities be set up in La Rambleta for commercial activities, so this is strictly forbidden.

Given La Rambleta's limited visitor burden capacity, visitor flows here will be regulated, as well as in the Teide crater. A maximum number of visitors at any one time will be established for the hut, as a way to control access to the Peak of Teide, which is also essential.

The other facilities associated to the cable car service will be kept in terms of their current dimension, so extensions either in surface area or storey height are not allowed. Current uses are the only ones permitted, and they cannot be extended: a) main building (cable car machinery, bar-restaurant, sale of souvenirs, staff housing facilities, and emergency health care unit); b) engine room (electrical power stations, garage for vehicles and gas-oil depot); c) terminal building (for receiving cable car cabins and passengers); d) towers and support systems for aerial cables.

Noise impact of the engine room must be minimised, by established sound-proofing systems. Under no circumstances should noise surpass 70 decibels measured at a distance of 10 metres from the building.

Moreover, protection and security conditions of users visiting the facilities will be improved significantly.

12.6. HYDRAULIC FACILITIES.

12.6.1. Canal del Riachuelo and water galleries.

Located on the eastern wall of the Las Cañadas cauldron they are under private ownership. They will be purchased or expropriated and subsequently closed, restoring the areas affected by the gallery entrances.

Waters flowing naturally on the ground surface of the Riachuelo ravine must flow freely along their natural waterways, and can not be used in any way.

The above mentioned galleries are enumerated blow:

a) Gallery Virgen de la Candelaria I, also known as El Sauce. It will be restored, with disposal of accumulated bulky waste and rubbish. A metallic gate with lock will be installed to prevent access to the inside.

b) Gallery Virgen de la Candelaria II, is situated in the vicinity of the Public Works Ministry cabin and shelter house for mountaineers. It will be restored, bulky waste and rubbish will be disposed of, and here too a metallic gate with lock will be installed to prevent access to the inside.

c) Gallery Virgen de la Candelaria III, is situated at the Riachuelo spring. A metallic gate with lock will be installed to prevent access to its interior.

12.6.2. Galleries in Barranco Erís de Carnero and neighbouring areas.

These galleries are located along the right margin of the Ucanca Valley, within the municipality of Granadilla de Abona, so ownership is public and water is used for public supply. These galleries encompass the following: a) El Filo, or Madre del Agua; b) Manantial Risco de la Sabina; Risco de la Sabina I and Risco de la Sabina II; d) Ucanca I or El Pino; e) Ucanca IV or Sol de los Muertos; and f) Corralito.

Traditional uses will be maintained and the areas affected by the water galleries will be restored, with disposal of bulky waste and rubbish, elimination of hydraulic infrastructure

out of service or whose use is un-determined. To prevent access into the galleries, a metallic gate will be installed, with a lock.

12.6.3. Brooks

Considered as natural emergences in the ground, with natural channelling of water that arises spontaneously.

Tauce brook or Manatial Madre Vieja and Manantial Madre del Agua II are situated along the left margin of the Erques ravine, located within the Monte del Estado Iserse y Graneritos, under ownership of the Organismo Autónomo Parques Nacionales. Water from these brooks will be allowed to flow freely, as at present, along the natural waterway in the Erques ravine, to be managed downstream after the Manantial Madre del Agua.

Remaining brooks will be kept in their current state.

12.6.4. Underground water tanks and water pipes

a) Water pipes from Guajara to the two water tanks in Cañada Blanca and from there to the Parador at Las Cañadas del Teide. Current use will continue although work is required to pursue improved environmental integration, by eliminating visual impacts that arise on account of the water pipes and tanks.

b) The Park's water tank and water pipes to the Cañada Blanca, are located in grounds close to the Parador. Current conditions of use will be maintained, although it will be subject to landscape treatment.

c) Water pipes from Guajara to the cable car base. Current use will be kept, until such a time that a decision is taken on continuity of the cable car and its adjacent buildings. It will however be subject to landscape treatment to achieve better environmental integration.

d) Sanatorio water tanks. They will continue to be used as water supply points for fire extinguishing and management activities. However, they will be subject to landscape treatment for better environmental integration.

e) Water pipes from La Cañada de La Grieta to El Portillo and connexion with water pipes from Guajara to the Sanatorio water tanks. Water pipes are approximately nine kilometres long. Their current use will continue, although they will be subject to landscape treatment for better environmental integration.

f) Water pipe from Cueva del Hielo to the Altavista hut water tank. This water pipe together with the steps leading down to the inside of the cave will be eliminated, since they generate tremendous impacts on the Park's natural, cultural and landscape resources.

g) Water tanks and water pipe at Casa de Fasnia. The water tanks will be kept and the existing pipe will be replaced with a new one, to ensure water supply to the Casa de Fasnia.

h) Pipe along Barranco Eris del Carnero and associated infrastructure. The pipe running from gallery El Filo or Madre del Agua connecting with the tank gauger will be kept, and it

will be the main pipe for water coming from different galleries in Barranco de Eris del Carnero and neighbouring areas. Given the landscape impact of the tank gauger it will be replaced with a counter with register.

The remainder of hydraulic infrastructure whose functionality is un-determined will be eliminated in order to improve landscape integration of the affected areas. Only infrastructure that is deemed to be essential for water use will be kept

12.7. FACILITIES TO PROVIDE BASIC SERVICES.

12.7.1. Montaña Blanca cabin. This National Park facility is situated in Montaña Blanca and is currently being used for research on volcanic activity. Its current use will remain although the facility will be subject to landscape treatment for better environmental integration

12.7.2. Telephone tower booster at Montaña Rajada. This facility belongs to the Spanish telephone company Telefonica and is located in Montaña Rajada. During the period of validity of this Master Plan endeavours will be made to replace the current communications system, so that the structures currently in place can be eliminated – totally or partially – in favour of more advanced technological solutions, with minimal visual impact, that will provide significant enhancement to the service. At any event, the facilities that are deemed as essential for continuation of the service will remain, although subject to landscape treatment for better environmental integration.

12.7.3. Booster stations.

All the booster facilities in the network of island and regional communications which are located within the National Park must adapt to the provisions of this Master Plan, and must pursue the highest possible degree of landscape integration.

Rules may be established to regulate the installation of re-emitting antenna stations in the Park. At any event, there should be a tendency towards light-weight and streamlined installations, combining as favourably as possible for the Park, technological progress with reduction of impacts.

12.7.4. Meteorological stations.

They are considered as scientific instrumentation and should be installed in conformity with provisions established in the relevant research projects to be conducted.

12.8. OTHER FACILITIES.

12.8.1. Platforms associated to the Caseta del Kaiser. These are concrete bases situated in the Cañada de la Grieta. The existing concrete platforms will be eliminated. An interpretational element may be installed in the grounds in allusion to this historical resource.

12.8.2. Ermita de la Cruz de Fregel. Located at the northern edge of the National Park, in an area known as Degollada del Cedro, it is home to the festivities of the Fregel Cross (Cruz de Fregel), which have originated in recent times, generating significant impacts on

the Park's botanical, fauna and landscape resources. Consequently, during these festivities, the only permitted events will be those that are strictly religious in nature, and they will require a priori authorisation from the Park's Board of Administrators which will set the necessary requirements to ensure conservation of resources.

12.8.3. Electricity and telephone cables.

All the electricity and telephone cables that exist in the Park are buried underground. Authorisation will not be granted for aerial installations either for the current facilities or for others that may be proposed in the future.

a) Cables between the Parador in Las Cañadas del Teide and Ermita de las Nieves. Current use will continue.

b) Cables running from the engine room and the cable car's main building. Current use will continue.

c) Cables running from the cable car's engine room and the telephone booster tower in Montaña Rajada. Current use will continue.

d) Underground telephone cables from the Caseria de Las Cañadas del Teide to the Astrophysical Observatory in Izaña, whose lay-out, for the most part, coincides with public property areas along roads TF-21 and TF-24, thanks to which telephone services are provided to El Portillo Alto and Bajo. Current use will continue.

12.8.4. Commemoration monuments. The Park's Board of Directors will standardise the type and features of commemoration monuments erected within the Park. Upon agreement with relatives that look after the monuments, endeavours will be made to replace the bulkiest or most outstanding ones with more discreet monuments. Authorisation for new monuments will not be granted.

12.8.5. Hydrologic data acquisition stations. Surveys S-1 and S-2, promoted by the Island's Local Council (Cabildo) will be kept given their importance in monitoring and control of the island's hydrological system, general geological research and detection of volcanic hazards. They are located in the vicinity of Montaña Majúa and El Portillo Alto respectively.

12.8.6. Gavion dykes. Structures formed by loose stone walls, where wiring is used to confer greater consistency to the walls which serve the purpose of adjusting waterways. They will be demolished and the grounds will be restored, provided this intervention does not affect nearby roads or dirt tracks.

12.8.7. Traffic counters. They are located at the Park's access points on roads TF-21, TF-24 and TF-38, and are used for counting vehicles. Four of the counters are owned by the Organismo Autónomo de Parques Nacionales, and one belongs to the Island Local Council's Road Service department. Current use will continue.

12.9. PARK INSTALLATIONS.

12.9.1. Installations inside the Park.

A) Management and Administrations facilities.

a) El Portillo office. There is an office located in El Portillo Alto. It will continue in its role of providing information to the public and for administrative management, as well as accommodation of the office's staff when necessary.

b) Fire fighting facility and first aid room. The installation is located in El Portillo Alto. It will continue to house accommodation areas, and storage for vehicles, equipment and other means necessary for fire fighting activities. There is also a first aid unit which is currently being manned by Red Cross staff, through an agreement. It may also include the offices of SEPRONA (Nature Protection Service) at the Teide National Park.

c) Garage in El Portillo Bajo. They are located in the vicinity of the Visitors Centre and will continue to be used as garages for the National Park's own vehicle fleet.

d) Cañada del Capricho control hut. Situated in the Cañada del Capricho, it will continue to be used for management of the Park and its staff.

e) Casa de Fasnia. Located on the grounds of Monte del Estado "Cumbres de Fasnia" which are part of the National Park. It will be refurbished during the period of validity of this Master Plan, as a facility supporting Park management.

B) For public use of the Park.

a) El Portillo visitors centre, botanical garden and adjacent facilities. Located in El Portillo Bajo, they will continue to serve the same purpose. The botanical garden will be equipped with a laboratory; its grounds will be fenced and remodelled. Some of its pathways will be adapted for access by the disabled. A gas oil depot will be set up with an engines room located far from the areas visited by the public.

b) Cañada Blanca visitors centre. This facility is adjacent to the Parador de Las Cañadas del Teide. It will continue to serve its purpose as an information and interpretation centre for the National Park's resources. With the aim of broadening its visitor capacity, the visitor centre will be extended, including a new audiovisuals room, while the adjacent car park, owned by National Paradores, will be released for re-possession by the Organismo Autónomo de Parques Nacionales.

c) Casa de Juan Evora. Located in Boca de Tauce, this rural house was inhabited until the early 1990s, as the last local home associated to shepherding in the Park. The building will be used to set up a site museum in which to display the way of life and the various ethnographical and cultural manifestations typical of the peaks of Tenerife. Its surrounding area will be adapted appropriately and its landscape will be restored.

d) El Portillo mountain hut. Some of the installations of the National Park in El Portillo could be adapted to turn them into mountaineer shelters. Use of the installation could be granted to the Canary Islands' Mountaineering Federation which can invite other sporting bodies to collaborate in its running, as has been the case up to date with the hut located in close proximity to the Llano de Ucanca.

e) Information hut in Boca del Tauce. Located in Boca del Tauce, it will continue to serve as an information point on the National Park and its surrounding area, until such a time that the site museum in la Casa de Juan Evora opens to the public. Only then will the hut be dismantled and the grounds restored.

f) Cañada Blanca Picnic Area. During the period of validity of the present Master Plan, a picnic area in Cañada Blanca will be set up, with elementary facilities. Under no circumstances will installations be set up for lighting fires, such as barbeques etc.

h) Montaña del Alto or de Guamasa picnic area. During the period of validity of the present Master Plan, a picnic area in Cañada Blanca will be set up, with elementary facilities. Under no circumstances will installations be set up for lighting fires, such as barbeques etc.

i) Hygienic services at Cañada Blanca. Located in the vicinity of La Ruleta it is currently in disuse so it will be demolished and the grounds restored.

12.9.2. Installations outside the Park.

A) For Park management and administration.

a) La Orotava Administration Centre. The headquarters of the Parque Nacional del Teide will be built in the old town of La Orotava; as well as offices, it will have a number of meetings rooms for the Joint Management Committee and the Trust, a library, storage areas and garages.

b) Los Realejos Forestry Centre and adjacent facilities. Located in Monte Cumbre, El Realejo Bajo, it operates as a surveillance centre for monitoring of Mount Cumbre, housing fencing material, storage devices and the necessary equipment for herbivore control. Its current usage will continue unaltered.

B) For the Park's public use

a) La Orotava Interpretation Centre. To be set up in the Headquarters in the old town of La Orotava, it will serve as an information bureau and service provider to the public. It will also have an exhibit hall. An area especially devoted to interpretation of other spaces related with the Parque or the Orotava Valley may also be included provided there is prior agreement with the relevant authorities.

b) Emilio Fernández Muñoz Centre for Nature Activities. Located close to the Parque in Mount Cumbre, El Realejo Bajo, it is to play a pivotal role in the accomplishment of the Park's objectives in terms of environmental interpretation and education. Its current usage will be continued.

Notwithstanding the above provisions in this section, should an agreement be reached with the Island's Local Council, for the creation of the Services Complex for the Central Massif, part or all of the infrastructures situated in El Portillo could be demolished or destined to other uses, and these Park services would be handed over to the facilities of the said Complex.

## 13. ADMINISTRATIVE SET-UP

In order to achieve greater efficiency in the utilization of the available means and resources, and in agreement with the general organizational scheme of the National Parks in the Network, the Park's Board of Administrators will be divided into the following four divisions:

13.1. Research, Planning and Resources Division. Its main mission is to prepare the plans and draft the documents which explain how the Park is managed, as well as conducting research programmes and projects on conservation of the Park's natural and cultural resources.

There are three clearly differentiated functional sections: a) Research, planning and projects; b) management of resources; and c) surveillance and application of legislation or regulations.

13.2. Public Use Division. It is responsible for organising and co-ordinating all matters related to management of public use.

There are three clearly differentiated functional sections: a) scheduling of activities; b) proposals and projects; and c) information and outreach.

13.3. Projects and Maintenance Division. Its mission is two-fold in so far that, on the one side, it is responsible for logistic execution of construction projects and works outlined in the Plans, and on the other it takes care of keeping facilities and equipment operational.

There are two clearly differentiated functional sections: a) projects and construction work; and b) maintenance.

13.4. Administration Division. Naturally, it is responsible for administration of the Park, with essentially horizontal functions. It organises and manages human, material and financial resources on the basis of the objectives established.

There are four clearly differentiated functional sections: a) records and personnel; b) permits and infringements; c) archive and documentation; and d) assistance to the Trust.

All together, these units will be co-ordinated and directed by the Director - conservador who - in accordance with provisions in Art. 23 ter of Act 4/1989, in the wording established by Act 41/1997 of 5th November - is responsible for administration and co-ordination of Teide National Park's activities.

For fulfilment of these objectives and tasks, the National Parks Network will allocate technical, nursery, public use, administrative and support staff, as well as sufficient financial resources.

## 14. INTERPRETATION OF THE PLAN

The management objectives and guidelines for the Teide National Park, as well as the entire content of the current Master Plan, will be key in interpreting of all its provisions.

Should contradictions arise between the Plan's regulations or between the different regulations that develop the Plan, in case of doubt or any degree of imprecision, the interpretation to be adopted as valid is that which affords a greater degree of protection.

## 15. LEGAL EFFECT AND DURATION

In accordance with provisions in Act 4/1989, amended by Act 41/1997 of 5th November, the current Master Plan on Use and Management will remain valid for six years, starting on the day it enters into force. The review process should be commenced sufficiently in advance so that when the validity period expires, the new text is ready for approval. Public participation will be encouraged in this process from the outset.

Nevertheless, the review process - partial or total - can be initiated before then, if circumstances that are not foreseen today but may arise in the future, recommend that course of action. In this case, the process will be identical to that established in the drafting of the present Plan.

The validity period of Sectoral Plans will be determined by that of the Master Plan.

## 16. FINANCIAL ESTIMATE FOR RELEVANT INVESTMENTS

During the validity period of the current Master Plan and in order to take forward the interventions outlined herein, the following investments are deemed to be required, distributed over six yearly instalments:

## A N N E X

Description of the boundaries of the various coverage zones:

Reserve Areas.

Their boundaries are defined as a function of sectors, in the following manner:

Sector I.A: La Fortaleza.

North: dividing line along mountain ranges La Fortaleza and El Cabezón.
East: El Cabezón along the dividing line and mountain range up until the mount foot alongside the pathway that runs from the Emilio Fernández Muñoz Centre for Nature Activities to the fire watch tower in San Juan de la Rambla.
South: Along the base of mount El Cabezón from the pathway until the dirt track starting in La Cañada de Los Guancheros, following a straight line until Montaña Negra.
West: Montaña Negra, following a straight line until the western border of La Fortaleza.

Sector I.B: Llano de Maja – Pared del Filo.

North: Arenas Negras pathway from its starting point at the Siete Cañadas dirt track, to La Degollada, between Montaña de Arenas Negras and Montaña El Cerrillar, and from there following a straight line towards Montaña el Cerrillar, and again a straight line until the vortex of Montaña de Enmedio.

East: from the vortex of Montaña de Enmedio until the vortex of Montaña de Abreu, and from there to Montaña de Las Piedras, passing through the Degollada de Abreu.
South: from Montaña de Las Piedras following the southern border of the Park along the Filo de Las Cañadas dividing line, until the Degollada de Guajara.
West: from Degollada de Guajara along the pathway to Hoya del Montón de Trigo, until the Siete Cañadas dirt track, and along that track towards El Portillo connecting with the Arenas Negras pathway.

Sector I.C: El Riachuelo

Road TF-21 from km 48.15 to km 47.85, from here following a maximum slope line until the mountain dividing line, and from there heading to Guajara until the maximum slope line - which starts at km 48.15 of road TF-21 - is intersected and then downwards from that maximum slope line towards TF-21.

Sector I.D: Chavao

Mountain range from Roques de Gangarro passing by Casa de Juan Evora until Los Corrales, and from there along the Cañada de Chavao pathway, along the mountain foot until the southern edge of Roques de Gangarro by Casa de Juan Evora.

Sector I.E: Montaña del Cedro

Roque del Cedro mountain foot at its northern border, by the outflow and from here until the Chavao dirt track; along that track until Los Corrales and from there along the mountain range to the Roque del Cedro.

Sector I.F: Pico Viejo

Defined by the watershed around the Pico Viejo crater perimeter, including the lava plain formed on its southern edge.

Sector I.G: Teide Crater

Defined by the watershed of Teide peak's, crater perimeter.

Sector I.H: Volcán Histórico de Fasnia.

Formed by the historical volcano in Fasnia, with its three morphological units - eastern, western and central - and associated pyroclastic material and lavas.

The pathways where transit is authorised - bearing in mind the limitations outlined in this Plan – are as follows:

Sector I.A:

El Portillo pathway, to the fire watch tower in San Juan de la Rambla.
Degollada del Cedro pathway.

Sector I.B:
Filo dirt track – pathway.
Pathway for access to climbing routes at Roque and Topo de La Grieta.

Sector I.C: Camino del Riachuelo, along the side track that starts at Fuente del Riachuelo, ascending the western side of the ravine.

Sector I.D: Cañada del Chavao pathway.

Sector I.E: pathway from Pista del Cedro to Fuente del Cedro.

Sector I.F: Pico Sur pathway to Degollada de Chahorra or Las Violetas.

Sector I.G: segment of Telesforo Bravo pathway that circles the Teide crater.

Restricted Use Areas:

They are defined by exclusion, i.e. the remainder of the Park not included in any of the other three zone categories.

Once the “Las Cumbres” estate - owned by the Ministry of Defence - and the private properties around the hill tops of Vilaflor peaks are incorporated into the Teide National Park, they will be considered as Restricted Use areas.

Moderate Use Areas:

Their boundaries as a function of sectors are defined in the following manner:

Sector III.A: Llano de Ucanca.

From km 51 of road TF-21, following a straight line perpendicular to the road along Llano de Ucanca until the outflow, following the border between the Llano de Ucanca and the outflow, until Roques de Garcia mountain base; then from there to km 48.15 of TF-21 and from that point following the mountain base of Filo de Las Cañadas until km 51 of TF-21.

Sector III.B: Portillo – Tabonal Negro - Roques de García.

North: from the intersection of Montaña Blanca dirt track and pathway to El Portillo visitors centre, along a straight line to Montaña de Los Tomillos; along a straight line to Roque del Peral, and following that line until the current border of the Teide National Park at a height of 2,000 metres. Following that height level towards the east until the line connects with road TF-21 close to km 31 and from there until the Siete Cañadas dirt track.

East: along the Siete Cañadas dirt track until the Montaña Mostaza pathway, from there along the pathway until 2,100 m in altitude, on the eastern face of Montaña Mostaza and from there along a straight line until the end of Valle Trujillo dirt track; from there along a straight line towards Arenas Blancas at 2,127 m altitude, straight ahead to the western border at the base of mount Tabonal Negro, and from here along an 800 m equidistant line from the Sanatorio dirt track, and along that line to the Siete Cañadas track.

South: from that point, following the Siete Cañadas track to a point situated at 800 m west from the intersection with the Sanatorio track; from there, along an 800 m equidistant line from that track until Montaña Majúa, the edge of the Montaña Blanca outflow, until the Siete Cañadas track; from here following a straight line until km 47 of road TF-21.

West: km 47 of road TF-21, along the Roques de García mount base to its northern border; from there along a straight line to the cable car terminal, following the access road to the cable car, including its engine room until TF-21; from here until the Montaña Blanca dirt track and following that track until Montaña Rajada mount base; along that route, anti-clockwise until the Montaña Blanca track, and from there to the point of intersection with the visitors centre path.

Sector III.C: Montaña del Alto or Montaña de Guamasa - Montaña del Limón - Corral del Niño – Montaña de las Vacas.

North: from the intersection of road TF-21 with the 2,000 m height level, near km 31, continuing along the northern border of the Teide National Park, until road TF-24, and from here northbound until the island's N/S dividing line, in the vicinity of Montaña La Crucita.

East: intersection of TF-24 and the Island's N/S dividing line, and from here until road TF-24 at km 34.3, along that road until the asphalted side road to the Izaña Astrophysical Observatory, and along that side road until it connects with the municipal boundaries of Fasnia and Guimar, at Barranco del Guaco and descending that ravine in the southeast direction until the contour line at 2,100 metres.

South: following the contour line at 2,100 metres until 300 m before the Fasnia's historical volcanoes' outflow. From that point, following a line that runs parallel to the historical volcanoes, at a distance of 300 metres until it intersects with Arico el Viejo track at 2,000 metres altitude. Follow that height level until the Park's border with the "Las Cumbres" estate, of the Ministry of Defence. Along that border towards the northeast until crossing the straight line que joins the Degollada de Montaña de Abreu and Montaña de las Vacas with Montaña de la Carniceria, and from here until the Arenas Negras path at 2,230 m. Along the Arenas Negras path until it connects with the Siete Cañadas track.

West: along the Siete Cañadas track until road TF-21, and from there to around km 31 where it connects with the Teide National Park's border.

Special Use Areas:

Their borders as a function of sectors are defined as follows:

Sector IV.A: Ruleta - Cañada Blanca.

Delimited by a circle 550 metres in diameter whose centre is at the point of intersection of TF-21 and the segment joining the Parador and La Ruleta, except for the area within that circle with is a Restricted Use Area.

Sector IV.B: El Portillo Alto.

Formed by buildings, and public ownership land plots located in El Portillo Alto. Once they are incorporated into the Teide National Park, private properties in El Portillo will be included in this sector.

Sector IV.C: El Portillo visitors centre - Botanical Garden.
Formed by the Visitors Centre, the botanical garden and adjacent infrastructure.

Sector IV.D: Casa de Juan Evora.
Formed by Casa de Juan Evora and the access esplanade, with a surface area of 1 hectare.

Sector IV.E: Roads
Formed by roads TF-21, TF-24, and TF-38 which cross the Park within its boundaries.

Service areas and car parks within the Teide National Park, included in this Master Plan, will be classified as Special Use Areas.

| Art | Item | Period of validity of yearly investment plan (figures expressed in Euros) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
| 61 | Track, detect and eliminate explosives in Llano de Maja and restoring the area | 300,506.05 | 300,506.05 | | | | |
| 60 | Restoring La Tarta or El Pastel as a stopping point for observation | 120,202.42 | | | | | |
| 61 | Restoring Roque de Caramujo | | | 30,050.61 | | | |
| 61 | Restoring and organising Fasnia Historic Volcano | | 120,202.42 | 871,467.55 | | | |
| 61 | Restoring El Riachuelo area | | 12,020.24 | | | | |
| 60 | Purchase of Riachuelo water galleries | 180,303.63 | | | | | |
| 61 | Restoring Cueva del Hielo | | | 90,151.82 | | | |
| 61 | Eliminating infrastructures and landscape integration | 120,202.42 | 120,202.42 | 120,202.42 | | | |
| 61 | Support to resource management | 150,253.03 | 150,253.03 | 180,303.63 | 180,303.63 | 180,303.63 | |
| 60 | Interpretational material | 90,151.82 | 30,050.61 | 30,050.61 | 36,060.73 | 36,060.73 | 36,060.73 |
| 60 | Extension of Cañada Blanca Visitors Centre (CBVC) | 601,012.10 | 601,012.10 | | | | |
| 60 | CBVC exhibit | | 420,708.47 | | | | |
| 60 | High definition audiovisual equipment at CBVC | | 300,506.05 | 300,506.05 | | | |

Articles 60, 61, 62, 63 and 64 are referred to in Chapter 6, real investments, in Resolution dated 11th June 1999 by the General Directorate for Budgets, which establishes the codes that define the financial structure established by the Ministry of Economy and Tax's Ministerial Order dated 3rd May 1999.

| Art | Item | Period of validity of yearly investment plan (figures expressed in Euros) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
| 60 | Casa de Juan Evora Site Museum | | | 120,202.42 | | | |
| 63 | Restoring Casa de Fasnia | 60,101.21 | | | | | |
| 60 | Cañada Blanca, Montaña del Alto or de Guamasa Picnic Areas | | 90,151.82 | | | | |
| 60 | Eliminating concrete platforms at Caseta del Kaiser and installation of interpretational aids | | | 18,030.36 | | | |
| 60 | Master Plan for Access. Execution. | 2,404,048.42 | 3,606,072.63 | | | | |
| 60 | Restoring Rambleta area. | | | 150,253.03 | | | |
| 61 | Demolition of Public Works cabin and mountaineers' shelter | 30,050.61 | | | | | |
| 60 | Expropriation of Casas del Sanatorio and restoring the area | | 360,607.26 | 240,404.84 | | | |
| 63 | Overhauling dirt tracks network | | | 120,202.42 | 120,202.42 | | |
| **Art** | **Item** | **Period of validity of yearly investment plan (figures expressed in Euros)** | | | | | |
| 61 | Overhauling scenic view points and car parks | | | 90,151.82 | 120,202.42 | 120,202.42 | 120,202.42 |
| 61 | Overhauling network of tracks and pathways | 30,050.61 | 90,151.82 | 90,151.82 | | | |
| 60 | Sign-posting | 240,404.84 | | | | 240,404.84 | |
| 62 | Headquarters in La Orotava (Admin and Interpretation) | 1,202,024.21 | 480,809.68 | | | | |
| 60 | Exhibit at Interpretation Centre in La Orotava | 60,101.21 | 300,506.05 | | | | |
| 62 | Technical support for planning | 60,101.21 | 60,101.21 | 60,101.21 | 48,080.97 | 48,080.97 | 48,080.97 |
| 64 | Surveys and Inventories | 120,202.42 | 180,303.63 | 240,404.84 | 240,404.84 | 240,404.84 | 240,404.84 |
| 60 | Purchase of Vilaflor estates | | | | 300,506.05 | | |
| 62 | Purchase of El Portillo estates | | 180,303.63 | 300,506.05 | 601,012.10 | 1,202,024.21 | 1,803,036.31 |
| 60 | El Portillo Services Complex | | | | 1,502,530.26 | 1,502,530.26 | |
| 61 | Fire fighting | 222,374.48 | 300,506.05 | 300,506.05 | 300,506.05 | 360,607.26 | 360,607.26 |
| 62 | Vehicles | 30,050.61 | 60,101.21 | 60,101.21 | 60,101.21 | 60,101.21 | 60,101.21 |
| 62 | Supplies miscellaneous | 30,050.61 | 60,101.21 | 60,101.21 | 60,101.21 | 60,101.21 | 60,101.21 |
| | **TOTAL** | **6,052,191.91** | **7,795,126.99** | **3,654,153.60** | **3,750,315.52** | **4,351,327.63** | **2,704,554.47** |

## The Conservation regulations of the Teide Natural Monument

(Agreement of the Canary Island Regional Planning and Environment Committee)

***Directorate General of Regional Planning.- Ruling of the 26th of October 2005, whereby the Agreement of the Canary Island Regional Planning and Environment Committee, in a meeting held on the 10th of October, finally adopting the Rules of Conservation of the Mt. Teide Natural Monument (Tenerife), was made public.***

Pursuant to the legislation in force, I hereby,

RULE:

To order that the Agreement of the Canary Island Regional Planning and Environment Committee reached in a meeting held on the 10th of October 2005, finally adopting the Rules of Conservation of the Mt. Teide Natural Monument (Tenerife) be inserted in the Official Canary Island Gazette. The text of said agreement is attached as an annex.

Santa Cruz de Tenerife, 26th of October 2005. - The Director General of Regional Planning, Miguel Angel Pulido Rodriguez.

A N N E X E

One of the Agreements reached by the Canary Island Regional Planning and Environment Committee in the meeting held on the 10th of October 2005 was as follows:

One.- To finally adopt the Rules of Conservation of the Mt. Teide Natural Monument, in the municipal districts of La Orotava, Icod de los Vinos, Guia de Isora and Santiago del Teide (Tenerife), pursuant to article 43.2 a) of the Modified Text of the Canary Island Regional Planning and Natural Spaces Acts, enacted by Legislative Decree 1/2000, of the 8th of May, concerning the competence attributed in article 24.3 of said legal text, file 28/03, in the terms proposed and with the following wording of article 15 of the regulations:

**Article 15.-** Legal regimen.

The legal regimen for the use and interventions of these Rules of Conservation is the regimen established in the Regulatory Document of the Use and Management Master Plan for the Mt. Teide National Park, approved by Decree 153/2002, of the 24th of October.

With regard to authorisations in this Natural Monument, and as both the Joint Canary Islands National Parks Management Committee and the Tenerife Island Cabildo are management bodies of the monument, a procedure of communication between these two bodies must be put in place in order to avoid a duplication of the authorisations requested.

Two.- To consider the allegations and reports presented as decided in the terms proposed in the technical report presented by the Protected Natural Areas Planning Service of the Directorate General of Regional Planning, making the pertinent corrections thereto,

pursuant to the decisions taken in that regard and pursuant to the reports issued that, on the other hand, are not considered substantial corrections.

Three.- This Accord shall be published in the Official Canary Island Gazette and added to the regulations approved as an annex.

Four.- All and any physical individuals or legal entities that may have presented allegations or suggestions shall be duly notified of this report, together with the report accepting or rejecting said allegations or suggestions.

Five.- The Local Councils of La Orotava, Icod de los Vinos, Guia de Isora and Santiago del Teide, and the Tenerife Island Cabildo (Island Council) shall be duly notified of this Accord, with a duly legalised copy of the approved document attached.

A contentious-administrative appeal may be brought against this act, which represents the final step in the administrative proceedings, within two months before the Contentious-Administrative Section of the Canary Island High Court, from the day after the notification of this Accord.

All pursuant to articles 109, 116 and 117 of the Public Administrations' Legal Regimen and the Common Administrative Procedure Act, Law 30/1992, of the 26th of November, in the wording modified by Law 4/1999, of the 13th of January; in article 46 of the Contentious-Administrative Jurisdiction Regulation Act, Law 29/1998, of the 13th of July; in article 248 of Legislative Decree 1/2000, of the 8th of May, concerning the Modified Text of the Canary Island Regional Planning and Canary Island Natural Areas Acts and article 22 of Decree 129/2001, of the 11th of June, adopting the organisational and functional Regulations of the Canary Islands Regional Planning and Environment Committee, modified by Decree 254/2003, of the 2nd of September.

This notification is hereby issued pending the exact terms arising from the ratification of the corresponding act, in accordance with article 18.2 of the organisational and functional Regulations of the Canary Islands Regional Planning and Environment Committee, approved by Decree 129/2001, of the 11th of June.- The Secretary of the Canary Islands Regional Planning and Environment Committee, Juan Jose Santana Rodriguez.

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PREAMBLE

The Mt. Teide Natural Monument is an emblematic element of great scientific and scenic value with outstanding and particular geo-morphological features that define a landscape of great beauty. It is also a landmark and a point of reference in the island landscape, especially the Pico del Teide, the highest mountain in Spain. Moreover, it shelters a representative sample of aeolic habitats, with exclusive species like the Teide violet.

It was declared a Natural Monument by the Canary Islands Natural Areas Act, Law 12/1994, of the 19th of December. It was later re-classified as a Natural Monument by Decree 1/2000, of the 8th of May, which approved the Modified Text of the Canary Island Regional Planning and Natural Areas Acts (hereinafter, Modified Text).

Pursuant to the provisions and the object established for Natural Monuments by the Modified Text, these Rules of Conservation shall implement the form in which the conservation of the natural and cultural processes shall be made compatible with the promotion of activities and uses that enhance the Monument's public services.

## TITLE I

GENERAL PROVISIONS

**Article 1.-** Location and accesses.

The Mt. Teide Natural Monument is located in the centre of the island, in the Mt. Teide National Park.

The Monument falls within the municipal districts of La Orotava, Icod de los Vinos, Guia de Isora and Santiago del Teide in the following amounts and proportions:

- La Orotava, 3,348.63 ha (93.4% of the total Monument).

- Icod de los Vinos, 110.16 ha (3.1% of the total Monument).

- Guia de Isora, 113.23 ha (3.2% of the total Monument).

- Santiago del Teide, 14.12 (0.4% of the total Monument).

Access to the Monument may be gained by a range of different tracks or trails:

- Track leading off the TF-21 road at kilometre. 40.2.

- Trail setting out from Montaña de Los Tomillos.

- Trail leading off the TF-38 road to climb Pico Viejo.

- The major access to the Monument, however, is the access from the Cable Car, on the slopes of the strato volcano.

**Article 2.-** Territorial scope.

Pursuant to the Modified Text, the boundaries of the Monument contain the entire Mt. Teide-Pico Viejo strato volcano above a height of 2,400 metres, encompassing an area of 3,606.7 ha.

**Article 3.-** Territorial scope. Ecologically sensitive area.

Based on article 23 of the Prevention of Ecological Impact Act, Law 11/1990, of the 13th of July, and article 245 of the Modified Text, the entire area of the Mt. Teide Natural Monument is considered an Ecologically Sensitive Area.

**Article 4.-** Purpose of protecting the Natural Monument.

In accordance with article 48.9 of the Modified Text, Natural Monuments "are small areas of natural spaces or elements, basically made up of outstanding, rare or beautiful formations that are provided with special protection".

In the specific case of the Mt. Teide Natural Monument, it is a geological formation of special interest because of the outstanding importance of its scientific, cultural and scenic values.

**Article 5.-** Grounds for protection.

The criteria on which the protection of the Mt. Teide Natural Monument are founded, pursuant to article 48.2 of the Modified Text are principally:

a) Mt. Teide constitutes a representative sample of the main natural systems and characteristic terrestrial habitats of the Canary Island Archipelago; in particular, of the mountain flora and fauna.

b) The Natural Monument shelters populations of animals and plants that are classed as endangered species, high concentrations of endemic species and species that require special protection by virtue of international conventions or specific provisions.

c) The Monument makes a significant contribution to maintaining the biodiversity of the Canary Island Archipelago.

d) This area is the only remaining habitat or the area containing the largest remaining population of endemic Canary Island species. These plant species include Gnaphalium teydeum, Stemmacantha cynaroides, Silene nocteolens and Viola cheirantifolia.

e) The area contains geo-morphological structures that are representative of the island geology, in a good state of conservation.

f) The Monument includes zones of vital importance for certain phases of the biology of animal species, such as breeding grounds, a refuge for migratory species and analogous purposes.

**Article 6.-** Need for Rules of Conservation.

1. The conservation of the Mt. Teide Natural Monument and the need to establish protection measures to curb the degradation of the environment or the loss of its resources are the prime rationale for drawing up these Rules of Conservation, a planning measure established for Natural Monuments in article 21 of the Modified Text.

2. In this sense, these Rules of Conservation constitute the instrument defined by the regulations that must provide the legal framework to regulate all uses and activities that take place in the Mt. Teide Natural Monument.

**Article 7.-** Effects of the Rules of Conservation.

The Mt. Teide Natural Monument Rules of Conservation shall have the following effects:

1. Their decisions shall be obligatory and executive for the Administration and for private individuals from the moment they come into effect, to whit, when they are published.

2. They are binding and regulate the use of the natural resources of the Mt. Teide Natural Monument with regard to its conservation and protection. The environmental decisions shall prevail over the strictly regional and planning aspects in the formulation, interpretation and application of the Rules of Conservation and said regional and planning aspects should act as an instrument to use and complete the environmental objectives and criteria of the regulations.

3. These Rules of Conservation shall prevail over all other regional and town planning instruments. For this reason, article 22.5 of the Modified Text indicates that regional and town planning plans must take on board whatever rulings may be established by these Rules and develop them, should said rulings so establish. Transitory Provision Five, 5, of this same legal text, on the other hand, states that the town planning provisions established by the Rules of Conservation shall displace those established for the regional and town planning instruments for the territorial scope of the Natural Area.

4. Non compliance with their provisions shall be considered as an infringement of the Modified Text, as established by article 202.3.c). The regimen of sanctions shall be the

one established in article 39 of Law 4/1989, in Title VI of the Modified Text, and in any other applicable provision.

**Article 8.-** Objectives of the Rules of Conservation.

1. To enhance the capacity for survival of the endangered animal and plant species.

2. To establish a progressive control plan for the mouflon, rabbit and other introduced mammals, aimed at the total eradication of the former and the maintenance of the other species at a level that does not represent a significant threat to the Monument's flora.

3. Take the necessary measures to provide an integral protection for the archaeological and ethnographic resources of the Monument, establishing the appropriate co-ordination between the competent authorities.

4. To regulate and plan mass visits and open air sports in such a manner as to make them compatible with the conservation of the resources and the dissemination of the values of the Monument.

5. Disseminate the resources, services and Rules of the Monument to attain greater understanding of said Monument and to involve users and the associated population in its conservation.

6. To promote research to cover deficits in information, facilitating the management of Monument resources and the establishment of an environmental monitoring plan in accordance with the characteristics of the area.

7. Regulate the measures that may be necessary to promote greater integration and a reduction of the impacts caused by infrastructures, facilities and amenities within the Monument, and to co-ordinate their management by the competent authorities.

## TITLE II

ZONING, CLASSIFICATION AND CATEGORIES OF LAND

### CHAPTER 1

### ZONING

**Article 9.-** Zoning objectives.

With a view to defining the degree of protection and use in the different sectors of the Mt. Teide Natural Monument, and bearing in mind, on the one hand, its environmental quality, it capacity to support present and potential uses and, on the other, the purpose of protection contained in the Law and the objectives of these Rules of Conservation, several different zones have been delimited in accordance with the definitions indicated in the Modified Text, article 22. The scope of these zones is included in the 1:10,000 scale map attached.

Hence, to zone the area, the starting point was the carrying capacity established for the different Homogeneous Diagnosis Units, which have taken into consideration the environmental and cultural values as a whole.

After establishing the capacity to tolerate these activities for each unit, and based on the information obtained from the analysis of the location and intensity of the impacts and

activities affecting the Mt. Teide Natural Monument, a regulatory zoning has been established for the uses permitted in each zone, pursuant to the provisions of the Modified Text.

It must be pointed out that in some cases, the Homogeneous Diagnosis Units have been fragmented in the zoning, depending on the location of the activities that affect them related to the uses to be regulated and the infrastructures provided for said activities, as these have attenuated or reinforced the different average carrying capacity values assigned to each Homogeneous Diagnosis Unit.

The zoning established for the Mt. Teide Natural Monument is defined in four zones. The area of each of these and its proportion of the total Monument are shown in table 3. The zoning is reflected in the corresponding plans of the mapping annex.

TABLE 3

Zoning of the Mt. Teide Natural Monument.

Area and proportion of the total area.

| Zoning | Area (ha) | Proportion (%) |
|---|---|---|
| Exclusion Zone | 55.82 | 1.56 |
| Restricted Use Zone | 3,485.16 | 97.21 |
| Moderate Use Zone | 42.71 | 1.19 |
| General Use Zone | 1.58 | 0.04 |

SOURCE: own data.

Exclusion or prohibited access zone.

For the effects of these Rules of Conservation, the exclusion or prohibited access zones are those that contain the most vulnerable and representative biotic and abiotic elements of the Area. Access to them is regulated and only permitted for scientific and conservation purposes. These zones, the limits of which are established in the enclosed zoning maps, cover and area of 55.82 ha, or1.56% of the area of the Monument. This is the entire Homogeneous Unit of the Craters:

- Crater of Mt. Teide.

- Crater of Pico Viejo.

This decision is justified by the high degree of vulnerability of these zones and their low carrying capacity with regard to use, so access and man-made pressures should be absolutely restricted.

This zone coincides with Sector I. F. Pico Viejo and Sector I. G. Crater of Mt. Teide of the Reserve Zone delimited by the Regulation Document of the Mt. Teide National Park Use and Management Master Plan, approved by Decree 153/2002, of the 24th of October, which, apart from this article, also applies the definition, purpose and limits established in the aforementioned Use and Management Master Plan.

Restricted Use Zone.

For the effects of these Rules of Conservation, this is the zone consisting of the area of high biological, cultural and geo-morphological quality. Said zone encompasses practically

the entire surface area of the Monument, covering a total of 3,485.16 ha, 97.21% of the territory of the Area.

Low intensity public use is admitted in this zone, considering educational and interpretation activities to be compatible with the protection of the Monument. In any event, all public transit shall be made by non mechanical means and shall be restricted exclusively to the trails established to that end, except for reasons of research, management or use authorised by the Monument's management and administration body, pursuant to article 2.1 of Decree 124/1995, of the 11th of May, establishing the General Use Regimen for Tracks in Canary Island Natural Areas.

The boundaries are detailed in the attached zoning mapping, and encompass practically the entire area of the Homogeneous Diagnosis Units, except for the enclaves zoned for General Use and Moderate Use.

This is justified by the high overall vulnerability of the territory, including its environmental quality. Public use is allowed however, provided that all transit is made along established tracks.

This zone coincides with the corresponding Sector of the Restricted Use Zone delimited by the Regulation Document of the Mt. Teide National Park Use and Management Master Plan, approved by Decree 153/2002, of the 24th of October, which, apart from this article, will also apply the definition, purpose and limits established in the aforementioned Use and Management Master Plan.

Moderate Use Zone.

For the purposes of these Rules of Conservation, these are the zones made up of the areas in which educational-environmental and recreational activities are compatible with their conservation, including, moreover, traditional activities that are also compatible with the conservation of the zone. These zones cover an area of 42.71 ha, or 1.19% of the surface area of the Monument.

The boundaries are detailed in the attached zoning maps, encompassing the northern sector of Montaña Blanca-Montaña Rajada, with the track crossing Montaña Blanca as the boundary, at an altitude of 2,500 metres and as far as the Monument boundary.

This is justified by the number of secondary tracks included in the National Park network of trails and its lesser relative environmental quality, which explains a greater global use.

This zone coincides with the corresponding Sector of the Moderate Use Zone delimited by the Regulation Document of the Mt. Teide National Park Use and Management Master Plan, approved by Decree 153/2002, of the 24th of October, which, apart from this article, also applies the definition, purpose and limits established in the aforementioned Use and Management Master Plan.

General Use Zone.

For the effects of these Rules of Conservation, this is a small area where buildings and major facilities necessary for management, administration and public use of the Monument are located.

The boundaries are detailed in the attached zoning maps, and encompasses the location of the Cable Car and adjacent buildings in the area of La Rambleta. It covers a total of 1.58 ha, or 0.04% of the Monument.

This is justified by the presence of the Cable Car and its adjacent buildings and the number of visitors coming to this area.

This zone coincides with the corresponding Sector of the Special Use Zone delimited by the Regulation Document of the Mt. Teide National Park Use and Management Master Plan, approved by Decree 153/2002, of the 24th of October, which, apart from this article, also applies the definition, purpose and limits established in the aforesaid Use and Management Master Plan.

CHAPTER 2

CLASSIFICATION AND CATEGORIES

OF THE LAND

**Article 10.-** Objective of classifying the land.

1. As established in article 56 of the Modified Text, the objective of classification, categorisation and, if any, the planning clarification of the land is to define the social function and binding the lands and buildings to the corresponding uses established in their definitions.

2. Delimit the planning content of the right to ownership pertaining to each of the aforementioned lands and buildings, notwithstanding the application of Chapter III of Title II of the Modified Text.

**Article 11.-** Classification of the land.

Rustic land.

1. Pursuant to article 49 of the Modified Text, rustic land is one of the classes of land in which the territory being zoned can be included and its definition is included in article 54 of the aforementioned Modified Text.

2. In accordance with these articles and article 22.2 of the aforesaid Modified Text, whereby each of the areas resulting from the zoning must be assigned to the most appropriate class of land for the protection purposes of the Rules of Conservation, the entire territory of the Mt. Teide Natural Monument is hereby classified as rustic land.

3. Notwithstanding the definition established in article 54, the rustic land of the Mt. Teide Natural Monument includes lands that, due to their natural and cultural conditions, their environmental and scenic features, the environmental functions and services they offer and for their productive potential, must be kept apart from and unaffected by urbanisation development processes.

**Article 12.-** Objective of categorising the land.

The objective is to complement the classification of the land by dividing each class of land into different categories in order to determine its legal regimen.

**Article 13.-** Categorising rustic land.

For the effects of the previous article, these Rules of Conservation categorise rustic land, dividing it into the categories of:

a) Natural protection Rustic Land.

b) Infrastructure protection Rustic Land.

Its delimitation is indicated in the land classification plans of the mapping attachment of these Rules of Conservation and in the attached figure.

**Article 14.-** Natural Protection and Infrastructure Protection Rustic Land.

1. Natural Protection Rustic Land consists of zones of high geological and ecological value that include sectors of high quality and vulnerability. The destination foreseen is to provide integral protection of their geological, scenic and ecological values, scientific research and for low intensity educational and recreational uses that are compatible with their conservation.

This encompasses the entire surface area of the Mt. Teide Natural Monument, although there are additional provisions in the sector of La Rambleta, due to the infrastructures located there and the greater impact of visitors and, therefore, this part is also classified as infrastructure protection rustic land.

2. Infrastructure Protection Rustic Land is established exclusively for maintaining, to the extent and based on the criteria established in the Mt. Teide National Park Use and Management Master Plan, the current uses of the existing facilities in the enclave of La Rambleta associated with the cable car service, which encompass the Terminal station, for receiving the cable cars and their passengers. The objective of said service is to facilitate the suppression and reduction of the impact caused by existing facilities and uses and to promote the realisation and execution of the project to implement a full scenic restoration of the area, established in article 12.5, Industrial facilities, of the Regulation Document of the Mt. Teide National Park Use and Management Master Plan, approved by Decree 153/2002, of the 24th of October. This category of Infrastructure Protection Rustic Land is compatible with and overlaps with the category of Natural Protection Rustic Land, considered for the scope of the regulations, as a superimposition over the basic category of this area: Natural Protection Rustic Land. In any event, the more restrictive regimen of uses shall prevail.

This category of Infrastructure Protection Rustic Land includes the enclave of La Rambleta, where the facilities associated with the cable car service are located, coinciding with the only Special Use Zone of the Natural Monument, due to the differential of the man-made impact of the enclave.

The classification is reflected in the corresponding plan of the mapping annex.

**TITLE III**

REGIMEN OF USES

**Article 15.-** Legal regimen.

The legal regimen of the uses and interventions of these Rules of Conservation is contemplated in the Regulation Document of the Mt. Teide National Park Uses and Management Master Plan, approved by Decree 153/2002, of the 24th of October.

As far as the regimen of authorisations for this National Monument is concerned, and given that both the Joint Canary Islands National Parks Management Committee and the Tenerife Island Cabildo (Island Council) are governing bodies, a communications procedure should be put in place between these two organs to prevent a duplication of authorisations applied for.

## TITLE IV

VALIDITY AND REVIEW

**Article 16.-** Validity and review.

1. These Rules of Conservation shall remain in force for an indefinite period of time, and until such time as the document is reviewed or modified.

2. Review and modification.

a) The review of modification of the Rules of Conservation shall be governed by articles 45 and 46 of the Modified Text.

b) Should circumstances occur that affect the application of the Rules of Conservation, this would be a decisive criterion for assessing the appropriateness of modifying or reviewing them, especially if there is a review or modification to the Mt. Teide National Park Use and Management Master Plan, approved by Decree 153/2002, of the 24th of October. In any event, these Rules of Conservation may be reviewed or modified in the circumstances established in article 46 of the Modified Text.

c) Any review or modification shall be governed by the same procedure for presentation and approval as the Rules of Conservation themselves.

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## Insular Planning of Tenerife (PIOT)

(DECREE 150/2002, OCTOBER 16)

### *Chapter 1: General Aspects of the Territorial Planning Model.*

### Section 3. The Territorial Planning Model

2.1.3.1. Basic distribution of the island's usage

2-D Areas of environmental protection: encompass the majority of the woodlands areas located in the centre of the island, Teide National Park and the forest crown that surrounds it, the two mountain masses located at the extremes (Anaga and Teno), in which agricultural spaces and even communities can be found, as well as other protected nature reserves that have been declared as such by standing legislation. Other areas are also included that complete the structure of protected nature reserves on the island.

2.1.3.5. Insular infrastructure

6-D The PIOT also proposes to undertake a singular infrastructure project very closely tied to the goals of improving the recreational activities that the island can offer, expanding the range of services available in the central mountain mass by creating a complex outside of the National Park, but close to its access point at El Portillo, where the services facilities needed to maintain a nature reserve of this magnitude, subject to heavy public use, can be concentrated.

### *Chapter 2: District Planning Models*

*Section 4. Planning Model for Abona*

*2.2.4.5. The road and transportation model*

7-D Vilaflor-Arona-Los Cristianos axis: the secondary road that transverses this axis must maintain its current route and be adapted to its role as a scenic drive for tourists and a structural axis for the district and its main populations. In order to achieve this, investments must be made in the road and in the towns it passes through to ensure that this connection between the tourist city and Teide National Park is both functional and attractive to tourists

*Section 9. Planning Model for the Central Mountain Mass*

2.2.9.1. Preliminary observations

1-E Location and delimitation: it spans the centre of the island, encompassing Teide National Park, La Corona Forestal Natural Park, the Protected Landscape of Las Lagunetas and part of the Chinyero Nature Reserve; the boundaries of these nature reserves delimit the district, except in the north-western corner where its boundary is marked by road TF-2228. The central mountain mass includes the highlands of almost all of the island's municipalities. It has a total surface of 66,777 hectares.

2-E Territorial morphology: The Teide-Pico Viejo complex lies in the centre of the island, 1,500 metres above the Cañadas, the plain that surrounds it in the south and east. Starting from east of the Teide-Cañadas edifice, the dorsal axis traces a north-eastern path; this is a descending crest that divides the two slopes of the north-eastern part of the island. The semi-circular depression of the Cañadas is delimited morphologically by a semicircular line of ridges, whose slopes form the highlands of the south-eastern districts, Abona and the uneven foothills of the Adeje mountain mass. A final axis of ridges starts from the central structure heading north-east to the Teno mountain mass, marking the boundary between the south-eastern districts and Daute. Therefore, next to the central structure, the district contains a series of slopes corresponding to the described morphology; these slopes have sharp inclines that gradually even out at lower altitudes and contain much less pronounced morphological irregularities. These slopes are mostly covered with pine groves: the forest crown that surrounds the central structure.

3-E Development: this area is practically uninhabited, although it was somewhat important in the past as a supplier of forest products and as a pasture, as well as its importance (still true today) as a regulator of the island's ecological balance, especially in the hydrological processes of reloading the aquifer. Today this district is primarily a scenic nature reserve, which has led to a massive influx of visitors and to equipping it with unique infrastructure (*parador*, cable car). Its remarkable natural characteristics have also led to placing infrastructure important to the entire island (telecommunications equipment, water galleries) within its boundaries as well as special scientific facilities (observatory).

4-E Its function for the island as a whole: this district constitutes the island's major nature reserve, where a large part of its natural and scenic resources are found and where essential ecological processes take place. It is an essential part of the recreation that Tenerife offers to both tourists and residents. Therefore, the main goal of the planning and actions taken on the central mountain mass must be to maintain and develop its two main functions (nature reserve and recreational area), guaranteeing that its usage and the facilities placed within it contribute to Tenerife's socio-economic development and satisfying the service demands of its population without degrading the district's natural resources.

2.2.9.2. Basic distribution of usage

1-D General layout: the entire district is made up of environmentally protected areas. Its most important characteristics include consolidated and potential forests that form concentric rings at the base of the mountain mass, a large area of slopes on the summit of the southern face, the Las Cañadas karst and the Teide-Pico Viejo complex.

2-D Planning criteria: the main use of the entire district is preservation and conservation compatible with recreational activities linked to nature and scenery. This recreational use has two basic forms divided territorially: on one hand the large forest crown has a fundamental role in the insular network of open spaces; and on the other Las Cañadas del Teide is a key part of the island's tourism, with a high level of use. As well as its recreational uses, the district also must continue to quarter activities that, despite being less demanding, are essential to the development of Tenerife (scientific and hydrological activities, infrastructural services, etc.). The future evolution of all of these activities should be considered from a holistic vision subject to the principle of conservation.

2.2.9.3. Infrastructures

1-D General layout: from the point of view of the island as a whole, the PIOT only defines the configuration of the roadways in the district. However, the summits of the island contain infrastructure that is very important to the operation of the island, such as telecommunication antennas or the astrophysics observatories, whose future role should be defined with greater precision in infrastructure plans and within the framework of district planning.

2-D General observations on the roadway network: the network is considered to be definitively consolidated and should not be altered, nor should new routes be created. The function of any road that flows to the central mountain mass is to give access to the to the summits of the island according to the intensity of use that these have; they should not, therefore, be considered as traffic support to convey motorists between population centres or centres of activity outside of the district, neither should they be considered as support for territorial construction. Due to the great natural and scenic value of the surroundings, any intervention in the district's roadways must respect the enjoyment of the area's scenery before other criteria such as speed and capacity to accommodate traffic. For these reasons all roadways in the central mountain mass must fulfil its function with the least impact on the environment possible and not permit visitors to access areas beyond their capacity to accommodate them.

3-D District roadway networks: the central axis of Las Cañadas is the C-821 primary road between El Portillo and Boca de Tauce. From El Portillo the primary road separates into two different primary roads: the first (C-824) leads to the metropolitan area, connecting with the metropolitan traffic system in La Esperanza; the second road is the section of the C-821 that arrives at the axis of the La Orotava midlands, at Aguamansa. Another two axes originate at Boca de Tauce: one is the section of the C-821 that leads to the town of Vilaflor, and from there separates into three roads (one primary, two secondary) that transverse the Abona roadway model; the other is the C-823 that leads to the connection to the north-west corridor of the island at Chío.

2.2.9.4. Provisions.

1-D General criteria: this district has its own basic provisions because of its importance as an area open to the population of the island as well as the great appeal Teide National Park has for tourists. In order to achieve the goals put forth by the PIOT, their development should be planned as a unified whole, despite the fact that the concrete actions to be taken will be specified in the different plans for each of the protected nature reserves that make up the central mountain mass. This unified planning will define the district's global public usage model, specifying the details of the different areas according to their accommodation capacity, conservation requirements and the possibility of using their resources, as well as the socio-economic development goals of the island.

2-D Service complex in the central mountain mass: in following with the proposed model, the PIOT recommends creating a single complex outside of the National Park, but close to its access point at El Portillo, where the facilities needed to service a nature reserve of this magnitude can be concentrated and even other public facilities that are in line with the objective of protecting these areas. This complex should allow for the progressive elimination of the rest of the buildings and infrastructures, thereby recovering the natural landscape, and alleviate the excessive demand for access to the National Park or other areas with more limited uses in the district.

***Chapter 4: Singular Infrastructure Operations***

Section 1. Generalisations

2.4.1.2. List of Singular Infrastructure Operations.

8) Central mountain mass service complex.

Section 9. Central mountain mass service complex

2.4.9.1. Objectives

1-E The main objective of this operation is to supply Teide National Park with facilities in line with its importance. These facilities will constitute a key element to future planning of the intense public usage of this nature reserve by improving its services and facilitating the compatibility between the visits and the preservation of its extremely high environmental value.

2-E The following objectives, derived from the concrete location proposed and related to the criteria of the PIOT's territorial planning, are proposed:

- Contribute to the planning of one of the fundamental tourist visits on the island without diminishing the natural value of the area.

- Centralise the various services that a nature reserve of these characteristics requires as much as possible, avoid the scattering of facilities and to proceed with the removal of the majority of facilities already in existence.

- Channel part of the revenue generated by this operation, as well as the greater organisation of tourism, toward the active conservation of the National Park and the island's nature reserves in general.

2.4.9.2. Territorial Scope

1-D The territorial scope of this operation includes the land used by the group of houses in El Portillo de La Villa.

2.4.9.3. Development planning

1-D The specification of the uses that will be allowed in the Service Complex, as well as any other conditions for its implementation, must be planned via the Nature Reserve Management and Usage Administration Plan.

2-D Once the conditions for allowable uses and an others that are pertinent, the implementation of the operation could begin once the project has been legally approved.

2.4.9.4. Planning criteria

1-R The Teide Service Complex will be a construction with a unified appearance (a single unit or various units adequately united) that is highly aesthetic and unique, in concordance with the spectacular landscape where it will be located. It will be designed to have the smallest possible visual impact.

2-D The project will have the parking spaces necessary for the number of vehicles that district's public usage planning establishes for the interior or surrounding area of the National Park. In order to minimise its impact, the possibility of an underground parking lot will be contemplated.

3-D The uses of the Service Complex will be defined in the program of requirements before writing the project, according to the conditions established in the district's Public Usage Plan. In any case, at least the following will be considered:

- National Park Visitor's Centre supplied with all of the facilities and services necessary to give visitors complete information on the nature reserve via entertaining content or activities.

- High quality restaurants with the capacity to accommodate many people with access to vistas of the Teide.

- The services required for the operation and management of Teide National Park and the Corona Forestal Natural Park.

4-D The complex may have other uses that are compatible with the characteristics of the complex, as long as they do not contradict the objective of protecting the nature reserve.

5-D In any case, the implementation of this complex implies the prohibition of new constructions that are not indispensable inside the National Park and should lead to the removal of existing constructions.

2.4.9.5. Administration and development criteria

1-R The administration of this operation must always remain under public control; at the least, the *Cabildo Insular* (Island Government), the Canarian Government and the Administration of Teide National Park will participate.

2-D Within the collaborative framework of the administrations mentioned in the last paragraph, a Nature Reserve Management and Usage Administration Plan must be developed that includes measures to ensure inter-administrative cooperation and coordination of public activity in their different competences such as the delimitation of integrated-management areas or similar objectives.

3-D Along with the formulation of this plan, the aforementioned administrations must proceed to acquire all of the land that will be used for these facilities.

4-R Once the program of requirements has been defined, the administrations managing this operation will guarantee that the design of the complex is of high architectural quality and integrated with the landscape, environment and ecology.

4-D The basic criteria of the administration of the Teide Service Complex will be to ensure that all of the services are in line with the public usage objectives of the district of the central mountain mass and the investment of part of the economic profits generated by these services (direct revenue from public services or taxes paid by private concessionaires) in the conservation of the island's nature reserves.

4-AD Until the Management and Usage Administration Plan is developed to establish the definitive planning of the area, the land included in this area will continue to be a reserve

as guaranteed by the development classification and the management and usage measures that are most convenient, in which only the actions described in point 2.4.9.6 can be authorised.

2.4.9.6. Effects of the declaration of the singular infrastructure operation

1-AD The territorial scope of the singular infrastructure operation is linked to its development; until the planning, management and implementation plans to develop this land are formulated, the actions of land use and territorial transformation are authorised:

- Actions consistent with the rustic nature of the land, for its use in agriculture, raising livestock or silviculture.

- Provisional activities and facilities that are permitted in the urban development legislation as long as they do not interfere with the eventual implementation of the operation.

2-AD The entire area will be declared of public interest so that the public administration can expropriate the land and intervene in issues involving ownership, thereby guaranteeing acquisition; the acquisition will also be subject to the public administration's rights of comparison and retraction.

# Other Documentation

## Eco-Management System

Teide National Park is implementing its own Eco-Management System adapted to the requisites of the EUROPEAN REGULATION (EC) 761/2001 (EMAS) that affects all of its activities, services and facilities.

This instrument will improve the environmental behaviour in the park and guarantee that all activities will be carried out in a way that will preserve and conserve the natural systems and resources, respecting the established legislation and environmental policies.

The first step in implementing the Eco-management and Audit Scheme was carried out in 2002 by completing a technical-legal Initial Evaluation of all of the park's facilities. This review assesses to what degree these facilities fulfil the requirements established in the EMAS regulations and other valid environmental legislation, identifying the defects and/or weak points of each facility.

During the implementation process steps have been taken to correct the defects identified in the Initial Evaluation. The technical projects necessary to carry out work and receive authorisations from different organisations have been written so that the requirements of the valid environmental legislation can be met.

The following are among the actions taken during the implementation that are related to the requirements of the EMAS regulation:

- Establishment of an environmental policy
- Identification and evaluation of environmental aspects (dumping, emissions, noise, waste, etc.)
- An eco-management manual
- Procedures and registers that describe the steps to take to develop the activities container in the environmental manual.
- Improvement objectives.
- Environmental training and awareness of personnel.

The actions taken in the park related to the fulfilment of environmental legislation include:

- Solicitude of an activity and/or opening license
- Solicitude of a dumping authorisation
- Solicitude of an authorisation to install electric generators and fuel dumps
- Analysis of waste-water dumping, atmospheric emissions, noise, etc.)
- Contracting an external maintenance service to control and prevent Legionellosis as per RD 865/2003.

Teide National Park establishes its own Eco-Management System; the documents that define the system provide a detailed description of the park's characteristics and particularities.

In March of 2003 the Canarian National Parks Mixed Management Commission approved the essential document of the system, the Eco-Management Manual, which spells out the park's commitment to the environment in its *Environmental Policy*:

- *PROTECT THE LANDSCAPE, the integrity of the autochthonous fauna, flora and vegetation and maintain the functional dynamic and structure, as well as the rest of the objectives defined in the park's Management and Usage Administrative Plan.*
- *STRICTLY FOLLOW THE VALID LEGISLATION and other requirements that are subscribed to by the organisation and maintain a formal eco-management system that allows the park to continually improve its environmental behaviour.*
- *PREVENT POLLUTION and establish goals to progressively reduce, as much as possible, the impact that the management of the park may have on the environment.*
- *PROMOTE ENVIRONMENTAL TRAINING AND AWARENESS at all levels so that that the importance that the actions people take have for the environment are understood, particularly the actions of the personnel involved in eco-management.*

The Eco-Management Manual defines the structure and responsibilities of the personnel in relation to environmental management and the general rules of behaviour. The implementation of the Eco-Management System is made effective through the use of *procedures* and *instructions*. These are documents that compliment the Eco-Management Manual by clearly and concisely describing the steps that must be taken to develop activities such as monitoring waste water, air emissions, waste management, consumption management, emergency plans, etc.

Each of the principal phases of the park's activities has been defined: the associated environmental aspects have been identified at the start and finish of each phase in order to determine which ones are important and establish improvement goals.

Among these environmental aspects are the following:

- Polluting atmospheric emissions
- Dumping
- Waste
- Consumption of natural resources and energy
- Noise
- Indirect aspects

Environmental Objectives and the Programme to continually improve the park's environmental behaviour are approved annually. The objectives that are established must be realistic, quantifiable and have a timetable, as well as meet legal requirements. The process of creating these goals will include contemplating important environmental aspects and listening to the opinions of all interested parties.

Keeping in mind the particularities of the activity carried out by the park and directed toward the prevention of pollution and continuous improvement, the objectives approved in 2004 are:

| OBJECTIVE | ENVIRONMENTAL IMPACT THAT IT SEEKS TO IMPROVE |
|---|---|
| 1. Improve the management of dangerous wastes: promote the evaluation of three dangerous wastes. | Generation of dangerous waste |
| 2. Reduce the emissions produced by the vehicles used by the park. | Gas emissions produced by burning diesel fuel |
| 3. Reduce the consumption of water in all of the park's facilities by 10%. | Water consumption |
| 4. Increase the environmental awareness of the visitors. | Impact of visitors |
| 5. Reduce the consumption of diesel fuel and the gasses produced by its combustion in permanent facilities by using alternative energies. | Gas emissions produced by burning diesel fuel |
| 6. Reduce the consumption of dangerous products by 15%. | Generation of dangerous waste |
| 7. Reduce the capacity of the electrical generators to 1.8. | Gas emissions produced by burning diesel fuel |
| 8. Apiculture (bee-keeping) planning in Teide National Park | Apiculture impacts |

For each objective a series of steps or goals has been defined that are to be carried out on a timetable. These steps are specific, quantifiable and realistic actions that make it possible to meet the objective within the established time period.

In order for this project to be successful, all of the park personnel have to collaborate. With this in mind, environmental training and awareness has been developed to help motivate the personnel to meet the park's environmental requirements. Among the actions taken with the personnel we can highlight environmental training sessions and the explanation of good environmental habits at each job post.

The service providers and contractors were informed of the implementation of the Eco-Management System in the park to ensure the fulfilment of environmental requirements.

In order to guarantee that the environmental requisites of the Regulation are carried out, an auditing scheme was established that consisted in:

- An internal audit was done on 9, 10 and 11 of June 2004, to evaluate the level of fulfilment of the requisites contained in the regulation. This audit was carried out by a sufficiently independent, outside auditing firm in order to guarantee impartiality and objectivity. This audit detected that the park was not completely in compliance. The areas where the park was not in compliance were studied by park management and by the personnel responsible for the eco-management system in order to correct these problems.

- On 5, 6, 7 and 8 July 2004 AENOR, an environmental inspection company certified by ENAC, "previewed" the park. This consisted mainly in a first contact between AENOR and Teide National Park, where doubts about the certification were explained and the level of implementation of the system was evaluated as well as the park's compliance with environmental legislation.

- In November 2004 AENOR held its final audit after which it presented a report which identified areas of non-compliance. After this audit an action plan was created that defines the actions carried out in 2005 to correct these problems.

Finally, in order to give the public and all interested parties information on the environmental behaviour of Teide National Park, the Environmental Declaration was created.

This document has been validated by AENOR on November 8, 2005 with the verification number VDM-05/049, and will be sent to the Canarian government's Vicecouncil on the Environment so that Teide National Park will be included on the EMAS registry.

The *Mont Avic Nature Park* was the first Protected Natural Space in Europe to receive EMAS certification at the beginning of 2003; in July of the same year *Dolomiti Bellunesi National Park* obtained the integrated certification quality-environment (ISO 14001 e ISO 9001) becoming the first European National Park to receive that EMAS certification.

Teide is the first Spanish National Park to begin to implement this kind of eco-management system and it is expected to receive the EMAS certification before the end of the year, given that the administrative processes are almost complete.

## Anual Report- European Diploma

(FROM 1 OCTOBER 2003 TO 30 SEPTEMBER 2004)

**Country:** SPAIN
**Name of diploma-holding area:** Teide National Park
**Central Authority:** AUTONOMOUS ORGANISATION OF NATIONAL PARKS **(**GRAN VÍA DE SAN FRANCISCO, 4; 28005 MADRID. Tel./fax num: 915964600-4895 / 915964874. E-mail: oapn-mail@mma.es
**Authority responsible for managing the diploma-holding area:** MIXED CANARY ISLAND NATIONAL PARK MANAGEMENT COMMISSION. (C/ EMILIO CALZADILLA, 5; 4º; 38002 SANTA CRUZ DE TENERIFE)
**Director-Conservador:** Manuel Durbán Villalonga (mdurban@oapn.mma.es)
**Tel./fax num:** 922 290129 / 922 244788
**e-mail:** teide@oapn.mma.es

### Natural Heritage
***1.1.***

Since October 2003 and up until September 2004, a total of 72 abandoned dogs were captured in the National Park, of which only 19 carried microchips. These animals were distributed in the following way:

- 2 were returned to their owners thanks to the information on the microchip.
- 70 were handed in to the pro-Animal Protection Association of Tenerife.

The lost or abandoned animals that have been retrieved during this period, of which most have been given to the pro-Animal Association of Tenerife has been, to a great extent, thanks to the active participation of this Association, which has gone up almost daily to the National Park, to pick up the dogs previously gathered by the Park's personnel and take them to their Association.

For the rabbit control campaign, we can highlight the measures for reporting lost animals by their owners, registering in this period approximately 40 claims.

As regards the stray cats, on 27th January 2004, a meeting was held with the Nursery of the Hunting Society Consortium and it was agreed that they would collaborate in the capture of these animals in the Fasnia farm using cage-traps loaned by Teide National Park. The tasks were coordinated with captures carried out by the personnel working at the Park inside the Park and in the Isere estate.

The activities for capturing have been carried out twice a week (cage placing and control) throughout the months of February to June, testing different types of bait and weekly changing the sites of the cages-tramps. The results obtained have been very inauspicious: only one animal was captured, some cats were found dead in the traps and various cage-traps that had been set were stolen. The collaboration of the Animal Protection Association of Tenerife (A.P.A.T.) has been important in fulfilling these tasks.

Following the trend of recent years regarding exotic flora introduced into the park, all detected plants were manually eradicated in the entire surrounding of the National Park. Furthermore, reconnaissance operations have been carried out in areas previously subject to eradication, with the aim of detecting the presence of any possible new neophytes of the species introduced.

As regards the perdiz moruna (*Barbary partridge*), a periodic vigilance has been carried out of the bird feeders and drinkers placed at the end of the year 2002 in the Fasnia and Iserse estates, replenishing water and food, with the aim of increasing the potentiality of these areas apt for this species. Since February 2004, the Consortium of Hunting Societies has collaborated in overseeing and repositioning the bird feeders and drinkers within the Fasnia estate.

In December 2003, partridges were released twice in the space of a week with the intention of sharing the actions in time and space and hence ensure the success of the repopulation. The birds were placed in acclimatisation cages in each estate, where they became familiar with the surrounding previous to their release 2 days later. The number of partridges used for the repopulation was as follows:

- 1st release: 125 partridges, 86 in Fasnia (divided into two acclimatisation cages) and 39 in Iserse.

- 2nd release: 124 partridges, 85 in Fasnia (in one cage) and 40 in Iserse.

The partridges came from the Helecho estate, located in the upper part of Arico, at around 1,200 metres altitude, property of the *Cabildo Insular* of Tenerife. The genetic quality and salubriousness of these birds, was hence guaranteed. All the partridge repopulations carried out in the island of Tenerife have the same origin.

A periodic inspection of the site has been carried out as a result of the release, confirming that the partridges have been slowly moving away from the area of release.

***1.2.***

The activities carried out over recent years regarding the conservation of endangered plant species (*Stemmacantha cynaroides, Silene nocteolens, Helianthemum juliae,Bencomia exstipulata,Echium auberianum,Gnaphalium teydeum, Cistus osbaeckiaefolius*) continue to be of vital importance to their survival. This is particularly true with respect to those aspects linked to the behaviour of populations in their natural habitat.

In the period being reviewed, the monitoring studies designed to detect the stability level of these populations have continued. The studies have used population viability analysis techniques (mortality and renewal rates), which enable researchers to predict the taxon's probability of extinction or, when applicable, the evolution of its populations in relation to the principal demographic parameters.

Simultaneously, diverse analyses have been carried out in order to study the productivity that characterizes the populations of each species, collecting census of fruit and seeds (reproduction rates), census of seedlings (mortality/survival rates) and biometry of seedlings in cohort, etc. Similarly, *ex situ* experiments have also been carried out in order to analyse the germination rate of these taxons.

We have also continued our research into the inter and intra-population genetic variability of certain species, such as *Helianthemum juliae*. The main aim of this research is to identify the exact genetic heritage of the few remaining resources of some of these species.

A meticulous study has been initiated with the aim of quantifying in the future, the magnitude of the effect produced by the introduced herbivores (mouflons and rabbits) on the flora and vegetation of the National Park. Although these damaging effects are evident, the numeric characterization, both globally and differentially, is very precarious, making this a necessary study by which to device advanced management measures as well as to complete the monitoring data carried out on the menaced species of the National Park with an eye on their population viability.

A selective gathering of seedlings and nursery plants for their posterior planting in their natural environment, are some of the principle *ex situ* actions of the recuperation program, thereby tackling the reinforcement of various populations of the species at a higher rate of extinction such as *Stemmacantha cynaroides, Helianthemum juliae, Bencomia exstipulata, Silene nocteolens* and *Cistus osbaeckiaefolius*. The number of specimens restored have thus successfully increased, providing a greater stability to their precarious natural manifestations. With this last objective in mind some sectors have been fenced, as is the case of Llano de Maja, site which contains one of the last natural representations of *Stemmacantha cynaroides.*

Lastly it is important to highlight the maintenance, improvement and adaptation tasks carried out in the Teide National Park Botanical Garden, which fulfils not only actions of educational interest, but is also an important support to the preservation actions of threatened plant species providing a refuge for samples of unquestionable value of these rare endemism.

**Cultural heritage and socio-economic context**
***2.1.1.***

The National Park organised in the month of November the fifth edition of the course “Accredition of knowledge required to work as a guide in the Teide National Park”. Celebrated in Santa Cruz de Tenerife, among the objectives of this course we find:

- To accredit the knowledge required by professionals in the sector in order to work as a guide in the Teide National Park.
- To provide information regarding the natural and cultural resources of the Teide National Park.
- To explain the natural processes that take place in the Park.
- To explain the Park’s management and planning directives within their legal context.
- To outline the Public Use activities that take place in the Park.

- To instil a knowledge of the codes of conduct that should be respected in the Park.

The course had 30 students and lasted twenty-seven lecture hours, divided between five afternoons plus a seven-hour visit to the Teide National Park on the morning of the last day. At the end of the course attendees took an exam to certify that they had gained the required level of knowledge.

Currently around 270 people are qualified as guides and the sixth edition of the aforementioned course, to be held at the end of this year, is already announced.

The work to have the Teide declared part of the World Heritage list continues. Among the actions taken locally, we can highlight the lectures given to environmental associations on the island, as well as the participation in the 8th University and Heritage International Seminar Forum ("Natural World Heritage: natural habitats, development, sustainability and ethics") held in La Laguna November 24-28; or in the 7th International Conference on the Renovation of Architectural Heritage and the Art of Building, held in Lanzarote from 12th to 16th July.

An important point about the initiative to inscribe Teide National Park on the World Heritage List is that the on April 2, 2004 The Spanish Historic Heritage Council included the Teide National Park on its "World Heritage" list with the goal of continuing process to have it inscribed on the list.

### *2.2.1.*

By Resolution of 6th November 2003, of the Autonomous Organisation of National Parks, the following public state subsidies were granted to the Areas of Socio-economic Influence of the National Parks corresponding to the year 2003.

| RECIPIENTS | PROJECT | 2003 | 2004 | 2005 | TOTAL |
|---|---|---|---|---|---|
| GRANADILLA DE ABONA TOWN HALL | RECOVERY OF THE MAIN RURAL AND PUBLIC ROADS IN THE TEIDE SOCIOECONOMIC INFLUENCE AREAS | 14,655.95 | 14,655.95 | 29,311.90 | 58,623.80 |
| GUÍA DE ISORA TOWN HALL | IMPROVEMENT OF THE ROADS TO ACCESS THE TEIDE N.P. BY THE RURAL *CASERIOS* OF ARIPE AND CHINCHE | 26,051.67 | 60,787.23 | 0.00 | 86,838.90 |
| LA GUANCHA TOWN HALL | WIDENING AND IMPROVEMENT OF THE RURAL SURROUNDING OF LAS LONGUERAS | 24,393.19 | 30,941.48 | 67,081.26 | 121,965.93 |
| LA OROTAVA TOWN HALL | PROJECT TO IMPROVE THE MARGINS AND REPAVING OF THE LA LADERA PATH, SECTION III | 38,077.97 | 58,847.46 | 118,464.41 | 215,389.84 |
| LOS REALEJOS TOWN HALL | CONSOLIDATION OF THE AGRICULTURAL-FOREST TRAIL OF CRUZ DEL CASTAÑO | 18,141.94 | 22,677.42 | 49,890.33 | 90,709.69 |
| VILAFLOR TOWN HALL | REMODELLING AND CONDITIONING OF THE CAMINO REAL DE CHASNA | 10,663.04 | 24,880.44 | 0.00 | 35,543.48 |
| FASNIA TOWN HALL | RESCUING THE TRADITIONS IN FASNIA | 47,248.48 | 0.00 | 0.00 | 47,248.48 |
| VILLA DE ARICO TOWN HALL | PROJECT FOR THE DEVELOPMENT OF A SUSTAINABLE RURAL TOURISM. PHASE II | 41,280.05 | 0.00 | 0.00 | 41,280.05 |
| SAN JUAN DE LA RAMBLA TOWN HALL | GORSE | 13,841.44 | 0.00 | 0.00 | 13,841.44 |
| ***TOTAL LOCAL CORPORATIONS*** | | | | | **711,441.61** |
| TECHNICAL ADVISORS IN VITICULTURE AND ENOLOGY BENAIGA S.L. | ACQUISITION OF SPECIALISED MATERIAL FOR THE IMPROVEMENT OF THE LAB EQUIPMENT FOR WATER, SOIL AND WINE ANALYSES | 901.52 | 17,128.84 | 0.00 | 18,030.36 |
| BENIJOPS S.C.L FARMING AND LIVESTOCK COOPERATIVE | METALLIC CAGES, PACKER, CARROTS LABORATORY AND MACHINERY | 1,250.10 | 23,752.00 | 0.00 | 25,002.10 |
| LAS MEDIANIAS, FARMING COOPERATIVE. | LOGISTIC EQUIPMENT FOR THE NURSERY, 2ND PHASE | 1,132.91 | 10,196.16 | 0.00 | 11,329.07 |

| | | | | | |
|---|---|---|---|---|---|
| LUIS MESA GONZÁLEZ | IMPROVEMENT OF THE ACCESS TO CASA LA VISTITA | 540.91 | 4,868.20 | 0.00 | 5,409.11 |
| PATEA TUS MONTES SENDERISMO Y AVENTURA S.L. | THE CANARIAN NATIONAL PARKS IN YOUR BACKPACK | 934.44 | 2,470.56 | 0.00 | 3,405.00 |
| ***TOTAL COMPANIES*** | | | | | **63,175.64** |
| FERDINAND FEIGEL | REHABILITATION OF THE STRAW LOFT | 750.75 | 2,252.25 | 4,504.50 | 7,507.50 |
| SIXTO GONZÁLEZ SOSA | ELIMINATING THE AERIAL CABLEWAYS IN THE RURAL NUCLEUS OF LAS VEGAS | 1,122.32 | 5,112.79 | 0.00 | 6,235.11 |
| EDUARDO MARRERO MARRERO | RESTORATION OF TWO LOFTS IN PINOLERIS | 2,040.79 | 6,122.38 | 12,244.77 | 20,407.94 |
| NICOLÁS PERDOMO LINARES | REFORMATION OF LOFT | 1,451.26 | 6,611.28 | 0.00 | 8,062.54 |
| ***TOTAL ASSOCIATIONS*** | | | | | **42,213.09** |
| FARMING ASSOCIATION LOS POLEOS | RECOVERY OF DRY ORCHARDS IN THE REGION OF ISORA | 2,716.12 | 8,148.37 | 16,296.74 | 27,161.23 |
| ASSOCIATION OF BEEHIVERS OF ISORA | ACQUISITION OF A HONEY BOTTLER FOR THE ASSOC. OF BEEHIVERS OF ISORA | 22,290.30 | 0.00 | 0.00 | 22,290.30 |
| ASSOCIATION OF CIVIL PROTECTION VOLUNTEERS TIGAYA | IMPROVEMENTS OF THE BASIC EQUIPMENT IN PROTECTION AND EMERGENCY SERVICES IN THE SURROUNDING AREAS OF NATURAL SPACES | 2,417.98 | 0.00 | 0.00 | 2,417.98 |
| SPANISH RED CROSS | FIRST AID, RESCUE AND ENVIRONMENTAL SENSITIVISATION SERVICES | 30,768.44 | 0.00 | 0.00 | 30,768.44 |
| ***TOTAL ASSOCIATIONS*** | | | | | ***82,637.95*** |

Total of subsidies year 2003: EIGHT HUNDRED AND NINETY-NINE THOUSAND FOUR HUNDRED AND SIXTY EIGHT EUROS AND TWENTY NINE CENTS (899,468.29).

For its part, the Autonomous Organisation of National Parks, by Resolution of 28th January 2004, called for the concession of public state subsidies in the areas of socio-economic influence of the National Parks for the year 2004. The grant is foreseen for the end of this year.

**Educational and scientific activities**
***3.1.1.***

On occasion of the celebration of the 50th anniversary of the National Park's creation, a symbolic act took place on 22nd January 2004, of placing the first brick of what will be the new Administrative, Interpretative and Services Centre of the Park, located in the town centre of La Orotava. The building is expected to be finished in fall of the next year 2005 and implies a total investment of 8,000,000 euros with the final project.

At present there are 21 information signs distributed around the viewpoints and most representative sites of the Park, following the installation of the last 4 designed for the Botanical Garden and the Viewpoints of Zapatilla de la Reina and La Tarta.

New signs have been placed in regard to the Telesforo Bravo path, cautioning of the need for a permit to gain access to the Peak of Teide.

The budget to expand the Cañada Blanca Visitors Centre and equip the projection hall with a modern projector has been approved. This budget also includes remodelling the projection hall and upgrading the projector in the El Portillo Visitors Centre. The award of the corresponding tender is expected to take place before the end of this year.

In September 2004 a proposal was approved for drawing up a project to adapt the Casa de Juan Évora site Museum and its surrounding.

We continue to work on the educational project named "Teide for Didactics", which intends for the Teide National Park to be not only a space to "explain" but also, with the use of new educational tendencies, to become a place to "educate".

Among the new informative material handed out among the Park's visitors, we should make a point of highlighting the pamphlet referred to the effects of the mouflon on the vegetation, and somewhat more technical, the climbing Guide edited by the Canarian Mountain Federation.

We continue to collaborate with publications related to the environment, the preservation of nature and environmental education, and with other generic ones that occasionally discuss the subject of the Teide National Park.

The National Park's personnel continues spreading their resources and knowledge through talks (some, specifically for students of the island, and others, directed to the general public) and participating in fairs and conferences, such as was done in the *IV feria ecológica y del medio rural* (environmental and rural world fair) and *VII semana ecólogica* (environmental week) organised by the Town Hall of La Orotava.

Following is a detailed list of the main events organised throughout the period in question referred to in this report on the occasion of the Teide National Park's 50$^{th}$ anniversary as well as other pending events.

## Events carried out

- Presentation to the national press attending the commemorative events (El Portillo Visitors Centre, 21 January).
- Official commemoration ceremony of the 50th Anniversary of the Las Cañadas del Teide Parador (22 January 2004).
- Ceremony placing the first brick of the La Orotava Administration and Interpretation Centre of (22 January 2004).
- Section in the primary school curriculum that affected 25,000 primary school students around the Canary Islands.
- The education centres that participated in the Park Education Program were furnished with material and documentation giving general information on Teide National Park and on its 50th anniversary (110 Centres).
- Participation with a Stand in the *V Feria del mundo rural* and *VIII Feria Ecológica* (*VIII Semana Ecológica*) in the Valley of La Orotava: 17 April (Environmental week, from 17 to 23 April).
- Lectures given during the *VIII Semana Ecológica de la Villa de La Orotava* (17-23 April):
  - "Teide National Park archaeological resources", Matilde Arnay de la Rosa, 19 April.
  - "Historical-scientific notes on Las Cañadas and Teide", Eustaquio Villalba Moreno, 20 April.
  - "Threatened flora in Teide National Park: application of the Genetic Rescue Plans", Manuel Marrero Gómez, 21 April.
  - "Teide National Park Geology: origin of the of Las Cañadas crater", José Manuel Navarro Latorre, 22 April.
- Postmarks created on the initiative of the Philatelic and Numismatic Group *Las Pintaderas de La Orotava*. The presentation of the postmark was made during the programmed acts of the 7th Ecology Week of the Valley of La Orotava (17-23 April).
- Presentation of the "*Nature Cantata. Remembering Alexander von Humboldt and. Telesforo Bravo on the 50th anniversary of the Teide as a National Park*", organised by the Puerto de la Cruz Municipal Government: 23rd May in the Auditorium of Santa Cruz de Tenerife and 30th May at the San Francisco Park in Puerto de la Cruz.
- Presentation of the book "*Teide: from Geographical Myth to National Park*", 11th June, in the San Agustín Senior Citizen Home of La Orotava. Authors: Isidoro Sánchez García and Nicolás González Lemus.
- Presentation of the books, edited by the Autonomous Organisation of National Parks, "*Teide: a Historical Look*" (written by Eustaquio Villalba Moreno) and "*Historical Study of the Camino Real de Chasna*" (coordinators Matilde Arnay de la Rosa and Juan Ramón Núñez Pestano): 18th June held at the Edificio de Usos Múltiples I in Santa Cruz de Tenerife.
- Presentation of the Specific Programme of the 50th anniversary celebration in Teacher's Centres.
- Lectures on topics related to the Park's 50th anniversary in Education Centres that had scheduled acts to celebrate the (2nd and 3rd term of the school year 2003/04).
- Technical assistance to carry out various events and artistic and artisan workshops

(cart of the Primary School Teófilo Pérez in Tegueste, Workshops during the Cultural Week of the School María Auxiliadora in La Laguna, etc.).

- Information to different news media to improve the dissemination of the Anniversary. Reports appeared in the press and other specialised mediums.
- Participation of the Park's Administration personnel in different programmes and seminars both on television and radio.
- Technical and material collaboration in the Exposition "50th Anniversary of Teide National Park", organised by the Canarian-Germanic Foundation Alexander von Humboldt and which has been celebrated in various places (Puerto de la Cruz, Santa Cruz de Tenerife, Germany).
- Open door congresses, specific activities (lectures and routes) and commemorative ascents of Teide, with different groups (handicapped groups, neighbourhood associations, senior citizens groups, etc.). These activities have been in course since the second half of June and until the present have included the following:
    - *Association San Lázaro Amor a los Niños* (mentally handicapped): talk given at the association Thursday 22 and guided route through the Park Friday 23 July.
    - Program of guided routes in collaboration with La Orotava Municipal Government for associations and the local population: Saturdays10, 17, 24 and 31 July.
    - Route with the Canarian Foundation Alejandro Da Silva (fighting against leukaemia), dedicated to the care of oncohematological patients: 6th july.
    - Giuded routes in collaboration with the Andrés Llarena Ocupacional Centre for the physically and mentally handicapped located in Güímar: routes on the days 16 and 27 July.
    - Tenerife Association for Deaf People– ASORTE: talk given on the 10th of July, preparation to ascend Teide, staying overnight at the Refuge of Altavista (11-12 September).
    - Development and Employment Society of the Santa Cruz de Tenerife Municipal Government: lecture on 26th July and guided route on 2nd August.
    - Handover of diverse material and documents on the National Park's general information and on its 50$^{th}$ anniversary to the Handicapped Centres of the island of Tenerife (40 Centres).
    - Exchange of experiences between the personnel from the National Park and from the La Laguna Municipal Government, city catalogued on the World Heritage List: 24th September visit to the historic centre of La Laguna; 8$^{th}$ October: visit to the Teide National Park.

**Pending or foreseen actions**

- Celebration of the I National Meeting of Interpreter-Guides of the Spanish Heritage National Parks: from 11 to 15 October at the Teide National Park (Nature Activities Centre Emilio Fernández Muñoz).
- Award Giving day for those credited to perform as Guide in the Teide National Park: 5 year groups.
- Series of descriptive conferences of each on of the National parks in the Network. Organised by the Teide National Park and to be celebrated in Tenerife (Museum of Nature and Mankind) from 2 to 8 in the month of November, following the

celebrations of the 50th anniversary of the creation of the National Park of Caldera de Taburiente. Schedule: 2nd November: Teide, Timanfaya and Garajonay; day 3: Picos de Europa, Ordesa and Monte Perdido and Sierra Nevada; day 4: Tablas de Daimiel, Aigüestortes i Estany de Sant Maurici and Doñana; day 5: Cabrera, Cabañeros and Islas Atlánticas de Galicia; and day 8: Caldera de Taburiente and two specific ones of Teide, which will be run by Ms. Matilde Arnay de la Rosa (Archaeology and traditional uses) and Mr. Wolfredo Wildpret de la Torre (Flora and vegetation).

- Macro-exhibition held in collaboration with the Caldera de Taburiente National Park, financed by the Autonomous Organisation of National Parks. Inauguration date: 30th October in the Island of La Palma; later it will be shown in Liceo Taoro in La Orotava, from 25th November to 8th December.
- Week dedicated to Teide during the Enlightenment Century, promoted by the Royal Economic Society of the Friends of the Countryof Tenerife, with the collaboration of the Teide National Park. To be held at the end of November in the Chapel of San Miguel de La Laguna, and in which pictures will be exhibited from the Telesforo Bravo Archive and the lectures given will be: Teide and its relation with the literature of the 18th Century, given by Mr. Rafael Fernández Hernández; Teide in the 18th Century cartography (Juan Tous Meliá) and Teide in the work of Viera y Clavijo (Mr. Eustaquio Villalba Moreno).
- Meeting of the National Parks Network Council: 31st October, in the Teide National Park (Cañadas del Teide Parador).
- Issuance of diplomas for the Young Park Custodians Campaign: 31st October, in the National Park.
- Awards Ceremony of the "12th Writing and Drawing about the Teide National Park Contest" for school students of the island and which will take place on the 31st October (winners will travel to the National Parks of Doñana and Caldera de Taburiente during the week of the 22nd to the 28th November).

***3.1.2.***

The number of visitors from October 2003 to September 2004, increases to a total of 3,382,382. The month with the highest affluence has been August 2004, with 418,974 and an average of 13,667 daily visitors. Throughout this month and following the general dynamic, the most frequently used access to the Park has been through La Orotava by those visitors arriving by car and Vilafor for those arriving by bus.

It is observed that throughout the winter months a massive entrance of visitors arrives from the southern accesses, mainly from Vilaflor.

***3.1.3.***

- Mr. General Captain of the Canary Islands, General Tenent Mr. José Javier Arregui Asta.
- Scientists participating in the project "E-ruption: a satellite telecommunication and internet-based seismic monitoring system for volcanic eruption forecasting and risk management", coordinated by the National Geographic Service.

- President Mr. Jaume Matas, and other members of the Government of Baleares.
- Marielle Richon, Chief of the Promotions, Publications and Education Unit of the World Heritage Centre of UNESCO.
- Attendants to the VIII International University and Heritage Forum Seminar (The World Natural Heritage: natural habitats, development, sustainability and ethics).
- Phytosanitary work teams of forests, parks and gardens, in a meeting organised by the Regional Ministry of Agriculture, Livestock, Fisheries and Food of the Government of the Canary Islands.
- Delegation of the National Parks of Tanzania.
- Attendants to the Annual Conference of the European World Trader Centres and the extraordinary Conference of the tourism, hospitality and cultural exchange world committee of the WTC association.
- Technical National Commission of Edifying Quality.
- State Board of Forestry Technicians, on occasion of the celebration of the World Forestry Day and the National Park's 50th anniversary.
- Annual assembly of foreign trade counsellors from France in Spain.
- Ascent to Teide by members of the deaf peoples association of the Canary Islands, with the support of the Park's personnel.
- Personnel from the Town Hall of La Laguna, in an exchange of experiences related to the title of World Heritage.

### *3.2.1.*

The Park Administration granted 35 research permits in response to applications submitted between 1st October 2003 and 30th September 2004. The corresponding studies are listed below:

| Applicant and enterprise/organisation | *Research Work* | Date of work | Application date |
|---|---|---|---|
| Vicente Araña Saavedra. *C.S.I.C.* | Analysis of dry volcanic fluid and fumarole gases in Spain - Italy | 10 to 13 October 2003 | 01/10/2003 |
| Mª José Blanco *Canary Islands Geophysics Institute* | Installation of a temporal seismic station (Project e-ruption) | November 2003 -November 2004 | 08/10/2003 |
| Richard P. Brown *University of Liverpool* | Course study of flora | 11 December 2003 | 20/11/2003 |
| John Shaw *University of Liverpool* | Geophysics practical course | 24 January- 5 February 2004 | 21/11/2003 |
| Inés Galindo Jiménez I.T.E.R. | Volcano-tectonic evolution in the Teide National Park | December 2003 - July 2004 | 04/12/2003 |
| Marisa Tejedor Salguero University of La Laguna | Characterisation of the hydro functioning of the floors of the Island of Tenerife | December 2003 - December 2004 | 04/12/2003 |
| Joan Martí Molist. *C.S.I.C.* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evaluation and risk in Tenerife | Pending on E.I.A. | 07/11/2003 |
| August Gudmundsson *University of Gottingen* | Vulcanology course, practice class | From17 to 23 February 2004 | 05/02/2004 |
| Nemesio M. Pérez *Technological Institute of Renewable Energy - ITER.* | Installation of a GPS station in the upper cable car booth | 13 February 2004 | 12/02/2004 |

| | | | |
|---|---|---|---|
| Juan Carlos Carracedo *Superior Council of Scientific Investigations - CSIC.* | Vulcanological and structural study of the Teide Rift Complex northeast of the island of Tenerife | 22 and 23 March 2004 | 11/03/2004 |
| Johannes Gerardus Oostermeijer *University of Amsterdam* | Biology of the preservation of species of vegetation endemic to Teide National Park | 31 March 2004 | 23/03/2004 |
| Álvaro Márquez González *Rey Juan Carlos I University* | Application of geophysical detail techniques to the study of the gravitational deformation and stability of large volcanic structures. | From 26 to 30 April 2004 | 26/03/2004 |
| Joan Martí Molist. *C.S.I.C.* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evaluation and risk in Tenerife | From 13 to 24 March 2004 | 29/03/2004 |
| Joan Martí Molist. *C.S.I.C.* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evaluation and risk in Tenerife | From 13 to 18 March 2004 | 29/03/2004 |
| Manuel Nogales Hidalgo *I.P.N.A.* - C.S.I.C | Trophic ecology of the Alcaudón Meridional (*Lanius meridionales)* | From 13 March to 31 December 2004 | 29/03/2004 |
| Inés Galindo Jiménez *I.T.E.R.* | Study of the eruption of Guajara. (Cañadas structure) | From 13 to 28 May 2004 | 02/04/2004 |
| Raúl Martín Moreno *Autonomous University of Madrid* | Comparison of high altitudes and high latitudes | From 27 April to 13 May 2004 | 23/04/2004 |
| Joan Martí Molist. *C.S.I.C.* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evaluation and risk in Tenerife | From 24 April to 2 May 2004 | 23/04/2004 |
| Joan Martí Molist. *C.S.I.C.* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evaluation and risk in Tenerife | From 9 May to 12 June 2004 | 23/04/2004 |
| Raúl Martín Moreno *Autonomous University of Madrid* | Comparison of high altitudes and high latitudes | From 7 to 14 May 2004 | 04/05/2004 |

| | | | |
|---|---|---|---|
| José Carrillo Hidalgo *University of La Laguna Biology Department.* | Phylo-geographic study of the common kestrel in the Canary Islands | From 17 May to 31 Deciember 2004 | 07/05/2004 |
| Arnoldo Santos Guerra *La Orotava Acclimatisation Garden - ICIA (Canarian Institute of Agricultural Research).* | Study of the reproductive biology of autochthonous plants of Teide National Park | From 26 May to 2 June 2004 | 07/05/2004 |
| Pedro Oromí *University of La Laguna* | Anthropod Zoology course, practice class | 24 May 2004 | 21/05/2004 |
| Mª José Blanco *Canary Islands Geophysics Institute* | Observation of the magnetic control station (CAN) | From 15 to 18 June 2004 | 21/05/2004 |
| Ricardo Vieira Díaz *Astronomy and Geodesy Institute* | Re-observation of the geodesic distance, levelling and gravimetry networks | From 18 June until the end of September 2004 | 15/06/2004 |
| Susan Baker *University of Greenwich* | Geological map | From 14 July to 9 August 2004 | 07/07/2004 |
| Álvaro Márquez González *Rey Juan Carlos I University* | Application of geophysical detail techniques to the study of the gravitational deformation and stability of large volcanic structures. | From 16 to 23 September 2004 | 14/07/2004 |
| Gladys Melián Rodríguez I.T.E.R. | Study and observation of the levels of diffuse de-gasification in the cone of the Teide | From 4 to 22 August 2004 | 28/07/2004 |
| Blas Vilches Navarrete *Canarian Botanical Garden "Viera y Clavijo"* | Collection of seeds, plants and folders for the seed bank. | From 17 to 20 August 2004 | 03/08/2004 |
| Juan Carlos Carracedo *C.S.I.C.* | Vulcanological and structural study of the Teide Rift Complex northeast of the island of Tenerife | From 15 August to 15 September 2004 | 09/08/2004 |
| Douglas Godbold *University of Wales* | Practice outing for the Environmental Sciences course | 2, 4 and 6 November 2004 | 27/09/2004 |
| Mª José Blanco Sánchez *Canary Islands Geophysics Institute* | Installation of a temporal seismic station | From 30 September 2004 to 30 September 2005 | 29/09/2004 |

| | | | |
|---|---|---|---|
| Antonio Rodríguez Rodríguez *Universidad de La Laguna* | Evaluation of the degradation of the natural floors of the Island of Tenerife | Desde 7 hasta 15 de noviembre de 2004 | 06/10/2004 |
| Juan Carlos Carracedo *C.S.I.C.* | Geochemical and petrological study of the North-eastern Rift and of the Teide-Pico Viejo stratovolcano | From 20 to 25 October 2004 | 18/10/2004 |
| John Shaw *University of Liverpool* | Teaching of non-destructive, small-scale geophysical exploration techniques | From 22 January to 4 February 2005 | 19/10/2004 |

***3.2.2.***

VILLALBA MORENO, E. Organismo Autónomo Parques Nacionales "El Teide una mirada histórica". Serie Histórica.

ARNAY DE LA ROSA, M. & NÚÑEZ PESTANO, J. R. (COORDINADORES) "Estudio Histórico del Camino Real de Chasna" Organismo Autónomo Parques Nacionales. Serie Antropológica.

SÁNCHEZ GARCÍA, I. & GONZÁLEZ LEMUS, N. "El Teide, de Mito Geográfico a Parque Nacional". Ed. Lemus.

*Carqué, E., M.V. Marrero & A. Bañares (2003): Seed germination and dormancy in* Echium acanthocarpum *Svent (*Boraginaceae*), an endangered plant of the Canary Islands, Spain. Natural Areas Journal 23 (4): 362-367.*

Carqué, E., M. Durbán, M.V. Marrero & A. Bañares (en prensa): Influencia de los herbívoros introducidos en la supervivencia de *Stemmacantha cynaroides* (*Asteraceae*). Una especie amenazada de las Islas canarias. Vieraea, en prensa

Bañares, A., M.V. Marrero, E. Carqué & Á. Fernández (2003): Plan de recuperación de la flora amenazada del Parque Nacional de Garajonay. Las Gomera (Islas Canarias). Germinación y restituciones de *Pericallis hansenii, Gonospermum gomerae* e *Ilex perado* ssp*. lopezlilloi*. Botánica Macaronesica 24: 3-16

Marrero, M.V., Á. Bañares & E. Carqué (2003): Plant resource conservation planning in protected areas: an example from Canary Islands, Spain. Biological Conservation 113: 399-410.

Marrero, M.V., E. Carqué, Á. Bañares & Á. Palomares (2003): *Bencomia exstipulata* Svent. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 881-882.

Marrero, M.V., E. Carqué, Á. Bañares & Á. Palomares (2003): *Bencomia exstipulata* Svent. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro

Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 881-882.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Helianthemum juliae* Wildpret. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 284-285.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Silene nocteolens* Webb & Berthel. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 498-499.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Stemmacantha cynaroides* (Chr. Sm. *in* Buch) Dittrich. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 706-707.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Gnaphalium teydeum* Knapp. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 706.

Mesa, R., A. Acevedo, J.P. Oval, A. Hernández, M. Marrero & E. Carqué (2003): *Cerastium sventenii* Jalas. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Dirección General de Conservación de la Naturaleza, Madrid. 634.

**Management of the area**
***5.1.1.***

The plans aimed at controlling non-native animal species (rabbits and mouflons) and their effect on the Park's natural resources continued to be carried out.

**Mouflon Control**

Given the negative of the Hunting Federation to collaborate in the prolongation of the beatings carried out from July to September 2003 inside the Park, and in view of not having reached the fixed quota for them, 19 days were added, using the Administration's own means, in which personnel from the National Parks of Doñana and Ordesa collaborated. The actions took place from 11th November to 5th December 2003 and a total of 9 mouflons were eliminated.

Mouflon control actions were fulfilled inside and outside the National Park's boundaries with participants from the island, through the Island Hunting Federation and in coordination with the *Cabildo Insular* of Tenerife. The campaign began on July 2nd and finished on October 13th, with a total of 30 days in the interior of the Park. 27 animals were eliminated (20 females and 7 males).

### Mouflon Census

The results of the winter and spring mouflon census for the year 2004 in the National Park, have been 43 and 108, respectively, from a simple non-stratified extrapolation.

### Rabbit Control

The rabbit control campaign in the Teide National Park during the year 2004 took place between 1st August and 17th October throughout a total of 25 days, issuing around 2,700 permits and taking around 2,500 specimens. The control measures of stray dogs has continued, with an obligation for the participants to notify in written the loss of said animals.

At the end of the year 2003 a proposal of closure for the protection of endangered flora of the National Park was approved. Said proposal consists in the installation of three different types of parcels and sub parcels in 4 sites, with the aim of carrying out a thorough follow up of the effects of the herbivores on the endangered flora of the Teide National Park. The collection of data has begun in 2004 and will finish in 2007.

***5.1.2.***

An operation to prevent and extinguish forest fires is maintained. During the high-risk period, from July 1 to September 30, the operation is reinforced in relation to the low-risk period (the rest of the year). There have not been incidences that can be reviewed.

***5.1.3.***

With the aim of avoiding collateral damages, a series of restoration, conditioning and delimiting tasks have been set up on some of the main paths, with the aim of avoiding visitors to abandon them. Equally, works of maintenance of the main tracks of the Park have been initiated, above all following the habitual damages provoked by the harshness of winter.

To this respect, we can highlight the works framed within the Restoration project of the Teide National Park's habitat, which is already being carried out and whose objective centres around the restoration of the habitat of specific enclaves of the Park which have been degraded in past years with the objective of restoring them to their natural prime condition. The renovations can be summarised as follows:

- Restoration of ridges
- Demolition of infrastructure and shacks
- Integral restoration of the Historic Volcano Zone of Fasnia.
- Adaptation of roads and paths.

Even though the responsibility does not appertain to the Park, one of its objectives is to guarantee the safety of its visitors. For this reason, during this year, and with the

collaboration of the Park's Administration, the Canarian Mountain Federation has proceeded to reequip the climbing paths, activity that is permitted and regulated in the National Park.

***5.1.4.***

Two new energy generating equipments have been acquired to substitute the older ones in order to minimise the sound impact and economise the combustion expense.

***5.2.1.***

Carolina Suris Mesa, Administrative Assistant with a post in the National Park of la Caldera de Taburiente, will be incorporated into the Teide National Park in the month of April in the Services Commission.

***5.2.2.***

*The access exams to the scale of environmental agents of National Parks (Orden MAM/1157/2003, 29 April) have finalized. Out of four of the posts designated to cover these protected habitats in the Canaries, one corresponds to Teide. We are awaiting the assessment and introduction of the new environment agent of the Teide National Park.*

*Equally, by Order MAM/691/2004, of 4 March, the selection process has opened for entrance by the free access system into the scale of environmental agents of National Parks, of which 3 posts correspond to the Canary Islands.*

***5.2.3.***

During the implementation process of the Environmental Management System in the Teide National Park, the environmental aspects have been identified, both direct ones (related with its activities, installations and services), and indirect (of which it does not have full management control) and in emergency conditions, with the object of determining which ones are significant and establishing goals for improvement. Quantitative data have been obtained in relevance to each environmental aspect in all areas of the Park.

The environmental aspects comprise, among others, the following environmental subjects:

- Emissions
- Wastes.
- Residues.
- Noise
- Consumption of natural resources and energy.

Yearly, the Mixed Commission Management of the Canarian National Parks, approves the Environmental Objectives. At the time of establishing the objectives, it is necessary for them to be feasible, quantifiable and can be planned in time, asides from contemplating the compliance of the legal requisites, the significant environmental aspects and the opinion of the parts involved. These objectives, in which the entire personnel is involved, are directed towards pollution prevention and continuous improvement.

***5.2.4.***

The Park's personnel lodged a total of ninety five (95) claims during the period referred to in this report, related to incompliance of the norms in force, figure which doubles the previous period. This significant variation is principally due to the increase in claims towards the people who, participating in the cinegetic control campaigns of the Park have not complied with the established guidelines.

**II.**

The procedures and report attachments to declare the Teide National Park as World Heritage continue.

The implementation of the environmental management system EMAS follows its course.

**III.**

Activities are still being carried out regarding the rabbit population with the aim of keeping it within acceptable parameters. This is made possible thanks to the yearly campaigns of cinegetic control and the collaboration of the island's hunters.

As regards the mouflon, management controls have continued both in the interior and exterior of the Park (in this last case, in coordination with the *Cabildo* of Tenerife), tending towards the eradication of said introduced herbivore.

We have also continued our research on inter- and intra-populational genetic variability of some of the autochthonous plant species, as is the case of *Helianthemum juliae*

For the fourth consecutive year, the number of visitors to the Park has decreased. Specifically, in the year 2003, 3,364,874 people visited this protected habitat, in comparison to the 3,488,62 who came in the year 2002. These figures correspond to natural years and not to the twelve month period from October to September.

The subsidies for works and projects in the socio-economic area of influence of the Teide National Park in appliance to the article 18.2 of the Law 4/89, and corresponding to the tend in the year 2003, reached a total sum of eight hundred and ninety nine thousand four hundred and sixty eight euros and twenty-nine cents (899,468.29) distributed in the manner exposed in section 3.2.1 of the present report. We highlight at the same time, that by Resolution of 28$^{th}$ January 2004, the concession of this type of subsidies has been convoked corresponding to that year.

By Order 691/2004 of the Ministry of Environment, of 4th March, selection exams are convoked for entering the scale of environmental agents of the National Parks, 3 posts being reserved for these protected Canarian habitats.

Likewise, we are just awaiting the adjudication and incorporation of the new environmental agent who will develop his/her work in the Park (tender through state exam Order MAM 1157/2003, of 29th April).

Santa Cruz de Tenerife, December 2004

DIRECTOR-CURATOR



Manuel Durbán Villalonga

## 2004 report of the Teide National Park

### *General information*

**Total surface area of the Park:** 18,990 ha
**Surface area of the protection zone:** 6,864 ha
**Municipalities included in the socio-economic area of influence:** 14 (the 11 that are cited as follows, plus Arico, Fasnia and Güímar)
**The municipal distribution of the Park's surface area: (%):**

| | |
|---|---|
| La Orotava | 77.60 |
| Guía de Isora | 8.85 |
| Icod de los Vinos | 7.18 |
| Granadilla de Abona | 2.15 |
| La Guancha | 1.34 |
| San Juan de la Rambla | 1.26 |
| Adeje | 0,01 |
| Santiago del Teide | 0.81 |
| Los Realejos | 0.35 |
| Vilaflor | 0.34 |
| Garachico | 0.11 |

**Land ownership (%)**

| | |
|---|---|
| Public: | 99.98 |
| Private: | 0.02 |

**Additional protection:**

- - European Diploma of Protected Areas, given by the Council of Europe in 1989 and renewed in 1994, 1999 and 2004.
- Community Interest Area (LIC)
- Environmentally Sensitive Area, as indicated in the Environmental Impact Prevention Law 11/1990 of July 13.
- The part expanded in 1999, that until then had been the Corona Forestal Nature Park, is categorized as a Special Protection Zone for Birds (ZEPA).

**State legal instruments (Declarative Laws, Management and Usage Administration Plans, etc.):** January 22, 1954 Creation Decree; Reclassification Law 5/81, March 25, 1981; October 14, 1999 Resolution of the General Secretary of the Environment on the expansion of the National Park's boundaries.
**Autonomous Community legal instruments that affect the National Park:** Decree 153/2002 of October 24, that approves the Management and Usage administration plan (MUAP) (Official Bulletin of the Canary Islands #164, Wednesday 11 of December, 2002).

***Annual visitors (totals)***

**Total number of visitors:** 3,540,195 (first estimate)
**Student visitors (total of guided and unguided students):** since that the park has open access to the public, it is impossible to tell whether or not the visitors are students or not (although it is possible to measure the total number of visitors). However it is possible to measure the number of students that have visited the Park guided by the park's personnel and the number of students that come to the Visitor Centres, whenever they come as part of an organised visit.

5,457 students and 340 professors from 82 education centres from 26 municipalities in the island took excursions guided (111) by the park's personnel. Moreover, 7,518 students and 803 professors listened to a speech (147) in their education centre, belonging to 99 different centres from 26 municipalities in the island. Of the 119,076 people who visited the El Portillo Visitor Centre, 6,683 were students from Tenerife, 1,575 were students from the other islands of the archipelago and 2,776 were students from mainland Spain or the Balearic Islands. Of the 166,190 people who came to the Cañada Blanca Visitor Centre, 1,494 were students from Tenerife, 98 were students from the other islands of the archipelago and 792 were students from mainland Spain or the Baleares Islands.

**Guided visits (of all kinds):** personnel from the park guided 617 excursions in which 6,843 people took part. Among these visitors there were 5,457 students and 340 professors in 111 of the excursions. However, it has to be kept in mind that many people (approximately 45% or 1,600,000 people) visited the park in trips organised by travel agencies.

**Other available information (number of visits to the Visitor Centres, number of people attending audiovisual projections, average time of the guided visits, etc.)**

El Portillo Visitor Centre: 119,076 people
Cañada Blanca Visitor Centre: 166,190
Boca Tauce Booth: 18,156

The excursions guided on foot by the park's personnel take approximately two hours to complete, although they are offered from 1.5 hours up to 5 hours.

**Number of Visitor Centres:** 2 (Portillo and Cañada Blanca)
**Number of guided excursions:** 9

**Number of unguided excursions:** 35
**Other park services:**

- The Emilio Fernández Muñoz Nature Activities Centre (CANEFM): 65 groups and a total of 3,396 people used the centre, occupying it for 257 days.
- Permits to access Teide's peak: 14,055 were given out to a total of 43,198 people.

***Addresses***

Postal address, telephone number and e-mail of the centres that have personal attention (if there are various addresses, indicate all of them).

**Administration Office**

| | |
|---|---|
| **Address** | C/ Emilio Calzadilla, 5; 4º |
| **Zip code** | 38002 Santa Cruz de Tenerife |
| **Telephone** | 00 34 922290129 |
| **Fax** | 00 34 922244788 |
| **E-mail** | teide@oapn.mma.es |

**El Portillo Office**

| | |
|---|---|
| **Address** | El Portillo Alto (Km 34 carretera TF-21) |
| **Zip code** | La Orotava 38300 |
| **Telephone** | - |
| **Fax** | - |
| **E-mail** | - |

**El Portillo Visitor Centre**

| | |
|---|---|
| **Address** | El Portillo Bajo (Km 32 carretera TF-21) |
| **Zip code** | La Orotava 38300 |
| **Telephone** | 00 34 922356000 |
| **Fax** | - |
| **E-mail** | - |

**Cañada Blanca Visitor Centre**

| | |
|---|---|
| **Address** | Ala del Parador de las Cañadas del Teide (Km 46 carretera TF-21 |
| **Zip code** | La Orotava 38300 |
| **Telephone** | 00 34 922373391 |
| **Fax** | - |
| **E-mail** | - |

**Participating and managing organs**
***Mixed commission:***

**Members:**

Representatives of the State General Administration
- Inés González Doncel, served until 6/04/04
- Basilio Rada Martínez, served until 6/04/04
- Javier Moro Valverde, served until 6/04/04
- Miguel Castroviejo Bolíbar
- Appointed on 6/04/04:
- Antonio Serrano Rodríguez
- José Luis Herranz Sáez
- Juan Garay Zabala

Representatives of the Autonomous Community of the Canary Islands
- Milagros Luis Brito
- Isidoro Sánchez García
- Pedro Sosa Martín
- José Miguel González Hernández

Director-Curator of the Canarian National Parks:
- Manuel Durbán Villalonga, Director-Curator of Teide National Park
- Ángel Palomares Martínez, Director-Curator of the Caldera de la Taburiente National Park
- Aurelio Centellas Boda, Director-Curator of the Timanfaya National Park
- Ángel Fernández López, Director-Curator of the Garajonay National Park

Dates of meetings:
- February 27, July 7 and October 29, 2004

Summary of the principle agreements:

- Regarding the Conservation of Teide Natural Monument Norms: the Order that approves Teide Natural Monument Norm will refer to that which is established in Teide National Park's MUAP concerning its usage and also to Legislative Decree 1/20000, May 8 (which approves the Revised Text of the Territorial Planning of the Canary Islands and the Natural Habitats in the Canary Islands), that classifies and categorises its land.

- Regarding the Corona Forestal National Park's MUAP: the Decree that approves the Corona Forestal National Park's MUAP will refer to Teide National Park's MUAP in zones that overlap between the two parks and it will also refer to Teide National Park's MUAP concerning its usage and also to Legislative Decree 1/20000, May 8 (which approves the Revised Text of the Territorial Planning of the Canary Islands

and the Natural Habitats in the Canary Islands), that classifies and categorises its land.

- It was decided to approve the modifications to Teide National Park's Activity Plan corresponding to 2004.

- Regarding Teide National Park project, "Analysis of road danger, especially due to falling rocks", it was agreed to commission a study to find ways to improve vehicle safety.

- Pertaining to the creation of sanitary services for visitors of Roques de García in Teide National Park, it was decided that the project will not be carried out at present; as an alternative, the signage will be improved so that visitors can use the sanitary services at the Parador (hotel).

- Regarding the delay in the contracting procedure for the travelling exposition promoted by Teide National Park, it was agreed to contact the Autonomous Organisation of National Parks so that it can speed up the process.

- The 2002 Teide National Park Activities Report was approved.

- The composition of the teams proposed by the Director of Teide National Park that will carry out the development plans in Teide National Park's MUAP was approved.

- Regarding the new location and designation of the kilometre points of the TF-21, TF-24 and TF-38 roads caused by the modification of the route, it was decided to solicit a study by the Legal Services as to how to update these kilometre points in the content of the Administration Plan.

- In respect to the solicitude by the CSIC (Barcelona) to carry out the work in the "Determination of the pre-eruptive conditions of monolithic magmas and its application in the evolution and volcanic risk prevention in Tenerife (FONOTEN)" project: the study was authorised.

- The modifications to Teide National Park's Activities Plan were approved.

- The 2004 Mouflon (ovis musimon) Campaign and the Norms specific to the participation of the 2004 volunteers were approved.

- The 2004 apicultural norms were approved.

- It was decided to contact the appropriate Council to solicit that they contemplate the possibility of giving a denominación de origen (a prestigious product classification which is awarded food products such as wines, cheeses, sausages and hams that are produced in designated Spanish regions according to stringent production criteria – a denominación de origen serves as a guarantee of quality) to the honey obtained in Teide National Park.

- It was agreed to delegate the authorisations established in sections 5.1.E., 5.1.F., 5.1.G., 5.1.I., and those in section 5.1.J of the MUAP Decree referring to the rehabilitation, adaptation and maintenance of existing park infrastructure to the Director of Teide National Park, as long as it is contemplated in the MUAP or in the Activities Plan. This delegation includes the issuance of a favourable report on the managing organisation that the Cabildo Insular (island government) of Tenerife solicits to approve the qualification of this type of works project on rustic land.

- Approval of the environmental management program attached to the proceedings and the environmental objectives.

- The new regulations on the usage of the Emilio Fernández Muñoz Nature Activities Centre were approved.

- The Director of Teide National Park was entrusted with the re-elaboration of the park regulations so that parties interested in accessing the peak of Mt. Teide will be able to obtain permits via the Internet.

- It was decided to give an unfavourable report on the "Water and electricity connection between the Altavista Refuge and the upper cable car station" project.

- It was agreed to reject the "Renovation of Teide Rambleta" project.

***Patronage:***

**Members:**

| |
|---|
| **President of Teide National Park Patronage**<br>**Date appointed:** R.D. 52/1999, January 15.<br>**Name:** Ricardo **Surname:** Melchior Navarro |
| **Representative of:** State General Administration<br>**Date appointed:** Ministry Order of September 30, 2004<br>**Name:** José Luis **Surname:** Herranz Sáez |
| **Representative of:** State General Administration<br>**Date appointed:** Ministry Order of September 30, 2004<br>**Name:** Juan **Surname:** Garay Zabala |
| **Representative of:** State General Administration<br>**Date appointed:** Ministry Order of September 30, 2004<br>**Name:** María Jesús **Surname:** Rodríguez de Sancho |
| **Representative of:** State General Administration<br>**Date appointed:** Ministry Order of March 27, 2002<br>**Name:** Ignacio **Surname:** Blasco Lozano |

**Representative of:** Autonomous Community of the Canary Islands
**Date appointed:** December 15, 1998
**Name:** Manuel Luis **Surname:** Torres Herrera

**Representative of:** Autonomous Community of the Canary Islands
**Date appointed:** Canarian Government Accord of November 20, 2003
**Name:** Juan Carlos **Surname:** Moreno Moreno

**Representative of:** Autonomous Community of the Canary Islands
**Date appointed:** Canarian Government Accord of November 20, 2003
**Name:** José Alberto **Surname:** Díaz –Estébanez y León

**Representative of:** Autonomous Community of the Canary Islands
**Date appointed:** December 15, 1998
**Name:** Alonso **Surname:** Arroyo Hodgson

**Representative of:** *Cabildo Insular* of Tenerife
**Date appointed:** June 30, 2003
**Name:** Cristina **Surname:** Valido García

**Representative of:** *Cabildo Insular* of Tenerife
**Date appointed:** June 30, 2003
**Name:** Wladimiro **Surname:** Rodríguez Brito

**Representative of:** La Orotava Municipal Government
**Date appointed:** Plenum Accord of June 19, 2003
**Name:** Isaac **Surname:** Valencia Domínguez
Alternate: Juan Dóniz Dóniz

**Representative of:** Guía de Isora Municipal Government
**Date appointed:** Plenum Accord of July 20, 2003
**Name:** Pedro **Surname:** Martín Domínguez
Alternate: Antonio V. Álvarez Rivero

**Representative of:** Santiago del Teide Municipal Government
**Date appointed:** Plenum Accord of June 30, 2003
**Name:** Maria Ramona **Surname:** González Pérez
Alternate: Beatriz Bautista Hernández.

**Representative of:** Icod de los Vinos Municipal Government
**Date appointed:** Plenum Accord of June 25, 2003
**Name:** Jesús Manuel **Surname:** Rolo Rodríguez
Alternate: Maximino Fuentes Pérez

**Representative of:** University of La Laguna
**Date appointed:** 1985
**Name:** Wolfredo **Surname:** Wildpret de la Torre

**Representative of:** Superior Council of Scientific Research (CSIC)
**Date appointed:** March 11, 1997
**Name:** Braulio Manuel **Surname:** Fraga González

**Representative of:** the associations whose objectives coincide with the inspirational principles of Law 4/1989.
**Date appointed:** via a July 28, 2003 vote
**Name:** Juan Pedro **Surname:** Hernández Hernández
Coord. Popular Ecologist *El Rincón*

**Representative of:** the associations whose objectives coincide with the principles of Law 4/1989.
**Date appointed:** via a July 28, 2003 vote
**Name:** Juan Antonio **Surname:** Sánchez Perera
Coord. Popular Ecologist *El Rincón*

**Representative of:** the Professional Tourism Associations of Tenerife Island
**Date appointed:** via a July 28, 2003 vote
ASHOTEL
**Name:** Enrique **Surname:** Talg Wyss
Alternate: Pedro Luis Cobiella Suárez

**Representative of:** Canarian Federation of Mountain Climbing
**Date appointed**: R.D. 940/99 of June 4
**Name:** Sebastián **Surname:** Gil Ramos
(President of the Federation since December, 2002)
Alternate: Manuel Rosales

**Representative of:** Director-Curator (Reclassification of Teide National Park Law 5/1981, March 25)
**Date appointed:** December 7, 1994
**Name:** Manuel **Surname:** Durbán Villalonga

**Representative of:** Teide National Park Nursery
**Date appointed:** via an October 22, 1998 vote
**Name:** Juan Carlos **Surname:** Oviedo Sanz

**Representative of:** according to article 7 of the Patronage's internal by-laws, the following individual has been designated as an honorary member of the Patronage:
**Date appointed:** Plenum accord of April 13, 1984
**Name:** Antonio **Surname:** Machado Carrillo

**Representative of:** according to article 7 of the Patronage's internal by-laws, the following individual has been designated as an honorary member of the Patronage:
**Date appointed:** Plenum accord of April 13, 1984
**Name:** Eduardo **Surname:** Martínez Pisón

**Representative of:** according to article 7 of the Patronage's internal by-laws, the following individual has been designated as an honorary member of the Patronage:
**Date appointed:** Plenum accord of July 11, 1995
**Name:** Miguel **Surname:** Castroviejo Bolíbar

**Representative of:** according to article 6.8 of the Patronage's internal by-laws, the following individuals have been designated as invited members:
**Date appointed:** Accord of December 30, 1994
**Name:** Anabel **Surname:** Bacallado Torres
Proceedings Secretary
**Date appointed:** December 10, 1998
**Name:** José Luis **Surname:** de la Rosa García
Secretary
**Name:** Mr. Serrano Invited member
General Secretary of the Territorial Organs of Tenerife

***MEMBERS OF THE PERMANENT COMMISSION***

**President of Teide National Park Patronage**
**Date appointed:** R.D. 52/1999, January 15

**Name:** Ricardo **Surname:** Melchior Navarro

**Representative of:** State General Administration
**Date appointed:** Ministry Order of September 30, 2004
**Name:** Juan **Surname:** Garay Zabala

**Representative of:** Autonomous Community of the Canary Islands
**Date appointed:** Canarian Government Accord of November 20, 2003
**Name:** Juan Carlos **Surname:** Moreno Moreno

**Representative of:** *Cabildo Insular* of Tenerife
**Date appointed:** November 27, 1995
**Name:** Wladimiro **Surname:** Rodríguez Brito

**Representative of:** La Orotava Municipal Government
**Date appointed:** July 22, 1999
**Name:** Isaac **Surname:** Valencia Domínguez

**Representative of:** the associations whose objectives coincide with the principles of Law 4/1989.
**Date appointed:** via a July 28, 2003 vote
**Name:** Juan Pedro **Surname:** Hernández Hernández

**Representative of:** Canarian Federation of Mountain Climbing (R.D. 940/99 of June 4)
**Date appointed:** October 15, 1998
**Name:** Sebastián **Surname:** Gil Ramos

**Representative of:** Director- Curator (Reclassification of Teide National Park Law 5/1981, March 25)
**Date appointed:** December 7, 1994
**Name:** Manuel **Surname:** Durbán Villalonga

**Representative of:** according to article 6.8 of the Patronage's internal by-laws, the following individuals have been designated as invited members:
**Date appointed:** December 10, 1998
**Name:** José Luis **Surname:** de la Rosa GarcíaSecretary
**Date appointed:** accord reached December 30, 1994
**Name:** Anabel **Surname:** Bacallado TorresProceedings Secretary

**Dates of the meetings:**

- Plenums:
  February 9, June 9, October 4

- Permanent Commission:
  January 19, May 17, September 20, December 10

**Summary of the most relevant facts or events:**

Accords reached during the Permanent Commission meeting on January 19:

- Having seen the Basic Environmental Impact Study and the Declaration of Environmental Impact referring to the "Repair of the thermal solar energy and photovoltaic energy in the Altavista Refuge" project, remitted by the Insular Tourism and Landscape Services of the Cabildo Insular of Tenerife, it was agreed to make a favourable report.

- Having seen the Basic Environmental Impact Study and the Declaration of Environmental Impact referring to the "Restoration of the TF-21 defence dike in Teide National Park" project, remitted by the Motorway Service of the Cabildo Insular of Tenerife, it was agreed to make a favourable report.

- Having seen the Basic Environmental Impact Study and the Declaration of Environmental Impact referring to the "Horizontal signposting of the road network of the Cabildo Insular of Tenerife, 2003" project, remitted by the Ministry of the Interior, General Administration of Traffic, it was decided to make a favourable report.

- Having seen the Basic Environmental Impact Study and the Declaration of Environmental Impact referring to the "Placement of raised barriers in the TF-21 and TF-24 roads" project, remitted by the Technical Highway Service of the Cabildo Insular of Tenerife, it was agreed to make a favourable report.

- It was decided to contact the Autonomous Organisation of National Parks so that they can contemplate the possibility of creating some sanitary and water conduction services in La Ruleta during this year, given the massive influx of visitors that this area, located in the centre of Teide National Park, receives daily.

Accords reached during the February 9 meeting:

- It was decided to make a favourable preliminary report on Teide National Park Objectives and Activities Plan for 2004.

- It was agreed to solicit a preliminary study or first draft of the technical alternatives that exist for the improvement of road security in the National Park (the risks and problems caused by landslides), respecting the regulation on conservation matters that prevail in this Protected Natural habitat.

- It was approved to make a favourable report on the Protocol to control stray cats (felis catus) in Teide National Park and estates in Fasnia, Iserse and Graneritos.

- It was decided to approve the project promoted by the company, Teleférico Pico Teide, S.A.: “Repair of the outer sidewalk of the access to Teide Peak cable car”. The entire length of the sidewalk must have a homogenous finish, so as to avoid a visual clash between the new material in the repaired areas and the existing material in the areas that are not going to be repaired.

- It was agreed to favourably report on the project promoted by the Jaime Almera Earth Sciences Institute of the CSIC (Barcelona), solicited by Joan Martí Molist, to carry out the scientific project “Determination of the pre-eruptive conditions of monolithic magma and its application in the evolution and prevention of volcanic risk in Tenerife”.

Accords reached during the Permanent Commission meeting on May 17:

- After reviewing the solicitation made by the Technical Highway Service of the CABILDO INSULAR DE TENERIFEto place an enclosing barrier in the entrance of the Public Works booth (El Portillo), it was agreed to make a favourable report on this solicitation.

- It was decided to support the initiatives to posthumously concede the National Environmental Award, given out annually by the Ministry of the Environment, to Telesforo Bravo Expósito.

- Having studied the solicitation of professional activities presented by Javier García Bermejo, of the company, Atlas España, S.A., to film new episodes of the documentary series “The Canary Islands: a walk through the clouds” for Televisión Pública de Canarias, S.A. in which he states the intention of taking aerial images from a helicopter, it was decided to make a favourable report on this solicitation, respecting the conditions that the Administration of Teide National Park decides is

necessary to guarantee the preservation of the natural resources and landscape of this Protected Natural habitat.

- It was agreed to favourably report on the EMAS Implantation Project, "Infrastructure demolition and construction of a motor room in the Information Office and Teide National Park Nursery".

- It was decided to make a favourable report on the EMAS Implantation Project, "Installation of a fuel dump for use in the Casa Juan Évora Visitor Pavilion and Museum".

- It was agreed to make a favourable report on the EMAS Implantation Project "Installation of a Purification System in Teide National Park's centres":

    - El Portillo Administration Office
    - Visitor Pavilion.
    - El Portillo Visitor Centre
    - Nursery and Information Office
    - Fire Centre
    - Los Realejos Forest Home
    - "Casa Juan Évora" Museum

- It was approved to make a favourable report on the project, "Installation of an electric generator for the Nursery offices in Teide National Park".

- Having reviewed the project, "Installations for the El Portillo Visitor Centre, the Cañada Blanca Visitor Centre, the Emilio Fernández Muñoz Nature Activities Centre, Los Realejos Forest Home and Forest Fire Fighting Post", it was decided to make a favourable report on the project.

- It was agreed to favourably report on the project, "Installation of an electric generator for the Visitor Pavilion in Teide National Park".

Accords reached during the June 9 meeting:

- It was decided to approve the Report on the Activities and Outcomes of Teide National Park in 2002.

- It was approved to make a favourable report on the EMAS implantation project "Installations to fight against legionella in human consumption hot and cold water systems: networks and repositories, tanks, reservoirs, cisterns and wells and fire-fighting water systems".

- It was agreed to make a favourable report on the EMAS Implantation Project "Installation of water repositories for the Visitor Pavilion and the Information Office and Nursery".

- It was decided to make a favourable report on the EMAS Implantation Project "Electrical facilities for the Visitor Centre in El Portillo, the Fire Station, the Nursery and Information Office, the El Portillo Administration Office, the Visitor Pavilion, the Nature Activities Centre, the Casa Forestal and "Casa de Juan Évora" museum.

- It was agreed to report favourably on the EMAS Implantation Project "Instalment of renewable energies in Teide National Park".

Accords made during the Permanent Commission meeting of September 20:

- It was decided to make a favourable report on the solicitation presented by the Highway Technical Service of the CABILDO INSULAR DE TENERIFEto do maintenance on the public works booth (El Portillo).

- It was agreed to report favourably on the project "Refurbishment of the La Rambleta del Teide".

- It was accorded to solicit information on the demand for electricity in the Altavista Refuge in relation to the project "Water and electricity connection between the Altavista Refuge and the Upper Cable Car Station".

- It was decided to make a favourable report on the project "Supply and installation of a greenhouse annex to the Botanical Garden".

- It was decided to favourably report on the project "Restoration of the National Park Habitat".

Accords made during the October 4 meeting:

- Having reviewed the project, "Water and electricity connection between the Altavista Refuge and the Upper Cable Car Station", promoted by the CABILDO INSULAR DE TENERIFEand the company Teleférico Pico del Teide, S.A., having reviewed the Basic Environmental Impact Study and the Declaration of Environmental Impact on the activities that will be carried out, having reviewed the agreement adopted by the Permanent Commission of the Patronage on September 20, it has been agreed to report favourably on the water connection, but unfavourably on the electric connection.

- Having seen the document presented by D. José Garrido Burgos in which he solicits authorisation to repair the roof, paint the exterior, repair the fence and replace the doors and windows of a home on his property located in Portillo Alto and also having reviewed the report created by Catastro Territorial Management of

Santa Cruz de Tenerife in 1999 that describes the condition of the real estate that will be modified, the Patronage has decided to make an unfavourable report.

- Having seen the document presented by D. José Garrido Burgos in which he solicits authorisation to repair the roof, paint the exterior, repair the fence and replace the doors and windows of a home on his property located in Portillo Alto and also having reviewed the report created by Catastro Territorial Management of Santa Cruz de Tenerife in 1999 that describes the condition of the real estate that will be modified, the Patronage has agreed that the Administration of Teide National Park will inform the Canarian Government's Urban and Natural Protection Agency of the solicitation that Mr. Garrido Burgos has made along with the antecedents of the solicitation so that they can take the measures necessary in light of the unlicensed and unauthorised construction that has been carried out. It has also been decided to contact the La Orotava Municipal Government to inform them of this case and to solicit that they take the measures within its competences to deal with this situation.

- After debating the problem of construction that has taken place in El Portillo (solicitation presented by Mr. José Garrido Burgos to repair the roof and fence in a home on his property in Portillo Alto) without legal licenses and authorisations, the Patronage agreed to call a meeting in the near future between the different Administrations that have competences in this matter.

Accords reached during the Permanent Commission meeting of December 10:

- By proposal of the President and in unanimous agreement the Permanent Commission decided to thank Mr. Jesús Casas Grande in name of the Patronage, for the work he has done as a member of the Patronage.

- It was decided to make a favourable report on the petition made by Carlos Efrén Aguiar Valencia for authorisation to carry out preservation work (coating parts of the roof, preservation of frames, shutters and windows and painting the exterior) on a home on his property located in El Portillo Alto.

- According to the petition of the Secretary of the Instruction Commission, article 10.2.a of the Regulation of the determination and concession of public state subsidies in the National Parks' socio-economic areas of influence and also, according to the seventh point, section 1), of the January 28 Resolution of the Presidency of the Autonomous Organisation of National Parks that convokes the concession of public state subsidies in the socio-economic areas of the National Parks in 2004, this Permanent Commission is authorised by the Plenum of the Patronage of Teide National Park to report on the projects related to it, once the

level of interest is determined in each case and grouped according to the modalities that the Resolution establishes.

**Planning, management and legislative instruments.**

***Elaboration and/or modification of the planning instruments***

In accordance with the MUAP, at present the Section Plans (Public Use, Recuperation of the Flora, Introduced Herbivores, Apiculture and Master of Admissions) of the National Parks are being elaborated.

***Legislation*** (state, autonomous community, etc.), approved in 2004 that affects the National Park.

The recent Constitutional Court ruling that gives exclusive competence over the management of National Parks to the autonomous communities should be highlighted, despite the fact that this ruling has not yet been developed and much less applied.

**Typology of actions in national parks, centres and preserves.**

***Preservation.***

**Prevention and extinction of fires**
An operation to prevent and extinguish forest fires is maintained. During the high-risk period, from July 1 to September 30, the operation is reinforced in relation to the low-risk period (the rest of the year). There have not been incidences that can be reviewed.

**Supervision of introduced species**
During 2004 the manual eradication of exotic flora that had been introduced into Teide National Park has continued, eliminating around several thousand specimens located in 8 different areas of the park and corresponding to 7 different species. This year for the first time the Californian Poppy was observed growing within the park. The areas where exotic flora had been eradicated in the past were also monitored to find out how the population of these species has varied as well as to detect any possible new neophytes.

**Rabbit control.**
The rabbit control campaign started on August 1 and lasted until October 17, 2004 on Thursdays, Sundays and national and/or autonomous community holidays. During the first part of the campaign only hunting with dogs and ferrets was permitted, while after August 29 until October 17, the use of shotguns was also permitted. In total there were 25 hunting days, 9 with dogs and ferrets and 16 with dogs, ferrets or shotguns.

Just as in 2003, if a dog was lost during the hunting days it had to be reported to either Teide National Park or the Registry Office of the *Cabildo Insular* of Tenerife, as well as to the Hunting Society Consortium.

To allow the hunters access to certain areas of the park they were allowed to use vehicles on certain paths; therefore, it was necessary to implant an uninterrupted surveillance system at the access barriers of these paths.

A checkpoint was also set up at the park exists for each day to count the dogs and the number of rabbits captured. This checkpoint, located in El Portillo Bajo, remained open from 7 AM to 7:30 PM. The hunters were obligated to pass through the checkpoint before closing.

All of the regulations pertaining to the control of the rabbit population in Teide National Park are based on the park's Rabbit Control Plan, approved by the Mixed Management Commission of the Canarian National Parks, dated May 26, 1999, with modifications on April 29, 2002.

During the rabbit control campaign, 2,831 permits were registered, an average of 52.8 daily inspections were carried out during the dog-ferret days and 59.9 inspections during the dog, ferret and shotgun days.

During the 25 control days 2,511 rabbits were killed (739 during the dog and ferret days and 1,772 during the dog, ferret and shotgun days), a number far higher than those killed

during previous campaigns which indicates a higher density of rabbits in Teide National Park.

**Rabbit census.**
To determine how effective the campaign was, three times a month nocturnal itineraries through the Siete Cañadas path were carried out to establish the number of rabbits per kilometre (I.K.A). The I.K.A. has been reduced 63.5% compared to the level of rabbits before the start of the campaign.

**Mouflon control.**
The mouflon control campaign took place between July 2 and October 13, with control days established on Mondays (exterior of the park), Wednesdays and Fridays, except for holidays, for a total of 40 control days, with 30 of them taking place within the park. The control zone was divided into 3 sectors, each one with different days and schedules.

Each day of the campaign a group of 20 volunteers, accompanied by personnel from the park, carried out the inspection and control.

In the interior of the park 27 animals were eliminated (20 females and 7 males), below the maximum of 43 that had been established.

In the exterior of the park, 13 animals (7 females and 6 males) were eliminated during the campaign, for a total of 40 mouflons

All of the specimens eliminated were given to the personnel working for the *Cabildo Insular de Tenerife* at the end of the day.

**Mouflon Census.**
Winter Census.
The census-taking technique used is a network of linear itineraries establishing a stratified sample system.

The results of the census show the lowest number of specimens since 1994 (43 animals, 26 males and 17 females) from a simple non-stratified extrapolation of the census data. A relative increase in the groups west of Pico Viejo has been identified, as well as a variation in the pattern of mouflon population distribution during the winter.
Spring Census.
The downward trend of the winter census continued, counting 108 specimens (30 males, 48 females and 30 not identified) from a simple non-stratified extrapolation of the census data, a lower number than earlier spring censuses except for those carried out in 2001 and 2003.

**Stray dog control**

The policy toward stray or abandoned dogs in Teide National Park during 2004, following the directives of the Administration Plan, are based on humane capture methods, their transfer and withdrawal from the park as quickly as possible.

During 2004 88 dogs were caught, of which only 26 carried microchips and 9 tattoos. For rabbit control, it is obligatory that the dogs are identified with microchips and the owners have to report when the dogs are lost in the park. In 2004 there were 39 reports of lost dogs by their owners, of which only 2 of the dogs could be found and returned to their owners thanks to the information on their microchips.

The rest of the dogs have been given to the Tenerife Pro-Animal Association, which has gone almost daily to Teide National Park to pick up and transport dogs to their association.

**Stray cat control**

On January 27, 2004 a meeting was held with the Nursery of the of the Hunting Society Consortium and it was agreed that they would collaborate in the capture of stray cats in the Fasnia farm using cage-traps loaned by Teide National Park.

Twice a week the park personnel captured cats, from February to June, setting the traps with leftover food from the *Parador* and occasionally changing their location. The results of these actions have been very inauspicious: only one animal was captured in the Siete Cañadas area, some cats were found dead in the traps and various cage-traps that had been set were stolen.

The second trapping period started in November until the end of 2004. Five cats were captured, all of which were picked up by a representative of the Tenerife Pro-Animal Association.

**Partridges**

In February 2004, an agreement was reached with the Hunting Society Consortium to oversee and reposition the bird feeders and drinkers within the Fasnia estate, while park personnel will reposition the bird feeders and drinkers, oversee and monitor the population of partridges in the Iserse and Graneritos estates.

On December 16, 2004 an acclimatisation cage with 20 partridges inside was placed in the Iserse and Graneritos estates so that they could be released the next day. The following days they observed how the partridges adapted to their surroundings. The partridges came from the Helecho estate, located in the upper part of Arico, property of the *Cabildo Insular de Tenerife*.

During 2004, a census was taken of all of the plantings of endangered species in Teide National Park, among which were the following: *Stemmacantha cynaroides* (3 locations), *Helianthemum juliae* (6 locations), *Cistus osbaeckiaefolius* (1 location), Bencomia *exstipulata* (3 locations) and *Silene nocteolens* (2 locations).

Other censuses that have been taken are inventories of introduced plant species.

**Restoration of the natural environment.**

The following work includes 2004 and 2005 and focuses on the restoration of the habitat of certain park enclaves that have been degraded in the past with the goal of restoring them to their original condition. The work has been divided in:

**Restoration of ridges**

All along road TF-21 a series of ridges has been created to prevent the free passage of vehicles to the adjacent areas. These ridges will be replanted with the same species of vegetation in the proportions existing in each area.

In the sectors where the Filo trail runs parallel to the edge of the Llano de Maja, a ridge was created to prevent the passage of vehicles into this important area. Because in some sectors these ridges are large enough to be noticed and contrast in colour and vegetation with the better preserved sectors adjacent to them, they must be adapted to integrate more seamlessly with the landscape.

**Demolition of infrastructure and cabins**

**Integral restoration of the historic volcano area of Fasnia**

The renovations that are being carried out can be summarised as followed:

- Breaking up of a 3.5 m swath of the trail using a bulldozer with ripper shanks in the specified sections (branches of paths without defined uses that border the historic volcano). The total length of the overturned sections is 1,500 m.
- Supervision of the traffic for the branches authorised by the Park Administration. The barrier that connects the Arico el Viejo trail with the trail that leads to the apicultural settlement in El Roquillo and the barrier that leads to the Llano del Chupadero settlement have been closed.
- Repair of the lateral ridges of the Arico el Viejo trail that affects the area in question.
- Manual raking of the trails that run above the historic volcano of Fasnia and Llano del Roquillo. The length of the area raked has been estimated to be 2 km.
- Artificial re-vegetation of the unearthed trails by manual seeding with species that exist in the area.
- Placement of signs that indicate:

- Reserve area “PROHIBIDO EL PASO” (No entry)
- In the rest of the areas “PROHIBIDO ABANDONAR LA PISTA O LOS SENDEROS”. (It is prohibited to leave the trail or paths)

- Placement of two signs with information about the natural resources.

***Trails and paths***

**Trail that leads to the caseta del Capricho.**

The trail that leads to the Caseta del Capricho is a 700 m long, 5 m wide, paved trail that

starts at kilometre 46.7 of the TF-21 road heading east and connects with the Siete Cañadas trail. At the beginning of the paved trail there is a small 300 $m^2$ area for the entrance and exit of vehicles. The layer of asphalt has been eliminated (around 20-30 cm), converting the surface into a dirt trail 4 m wide with gutters and natural lateral structures that prevent water from flooding the surface. The sides of the road have been restored by turning over the dirt and vegetation. In order to prevent the transit of unauthorised vehicles on this trail its barrier has been closed at the entrance from the road.

**La Carniceria trail**.

The section of the La Carniceria trail that was eliminated and restored starts from the spot where the path to Fasnia branches out and ends where it meets the TF-24 at Km 38, as well as the two 900 m paths that branch out from the trail. This work will eliminate the La Carniceria trail except the branch that accesses the Casa de Fasnia from the Arico el Viejo trail. The trail was torn up with a bulldozer with ripper shanks so as to rejuvenate the area by turning over the dirt, this makes it easier to re-colonise the area with the seeds of nearby species. In order to reduce the initial impact caused by the work the regeneration was accelerated using species existing in the area.

**Proximity of the Arico el Viejo trail. Fasnia area.**

Beyond the Volcano of Fasnia in the left side of the Arico el Viejo trail around 3,300 m from where it begins, there are two other accesses that connected to the two trails that bordered the Volcano. A length of 1,200 m of these two trails has been eliminated.

**Factors common in all of the actions**

- The turning over of the earth is done using a bulldozer with ripper shanks that reach a depth of 30 cm. This allows for adequate turning over of the ground and makes it easier to colonise with seeds from the area. In all areas the natural regeneration is aided in the way and density estimated beforehand.
- The material that has dismantled is placed at the foot of the trail.
- The material is removed and transported to a landfill after recycling all of the material that can be used in posterior actions (wood…).
- The dismantled material is loaded onto a truck.
- Levelling and compacting of the trail when necessary.
- An informative sign is put up justifying the action. The sign is eliminated once the work is finished.
- The follow-up plots have a surface of 7 x 7 m.
- The re-vegetation is done with the same species and in the same proportion as the area around the action.

***Silvicultural treatments in the state mountain cumbres del Realejo Bajo***

The following are the objectives of this work:

- Repair the forest in sensitive areas of the mountain, especially in areas where there are facilities frequented by people, such as the Casa Forestal and the Emilio Fernández Muñoz Nature Activities Centre.

- Create lines of defence starting from the forest trails close to the Emilio Fernández Muñoz Nature Activities Centre and the Realejos Casa Forestal.

- Eliminate the *Pinus radiata* trunks around the Realejos Casa Forestal that may topple over (given the conditions that they are in after the strong winds of last winter) so that they won't affect the facility's structure.

To achieve these goals the following actions are being carried out:

- Thinning. Thinning consists in removing trees of the dominant species. The goal is to maintain the forest in optimal silvic conditions by controlling its density according to age, the demands of vegetation development and soil recovery.

- Elimination of debris and logs via chipping. Consists in mechanical grinding of felled trunks and those toppled by the wind using a wood chipper. This will be carried out with the intention of incorporating the wood chips to the soil, thereby improving its fertility.

- Manual clearing. Consists in cutting the brush with manual tools. This action will be carried out only in Casa Forestal Trail B.

- Occasionally cutting down trees. This consists in carefully eliminating trees near the Los Realejos Casa Forestal so that its infrastructure isn't harmed. To achieve this, prior to cutting the tree down the trunk is fastened with cables, the upper branches are pruned and then the felling takes place in a controlled area.

The silvicultural treatment covers 2004 and 2005.

**Species preservation plans.**

The last few years the work done on Teide National Park' Recuperation of Endangered Species Program has been extremely important for the preservation and safeguarding of species that were targeted for recuperation (*Helianthemum juliae, Bencomia exstipulata, Echium auberianum, Stemmacantha cynaroides* y *Silene nocteolens*). The lines of work that most stand out were focused on diagnosing the populations in their natural environment as well as on the improvement of the population by planting specimens (reintroductions).

**Diagnosis:**

This section highlights, among other things, population studies that are meant to detect the level of stability in the natural populations of these species. To achieve this, population viability analysis techniques are employed that allow us to predict the probabilities of extinction of each taxon or, when necessary, the evolution of their populations regarding the principle demographic parameters (coverage, effective size of the population, etc.), as well as design adequate management strategies. Among the most significant parameters sampled are the following:

- Reproduction rates
- Mortality/survival rates
- Germination rates *in situ* and *ex situ*

The data obtained are analysed by a computer using software designed for this kind of study.

Experiments have also begun in the natural environment with the goal of studying the habitat potential of *Helianthemum juliae*. In order to do this five different spots in Teide National Park were selected and in each three small experimental seedling-plots were established where the seeds being studied have been planted.

**Reintroductions**

Among the principle *ex situ* actions of the recuperation program are the selective gathering of seeds and/or fruit, the creation of seedbeds and the growing plants in nurseries so that they can later be planted in their natural environment. During this period the following species have been planted in the natural environment: *Silene nocteolens*, *Helianthemum juliae, Stemmacantha cynaroides* y *Bencomia exstipulata*.

The following table shows the origin of the material, the number of specimens restored, the locations where they were restored and the planting period:

| ***Species*** | ***Origin of the material*** | ***Total number of plants to restore*** | ***Location of the restoration*** | ***Planting period*** |
|---|---|---|---|---|
| *Bencomia exstipulata* | *Tiro del Guanche* | *100* | Tiro del Guanche<br>Roques de Chavao<br>Gangarro | November |
| *Helianthemum juliae* | *Cañada de las Pilas* | *150* | Cañada de las Pilas | November |
| | *Mesa del Obispo* | *50* | Mesa del Obispo | November |
| *Silene nocteolens* | *Montaña Blanca* | *350* | Minas de San José | April |
| *Cistus osbaeckiaefolius* | La Fortaleza (Fb) | 200 | Guajara | November |
| *Stemmacantha cynaroides* | Corredor de Mario | 250 | Llano de Maja | February |
| | Corredor de Mario | seeds | Llano de Maja | December |
| **TOTAL** | | **1,100** | | |

Also, the collection of cutting-buds continues in the natural *Bencomia exstipulata* population with the goal of obtaining individual clones that can be used in a drastic situation that may cause the partial or total disappearance of the few specimens that exist in the natural population.

As well as continuing to maintain and improve Teide National Park Botanical Garden, last year a total of 1,208 specimens were planted corresponding to 24 autochthonous species.

## Research

### Research authorisations.

The Park Administration granted 29 research permits to external agents that were solicited between January 1, 2004 and December 31, 2004. This research includes:

| Solicitor and business/organisation | *Research work* | Date of work | Date of solicitation |
|---|---|---|---|
| August Gudmundsson *University of Gottingen* | Vulcanology course, practice class | From February 17 to 23, 2004 | 02/05/2004 |
| Nemesio M. Pérez *Technological Institute of Renewable Energy - ITER.* | Installation of a GPS station in the upper cable car booth | February 13, 2004 | 02/12/2004 |
| Juan Carlos Carracedo *Superior Council of Scientific Investigations - CSIC.* | Vulcanological and structural study of Teide Rift Complex northeast of the island of Tenerife | March 22 and 23, 2004 | 03/11/2004 |
| *Johannes Gerardus Oostermeijer University of Amterdam* | Biology of the preservation of species of vegetation endemic to Teide National Park | March 31, 2004 | 03/23/2004 |
| *Álvaro Márquez González Rey Juan Carlos University* | Application of geophysical detail techniques to the study of the gravitational deformation and stability of large volcanic structures. | April 26 to 30, 2004 | 03/26/2004 |

| | | | |
|---|---|---|---|
| Joan Martí Molist. *CSIC* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evauation and risk inTenerife | March 13 to 24, 2004 | 03/29/2004 |
| Joan Martí Molist. *CSIC* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evauation and risk inTenerife | March 13 to 18, 2004 | 03/29/2004 |
| Manuel Nogales Hidalgo IPNA – *CSIC* | Trophic ecology of the Alcaudón Meridional (*Lanius meridionales)* | March 13 to December 31, 2004 | 03/29/2004 |
| Inés Galindo Jiménez *ITER.* | Study of the eruption of Guajara. (Cañadas structure) | May 13 to 28, 2004 | 04/02/2004 |
| Raúl Martín Moreno *Autonomous University of Madrid* | Comparison of high altitudes and high latitudes | April 27 to May 13, 2004 | 04/23/2004 |
| Joan Martí Molist. *CSIC* | Determination of the pre-eruptive conditions of phonolitic magmas and its application in volcanic evauation and risk inTenerife | April 24 to May 2, 2004 | 04/23/2004 |
| Joan Martí Molist. *CSIC* | Determination of the pre-eruptive conditions of monolithic magmas and its application in the evolution and volcanic risk prevention in Tenerife | May 9 to June 12, 2004 | 04/23/2004 |
| Raúl Martín Moreno *Autonomous University of Madrid* | Comparison of high altitudes and high latitudes | May 7 to 14, 2004 | 05/04/2004 |

| | | | |
|---|---|---|---|
| José Carrillo Hidalgo<br>University of La Laguna<br>*Biology Department* | Phylo-geographic study of the commmon kestrel in the Canary Islands | May 17 to December 31, 2004 | 05/07/2004 |
| Arnoldo Santos Guerra<br>*La Orotava Acclimatisation Garden - ICIA (Canarian Institute of Agricultural Research)* | Study of the reproductive biology of autochthonous plants of Teide National Park | May 26 to June 2, 2004 | 05/07/2004 |
| Pedro Oromí<br>*University of La Laguna* | Anthropod Zoology course, practice class. | May 24, 2004 | 05/21/2004 |
| Maria José Blanco Sánchez<br>*Canary Islands Geophysics Institute* | Observation of the magnetic control station (CAN) | June 15 to 18, 2004 | 05/21/2004 |
| Ricardo Vieira Díaz<br>*Astronomy and Geodesy Institute* | Re-observation of the geodesic distance, levelling and gravimetry networks | June 18 until the end of September, 2004 | 06/15/2004 |
| Susan Baker<br>*University of Greenwich* | Geological map | July 14 to August 9, 2004 | 07/07/2004 |
| *Álvaro Márquez González*<br>*Rey Juan Carlos University* | Application of geophysical detail techniques to the study of the gravitational deformation and stability of large volcanic structures. | September 16 to 23, 2004 | 07/14/2004 |
| Gladys Melián Rodríguez<br>ITER. | Study and observation of the levels of diffuse de-gasification in the cone of Teide | August 4 to 22, 2004 | 07/28/2004 |
| Blas Vilches Navarrete<br>*Canarian Botanic Garden "Viera y Clavijo"* | Collection of seeds, plants and folders for the seed bank | August 17 to 20, 2004 | 08/03/2004 |
| Juan Carlos Carracedo<br>*C.S.I.C.* | Vulcanological and structural study of Teide Rift Complex northeast of the island | August 15 to September 15, 2004 | 08/09/2004 |

| | | | |
|---|---|---|---|
| | of Tenerife | | |
| Douglas Godbold *University of Wales* | Practice outing for the Environmental Sciences course | November 2, 4 and 6, 2004 | 09/27/2004 |
| Mª José Blanco Sánchez *Canary Islands Geophysics Institute* | Installation of a temporal seismic station | September 30, 2004 to September 30 2005 | 09/29/2004 |
| Antonio Rodríguez Rodríguez *University of La Laguna* | Evaluation of the degradation of the natural soil of the Island of Tenerife. | November 7 to 15, 2004 | 10/06/2004 |
| Juan Carlos Carracedo *C.S.I.C.* | Geochemical and petrological study of the North-eastern Rift and of Teide-Pico Viejo stratovolcano | October 20 to 25, 2004 | 10/18/2004 |
| John Shaw *University of Liverpool* | Teaching of non-destructive, small-scale geophysical exploration techniques | January 22 to February 4, 2005 | 10/19/2004 |
| José Ramón Arévalo *University of La Laguna* | Specific and dominant wealth of exotic species along an altitudinal gradient | December 20 to 30, 2004 | 12/03/2004 |

The following studies have also been carried out:

- Inventory of the flora and vegetation of Teide National Park. This study was created by the University of La Laguna Biology Department with the goal of obtaining basic information that will aid in the management of the park's natural resources. In order to carry out this inventory, a 250 x 250 m grid system was established that encompasses the entire surface of the park.

- Genetic characterisation of the natural populations of the species *Helianthemum juliae* and *Bencomia exstipulata* and its application to the Recuperation Program. The University of Las Palmas de Gran Canaria Biology Department was designated to carry out these studies in which the genetic characterisations of the *Bencomia exstipulata* and *Helianthemum juliae* populations were collected. The samples were collected from the natural populations of these species as well as among reintroduced plants. These samples were used to extract DNA, as well as for subsequent analysis treatments.

**Applied research and studies.**

- Study of the effect that mouflons and rabbits have on the flora of Teide National Park. Four locations in the park have been fenced off in order to carry out an exhaustive observation of the effect that herbivores that have been introduced into the park (rabbits and mouflons) have on the endemic flora. In order to observe the effects that each animal has on the flora, each location has been divided into three plots of land, each with a different kind of protective barrier. Therefore, one plot is protected by a barrier that does not allow rabbits to enter, the second by a barrier that does not allow mouflons to enter and the third by a barrier that does not allow either to enter.

- Monitoring of the population dynamics of endangered species of flora. Studies of the population dynamics of endangered species of flora carried out in Teide National Park, include the monitoring of certain populations within which sample plots have been established and visited annually. Diverse data is measured in these plots related to the dynamic such as bio-metric information on each of the specimens, its life stage, the mortality and recruitment of individuals, the reproductive rate, etc. The species that are monitored are: *Helianthemum juliae, Bencomia exstipulata, Echium auberianum, Stemmacantha cynaroides* and *Silene nocteolens*.

***Infrastructure and equipment (works).***

**Maintenance and creation of buildings and management and administration equipment.**

The construction of the new Administration, Interpretation and Services Centre, located in centre of La Orotava, continues at a good pace. An investment of € 8,000,000 has been made in this construction project, which should be completed by the Fall of 2005.

**Issue of structural stability certificates and renovation projects**

In 2004, in order to obtain the licenses to open the facilities, the Municipal Government of La Orotava demanded a certificate endorsed by a qualified technician guaranteeing that the building was structurally sound and met all safety requirements. After evaluating and inspecting the new structures, structural stability certificates were issued for the Cañada Blanca Visitor Centre, the Fire Centre and the Nursery and Information Office. At the same time the renovation projects for the El Portillo Visitor Centre, the Visitor Pavilion and the Administration Office were carried out.

Throughout 2004 the corresponding the different construction permits were processed. The first step was to obtain the Territorial Qualifications of the different projects given by the Department of Planning, Tourism, Municipal Cooperation and Housing of the *Cabildo Insular de Tenerife*. At the same time the Island Water Council issued a waste authorisation for the park's infrastructure.

**Electric generators**
This year two electric generators were acquired, one for the Nursery and Information Office and the other for the Visitor Pavilion. These new generators meet the legal standards for machinery in the Spanish market and have been certified by the EC.

**Water purification systems**
This project will provide water purification systems to the El Portillo Visitor Centre, the Fire Centre, the Visitor Pavilion, the El Portillo Administration Office, the Nursery and Information Office, the Casa Forestal and the Juan Évora Museum, thereby guaranteeing the quality of the water that returns to the soil. The necessary effluent authorisation from the Island Water Council will also be obtained and the corresponding effluent tax for the protection and improvement of the aquifer will be paid, all in accordance with the Water Law 12/1990, July 26.

This project will be carried out during 2004 and 2005.

**Construction of a motor room in the nursery and information office**
This construction project started in 2004 and will be completed in 2005. The project involves the demolition of infrastructure in the Nursery and Information Office that has no defined function and the construction of a new room where an electric generator that will provide electricity to the facilities can be stored.

**Construction of a garbage room**
Construction of a garbage room where garbage dumpsters can be stored with the highest level of public health and hygiene while they are waiting to be removed from the park.

The construction of this structure complies with the Waste Management Law 10/1998, April 21, avoids the possible contamination of the soil by storing waste in hygienic conditions with the goal of ensuring public health, removes the garbage from the view of visitors, allows for waste separation and prevents the proliferation of rats within the park.

This project is currently being carried out and will be completed in 2005.

**Electrical fittings**
The competitive procurement for the installation of low-voltage electrical fittings in the different park structures was not awarded.

**Renewable energy sources**
At the same time, a competitive procurement to install renewable energy sources in Teide National Park (both solar thermal energy and photovoltaic solar energy) is currently being processed.

**Botanic Garden**
Teide National Park Botanic Garden continues to be maintained and improved: weed and stubble removal, planting new species, replacement of dead specimens, the placement of identification plaques, etc. A total of 1,208 specimens were planted in 2004 corresponding to 24 autochthonous species.

**Creation and maintenance of facilities to receive visitors.**

The budget to expand the Cañada Blanca Visitor Centre and equip the projection room with a modern projector has been approved. This budget also includes remodelling the projection room and upgrading the projector in the El Portillo Visitor Centre. Although at the end of the year the contract still has not been signed, it has been awarded.

In 2004 a proposal to design a project to adapt the Casa de Juan Évora Museum to the area surrounding it was approved. In the future this site will be converted into a museum that shows the traditional way of life in Las Cañadas.

**Creation and maintenance of infrastructure for traditional use.**

With the collaboration of Teide National Park personnel, the Canarian Federation of Mountain Climbing re-outfitted the climbing routes throughout the year.

**Maintenance of the trail network.**

The road that lead to the Caseta del Capricho has been adapted by removing the asphalt and converting the road bed into a dirt trail 4 m wide, with gutters and natural lateral structures that prevent water from draining onto the trail.

Parts of the La Carnicería trail have been repaired.

***Others***

Flora protection enclosure. In order to carry out the "Study of the effect of rabbits and mouflons on the flora of Teide National Park", various protection plots have been installed that partially or totally protect the vegetation enclosed within them.

***Public Use.***

**Environmental education.**

The Emilio Fernández Muñoz Nature Activities Centre (CANEFM) use and enjoyment program has continued throughout the year, promoting special programs chiefly for children and young people. This year 65 groups, totaling 3,396 people used the facility. The centre was used during 257 days and of the 65 groups that used it, 41 were education centres (23 primary schools and 18 high schools).

The environmental education support programs continued in the island's education centres, attended by specialised personnel who gave talks in the centres and guided excursions in the park. This years data includes:

- 147 talks given to a total of 7,518 students and 803 teachers belonging to 99 education centres from 26 island municipalities;
- 111 excursions, taken by 5,457 alumnos and 340 teachers belonging to 82 education centres from 26 island municipalities.

Besides these, other talks were given to various associations and delegates both at the location of these groups (both on the island and outside of the island) and in the park: Association of Friends of the Nature and Man Museum (Santa Cruz de Tenerife), 7th International Conference on Renovation of Architectural Heritage and the Art of Building (Yaiza, Lanzarote), Technicians of Protected Habitats in Central America (Agreement between the OAPN and the Central-American Commission on Environment and Development), environmental associations from the island, 2nd Biodiversity Forum (Logroño), course on planning held in Valsaín, anniversary of the Caldera de Taburiente (El Paso) National Park, etc.

The following are statistics on the free guided excursions available to the general public. 6,843 people on 617 excursions were attended to. These visitors were from:

- Tenerife: 2,872 (42%);
- The Canary Islands*: 503 (7,35%) * Spanish residents in the Canary Islands other than Tenerife;
- Mainland Spain**: 2,850 (41,65%) ** Spanish citizens from mainland Spain and the Balearic Islands;
- Other countries: 618 (9%)

From November 25 to December 8 the Liceo de Taoro in La Orotava held the 50th Anniversary commemorative macro-exposition of the creation of Teide National Park and Caldera de Taburiente National Park.

Within the National Parks Autonomous Organisation Training Program, the park and the CENEAM organised the 6TH TEIDE NATIONAL PARK GUIDE CERTIFICATION COURSE. Date: November 22-26, 2004. Place: the Alcalde Bernabé Rodríguez Institute of Secondary Education (Santa Cruz de Tenerife). Coordinator: José Luis de la Rosa García, Adjunt Director of Teide National Park.

Goals of the course*:*

- Certify professional guides to work in Teide National Park.
- To learn about the natural and cultural resources of Teide National Park.
- Comprehend the natural processes that take place in the park.
- To learn the administration and planning directives of the park.
- To learn about the public-use activities available in the park.
- Learn how they must behave as park guides.

**Management of Services.**

- The management of the bookstores in the the Visitor Centres (El Portillo and Cañada Blanca) is conferred to private entities.
- The cable car is also conferred but not by the organisation.
- This year the park conferred 65 AUTHORISATIONS to carry out professional activities related to the visual medium (photography, video, etc.): 32 directly to the interested

party and 33 that were processed by the *Cabildo Insular de Tenerife*. The following table gives the details on these authorisations.

**Details of the authorisations to carry out professional activities in Teide National Park in 2004**

| DESCRIPTION OF THE WORK | SOLICITOR | DATE OF SOLICITATION |
|---|---|---|
| SMART car commercial | 24-6 STUDIO TENERIFE S.L. | January 16 to 18 |
| Jack Wolfskin clothes commercial | VOLCANO INT. PRODUCTIONS | January 18 to 22 |
| Photographic report on the SMART car | 24-6 STUDIO TENERIFE, S.L. | February 1, 4 and 5 |
| Filming of a MERCEDES documentary | 24-6 STUDIO TENERIFE, S.L. | February 29 |
| Vehicle photo shoot | 24-6 STUDIO TENERIFE | March 17 to 29 |
| VOLVO photo shoot | SALTAMONTES PRODUCCIONES | January 13 to 20 |
| Vehicle photo shoot | SEAQUIST A COMPANY S.L. | March 16 and 21 |
| Filming of a car commercial | SEAQUIST A COMPANY S.L. | March 21 and 28 |
| Taping of a new episode of the documentary series “The Canary Islands: a walk through the clouds” | ATLAS ESPAÑA S.A. | May 18 to 19 |
| German cycling pictures. Training for the Tour de France | HEAD LIONS CLUB | May 18 |
| Documentary Series | VJANUARY Y GORROCHA TEGUI S.L. | June 8 |
| BMW commercial | 24-6 STUDIO TENERIFE | June 14 to 18 |
| *Canarias Directo*: Transmisión from Teide | MEDIA REPORT PRODUCCIONES | June 25 |
| Swiss TV commercial for the Olympic Games | 24-6 STUDIO TENERIFE | June 23 |
| Golf GTI vehicle filming | 24-6 STUDIO TENERIFE | July 8 |
| Documentary “*Cielo, Mar y Tierra de Canarias*” | RETINA PRODUCCIONES AUDIO VISUALES | August 24 |
| Music video | FRANCESCO PEZZINO. RETRO-JUICE PRODUCTIONS LTD. | August 24 to 26 |
| Porsche commercial | 24-6 STUDIO TENERIFE | August 31 to September 13 |
| Canary Islands documentary | GRUPO MASTER S.A. TOUR ESPAÑA | September 23 |

| | | |
|---|---|---|
| Filming of episodes of the Russian soap opera "*Casus Kukotsava*". | 24-6 STUDIO TENERIFE. Ministerio de Cultura | November 27 to December 2 |
| Pictures to be published in a book | José Damián Borges Hernández | September to January, 2005 |
| Teide National Park documentary | IWC MEDIA LTD | October 2 and 3 |
| Santiago del Teide Municipal Government promotional video | IMAGEN INDUSTRIAL | October 4 and 7 |
| Teide National Park news item | TEZ TOUR ESPAÑA S.L. | October 8 |
| Filming of video-clip for a campaign of the Department of the Environment of the *Cabildo Insular de Tenerife* | REPORT LINE S.L. | October 29 |
| Filming in the cable car | OASIS EUROPKIKARA S.L. | November 9 and 16 |
| Fashion filming | MARIPOSA PRODUCTION S.L. | November 15 to 28 |
| Picture of Honda motorcycle | TONY PHILLIPS | November 16 and 17 |
| Car publicity photo | SEAQUIST COMPANY S.L. | November 17 to December 7 |
| Car video | SEAQUIST COMPANY S.L. | 21 al 30 de November |
| Fashion news | GUENTHER HAASE | November 24 and 25 |
| Fashion news | VOLCANO INT. PRODUCTIONS | December 9 to 14 |

| **DETAILS OF THE AUTHORISATIONS TO CARRY OUT PROFESSIONAL ACTIVITIES IN TEIDE NATIONAL PARK PROCESSED BY THE *CABILDO INSULAR DE TENERIFE*** **(Tenerife Foreign Promotion Society– SPET)** | |
|---|---|
| **DESCRIPTION OF THE WORK** | **DATE** |
| Tourism report for CHANNEL 5, British TV | January 12 |
| Cultural and educational program of the Cádiz Delegation | January 25 |
| Program to promote tourism | February 5 |
| Program to promote tourism | February 7 |
| Program to promote tourism | February 17 |
| Article by the Sunday Telegraph newspaper | February 17 |
| Report to promote tourism for the "Scottish Passport" program | February 26 |
| Report to promote tourism for the Sunday Telegraph newspaper | March 24 |
| Report to promote tourism for the "Genre", "Ocean Drive" and "Vegas" magazines | April 9 |
| TV report for "Get a new life" for the BBC 2 | April 22 |

| | |
|---|---|
| Report for Viajar magazine | May 10 |
| Active tourism event | April 26 |
| Report for the *Casa de la Miel* on apiculture in Teide National Park | May 14-28 |
| Report on Tenerife by National Geographic Television | June 4 |
| Photographic report for the New Zealand Press | June 8 |
| Photographic report for OET of Warsaw | June 9 |
| Photographic report for the Dutch press | June 18 |
| Photographic report for the Italian press | June 25 |
| Photographic report for Ottagono and Plaisir de la Maison magazines | June 28 |
| Photographic report for Gewinn magazine | July 6 |
| Photographic report for Evening Star magazine | July 27 |
| Photographic report for Abroad, Wine Island, Irish Examiner, Irish Independent magazines | July 20 |
| "Tenerife Experience" active tourism circuit | July 11 |
| Report by Murfia Productions for the BBC | July 23 |
| Report for the German press | September 20 |
| Report for the English press | September 30 |
| Teletext Holiday Channel | October 10 |
| Report for the Italian magazine, "Airone" | October 13 and 14 |
| Report for the British press | October 16 |
| Report for "Trail Magazine" | October 18-20 |
| Report for "Sky Travel Shop" magazine | November 6 |
| Report for GEO magazine | November 30 |
| Report for Marie Claire magazine | December 30 |

**Heritage Signposting, Visitor Information and Interpretation**

- Specific signs were posted in the La Ruleta area indicating the distance and location of structures with restrooms for visitors.
- Meetings were held in Tenerife with the Tenerife Foreign Promotion Society (SPET) via the information offices of local administrations.
- Teide National Park Trail Network is being incorporated into a Geographical Information System (GIS) that integrates the park sign system and the motorway system.
- Using a GIS, a system to verify the signs that indicate the park limits is being implemented.
- New signs have been placed in the Telefero Bravo path cautioning visitors that it is necessary to have a permit to access the peak of Mt. Teide.
- The El Portillo and Cañada Blanca Visitor Centres remain the principle information points in the park. Other information points include the information booth at Boca Tauce, the El Portillo Office and, of course, the Park Administration Office in Santa

Cruz de Tenerife.

- Information pamphlets are being given out at the island's tourism information points, the municipalities with offices that attend the public, youth information points, etc.

**Planning and monitoring the number of visitors that the park can manage**

- Reporting the influx of visitors via Teide National Park traffic appraisal network continues. This work aids in the planning, administration and, therefore, preservation of the park's natural resources and also in the development of a public usage system that encourages visits that respect the preservation of the park.
- Regarding a system to gauge the number of visitors, the organisation's proposal includes field work to better understand how to implement such a system in the park and solicits the Technical Administration that Teide National Park be included within it.
- A system to control access to Teide's peak is being considered by comparing the data obtained by the different segments that participate in this activity.

***The promotion, communication and participation in outside events***

Among the public relations activities, the most important included having a booth in the 8th Ecological and Rural Environment Fair (organised by the municipal government of La Orotava) staffed by park interpreter-guides. Lectures about Teide National Park were given during this fair (held on April 17 and 23) which was dedicated to the park due to its 50th anniversary.

Lectures were also given to various associations and delegates both at the location of these groups (both on the island and outside of the island) and in the park: Association of Friends of the Nature and Man Museum (Santa Cruz de Tenerife), 7th International Conference on Renovation of Architectural Heritage and the Art of Building (Yaiza, Lanzarote), Technicians of Protected Habitats in Central America (Agreement between the OAPN and the Central-American Commission on Environment and Development), environmental associations from the island, 2nd Biodiversity Forum (Logroño), course on planning held in Valsaín, anniversary of the Caldera de Taburiente (El Paso) National Park, etc.

The following list includes the principle events organised during 2004 to celebrate the 50th anniversary of the creation of Teide National Park:

- Presentation to the national press attending the commemorative events (El Portillo Visitor Centre, January 21).
- Official commemoration ceremony of the 50th anniversary of the Las Cañadas del Teide Parador (January 22, 2004).
- Ceremony placing the first brick of the La Orotava Administration and Interpretation Centre (January 22, 2004).

- Section of the primary school curriculum that affected 25,000 primary school students in all of the Canary Islands.
- The education centres that participated in the Park Education Program were furnished with material and documentation giving general information on Teide National Park and on its 50th anniversary (110 centres).
- The park had an information booth at the *V Feria del mundo rural y VIII Feria Ecológica* (*VIII Semana Ecológica*) *de la Villa de La Orotava*: April 17 (Environmental Week, April 17-23).
- Lectures given during the *VIII Semana Ecológica de la Villa de La Orotava* (April 17-23):
    - "Teide National Park archaeological resources", Matilde Arnay de la Rosa, April 19.
    - "Historical-scientific notes on Las Cañadas and Teide", Eustaquio Villalba Moreno, April 20.
    - "Endangered flora in Teide National Park: application of the Genetic Rescue Plans", Manuel Marrero Gómez, April 21.
    - "The Geology of Teide National Park: origin of the Las Cañadas crater", José Manuel Navarro Latorre, April 22.
- Postmark created on the initiative of the philatelic and numismatic group, *Las Pintaderas de La Orotava*. The presentation of the postmark was made during the 7th Ecology Week of La Orotava (April 17-23).
- Presentation of the *Nature Cantata. Remembering Alexander von Humboldt and Telesforo Bravo on the 50th anniversary of Teide as a National Park*, organised by the Puerto de la Cruz Municipal Government on May 23 in the Santa Cruz Auditorium and May 30 in San Francisco Park in Puerto de la Cruz.
- Presentation of the book, *Teide: from Geographical Myth to National Park,* on June 11, in the San Augustín Senior Citizen Home in La Orotava. Authors: Isidoro Sánchez García and Nicolás González Lemus.
- Presentation of the books published by the Autonomous Organisation of National Parks, *Teide: a Historical Look* (written by Eustaquio Villalba Moreno) and *Historical Study of the Camino Real de Chasna* (coordinators Matilde Arnay de la Rosa and Juan Ramón Núñez Pestano): June 18 in the Edificio de Usos Múltiples I in Santa Cruz de Tenerife.
- Presentation in teacher's centres that had scheduled acts to celebrate the 50th anniversary of the park.
- Lectures on topics related to the 50th anniversary of the park in educational centres that had scheduled acts to celebrate the anniversary (2nd and 3rd trimester of the 2003-2004 school year and 1st trimester of the 2004-2005 school year).
- Technical assistance to carry out various events and artistic and artisan workshops (road leading to the Teófilo Pérez Primary School in Tegueste, Cultural Week workshops in the María Auxiliadora School in La Laguna, etc.).
- Information was given to the media to improve the diffusion of the anniversary. Reports appeared in the press and other specialised mediums.
- Personnel from the park's administration participated in different programs and seminars on television and radio
- Technical and material collaboration on the *50th Anniversary of Teide National Park* exposition organised by the Alexander von Humboldt Canarian-German Foundation and held at various locations (Puerto de la Cruz, Santa Cruz de Tenerife, Germany).

- Open-door days, specific activities (lectures and excursions) and commemorative ascents of Teide with different groups (handicapped groups, neighbourhood groups, senior citizen groups, etc.). These activities have taken place since the second half of June and until the present have included the following:
    - *Asociación San Lázaro Amor a los Niños* (mentally handicapped): lecture in the association Thursday, July 22, and a guided excursion through the park on Friday, July 23.
    - Program of guided excursions in collaboration with the La Orotava Municipal Government for associations and the local population: Saturdays, July 10, 17, 24 and 31.
    - Guided excursion dedicated to leukaemia patients, in collaboration with the Alejandro Da Silva Canarian Foundation (fighting against leukaemia): July 6.
    - Guided excursions in collaboration with the Andrés Llerena Occupational Centre for the mentally and physically handicapped located in Güímar: July 16 and 27.
    - Tenerife Association for Deaf People – ASORTE: talk on July 10 to prepare for an ascent of Teide, spending a night in the Altavista Refuge (September 11 and 12).
    - Development and Job Society of the Santa Cruz de Tenerife Municipal Government: lecture on July 26 and guided excursion on August 2.
    - Material and documentation giving general information on the 50th anniversary of Teide National Park was distributed to different centres for the handicapped (40 Centres).
    - Discussion between personnel from Teide National Park and from the La Laguna Municipal Government, a city catalogued on the World Heritage List: visit to the historic centre of La Laguna on September 24; visit to Teide National Park on October 8.
- The 1st National Meeting of Interpreter-Guides of the Spanish Heritage National Parks was held October 11-15 in Teide National Park (Emilio Fernández Muñoz Nature Activities Centre).
- Program of lectures describing each of the national parks in the network organised by Teide National Park to be held in Tenerife (at the Nature and Man Museum) November 2-8 after the celebrations of the 50th anniversary of the creation of Caldera de Taburiente National Park. Calendar: November 2: Teide; November 3: Timanfaya and Garajonay; November 3: Picos de Europa, Ordesa y Monte Perdido and Sierra Nevada; November 4: Tablas de Daimiel, Aigüestortes i Estany de Sant Maurici and Doñana; November 5: Cabrera, Cabañeros and Islas Atlánticas de Galicia; and November 8: Caldera de Taburiente and two specific to Teide National Park, given by Matilde Arnay de la Rosa (archaeology and traditional usage) and Wolfredo Wildpret de la Torre (flora and vegetation).
- Macro-exposition held in collaboration with Caldera de Taburiente National Park, financed by the Autonomous Organisation of National Parks. Inauguration: October 30 in La Palma Island; later it was shown in the Liceo de Taoro in La Orotava (Tenerife) from November 25 to December 8.
- Week dedicated to Teide during the Enlightenment Century, promoted by the Royal Economic Society of the Friends of the Country of Tenerife, with the collaboration of Teide National Park: end of November, held in the San Miguel de La Laguna Hermitage. Pictures from the Telesforo Bravo Archive were shown and lectures were given: “Teide and its relation with the literature of the 18th Century”, given by Rafael Fernández Hernández; “Teide in 18th Century Cartography”, given by Juan

Tous Meliá; and "Teide in the work of Viera y Clavijo", given by Eustaquio Villalba Moreno.
- Meeting of the National Parks Network Council on October 31 in Teide National Park (Cañadas del Teide Parador).
- Issuance of diplomas for the Young Park Custodians Campaign on October 31in the National Park.
- Awards Ceremony for the "12th Writing and Drawing about Teide National Park Contest", for students in Tenerife on October 31 in Teide National Park (the winners travelled to Doñana National Park and the runners-up to Caldera de Taburiente National Park, in December and November respectively).

The work to have Teide declared part of the World Heritage List continues. Among the actions taken locally, we can highlight the lectures given to environmental associations on the island, as well as the participation in the 8th University and Heritage International Seminar Forum ("Natural World Heritage: natural habitats, development, sustainability and ethics") held in La Laguna November 24-28; or in the 7th International Conference on the Renovation of Architectural Heritage and the Art of Building, held in Lanzarote July 12-16.

An important point about the initiative to inscribe Teide National Park on the World Heritage List is that the on April 2, 2004 The Spanish Historic Heritage Council included Teide National Park on its "World Heritage" list with the goal of continuing process to have it inscribed on the list.

The park continues to collaborate with the Tourism offices and patronages on the island, distributing information on the park, principally in the form of pamphlets in different languages.

***Volunteers and university practice classes.***

**Action**

Once again, Teide National Park has received the collaboration of volunteers. This year there were eight volunteers who participated via the SEO Birdlife volunteer program that lasted from August 6-26. During these 20 days the work done by the volunteers could be divided into three major groups:

- Flora handling
- The public usage program
- Fauna handling

This year all of the volunteers participated in the three major work groups, taking turns carrying out the different tasks given to them.

The Flora Handling Program included the following activities:
- Collecting seeds
- Helping with the maintenance of the Botanical Garden
- Taking inventory of and eliminating introduced flora
- Monitoring the reproduction rate and life cycles of different species
- Working in the nursery

The Public Usage Program included the following activities:

- Giving tours in the Emilio Fernández Muñoz Nature Activities Centre
- Guided excursions for the general public
- Checking the condition of the paths
- Helping to monitor the trails
- Helping in the Visitor Centres
- Keeping track of meteorological data

In the Fauna Handling program the volunteers participated in the following activities:

- Collection of abandoned dogs
- Stray animal control (stray cats)
- Repositioning of bird feeders and drinkers for partridges
- Assisting in the cynegetic control campaign

From July-18 practice classes were held in the National Park with 8 students from the Department of Agricultural and Environmental Sciences of the University of Salamanca. These students participated in activities related to the day to day functioning of the park such as maintaining the Botanical Garden, helping out at the Visitor Centres, helping with the guided excursions, working in the Emilio Fernández Muñoz Nature Activities Centre, aviculture, etc.
Also, from September 13 to October 4, five other students from Rey Juan Carlos University (Department of Environmental Sciences) also participated in practice classes related with the following:

- tracking the species of flora that have been endangered during the last 20 years;
- endangered species of flora and fauna;
- imported flora y fauna;
- evaluation and typology of the visitors during the last 20 years;
- evaluation of park zoning.

***Others*** **(**Official institutional visits; creation of friendly, collaborative relationships with other parks; awards given out; renewal of European diplomas; sponsorship and patronage)

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**Action**

In its 883rd meeting held on May 5, 2004, the Council of Europe's Committee of Ministers decided to renew Teide National Park's **European Diploma** for Protected Areas for another five years in recognition of the effort the Spanish authorities have made to maintain the environmental values of the National Park.
Important visitors:

- National Parks Delegation of Tanzania.
- Minister of the Environment, Elvira Rodríguez Herrer.
- Attendees of the Annual European World Trade Centres Conference and the Extraordinary Conference of the Committee on Tourism, Hospitality and Cultural Exchange of the WTC Association.
- National Commission on Quality Building Techniques.
- Official College of Technical Forest Engineers, to celebrate World Forest Day and the 50th anniversary of the National Park.
- Annual assembly of Spanish and French foreign trade advisors.
- Ascent of Teide by members of the Canarian Association of Deaf People, with the aid of park personnel.
- Personnel from the La Laguna Municipal Government to exchange experiences related to the World Heritage List.
- Minister of the Environment, Cristina Narbona Ruiz.
- Minister of Industry, Tourism and Commerce, José Montilla Aguilera.

**Human resources.**

**Workforce**. (the number of public officials and workers under contract was updated on 12/31/2003).

| Public Officials* 8 | Workers Under Contract* 12 | Outside Contractors (technical assistance) ** 54 |
|---|---|---|
| Technicians: 3<br>Public usage :<br>Security: 2<br>Administration: 3<br>Maintenance: -<br>Other: - | Technicians: -<br>Public usage: -<br>Security: 5<br>Administration: 2<br>Maintenance: 2<br>Other: 3 | Technicians: 7<br>Public usage: 15<br>Security: 9<br>Administration: 2<br>Maintenance: 16<br>Other: 5 |

*** The number of workers assigned to the corresponding autonomous community will be marked by category (if there are any) in parenthesis.**

**** If they are temporary appointees, mark days worked.**

**Training.** Personnel training.

**Training park personnel:** personnel attending different courses and seminars organised by the OAPN and the European Social Fund.

| Course Title | Organisation or Company that gives the course |
|---|---|
| Various information and training lectures were given throughout the year to park personnel related to the Eco-management and Audit Scheme (EMAS) that is being implemented in the park. | Park Administration |
| Attendance of the 4th European Conference for the Conservation of Wild Plants (PLANTA EUROPA) held in Valencia September 17 – 20. | Generalitat Valenciana and Botanical Garden of Valencia |
| Current and future perspectives for public financing of the biodiversity research: taking inventory and cataloguing Spanish microbiota. The 1st Scientific Meeting on Microbiota in Spain. Guadalajara University Campus of Alcalá University (*Sede de Sigüenza*). Held on September 30 and October 1, 2004. | Organised by the Mycology Group of the Department of Plant Biology (Botany). University of Alcalá. |
| International Symposium on Protected Areas | |
| The lecture, "Atlas and Red Book of the Endangered Vascular Flora of Spain" was given in the 1st Course on Biodiversity Conservation and Management organised by the Environment Council of the Canarian Government (Sentinel Project, INTERREG IIIB). | Held at the Environmental Planning Centre of the Canarian Government between November 29 and December 3, 2004. |
| Spanish representative (Ministry of the Environment – General Administration of Biodiversity) as technical expert in the "Ad Hoc Technical Expert Group in Island Biodiversity" (Biological Diversity Accord) held in Puerto de la Cruz (Tenerife) December 13-17, 2004. | |
| Selective entrance course in the National Park Environment Agents range. | |
| Course on environmental audits | |

**Accords currently in effect** (not pacts). Indicate organisation and objective of the agreement.

***With administrations from the Autonomous Community of the Canary Islands:***

An accord was reached with the Agriculture, Cattle Raising, Fishing and Food Council of the Canary Islands Government that allows students from that administration to do practice classes in the park.

***With local administrations:***

An accord was reached with the municipal governments of La Orotava and La Guancha to collect dogs abandoned in Teide National Park.

***With NGOs:***

An agreement was reached with the Spanish Red Cross that allows that NGO to resume first-aid service in Teide National Park, with an ambulance available every day.

An agreement was made with the Canarian Federation of Animal Protection Associations and the Tenerife Pro-Animal Association, to improve and coordinate work guidelines between park personnel, the Canarian Federation of Animal Protection Associations and the Tenerife Pro-Animal Association.

***With research centres:***

An agreement was reached with the University of La Laguna to hold practice classes for students enrolled in the university in the park.

An accord was reached with Rey Juan Carlos University to hold practice classes for students enrolled in the university in the park.

**Publications (**Magazines. Bulletins. Pamphlets. Special Publications (posters, etc.). The publications of the Autonomous Organisation of National Parks are expressly excluded).

Carqué, E., M. Durbán, M.V. Marrero & A. Bañares: Influencia de los herbívoros introducidos en la supervivencia de *Stemmacantha cynaroides* (*Asteraceae*). Una especie amenazada de las Islas canarias.

Dormancia seminal y germinación en *Echium acanthocarpum* Svent. (Boraginaceae). Una especie amenazada de las Islas Canarias. España. E. Carqué y colaboradores, 2004

Manuel Marrero Gómez, Ángel Bañares Baudet, Eduardo Carqué Álamo (2003): Planificación para la conservación de los recursos vegetales en áreas protegidas. M. Marrero y colaboradores, 2004

Plan de recuperación de la flora amenazada del National Park de Garajonay. Las Gomera (Islas Canarias). Germinación y restituciones de *Pericallis hansenii*, *Gonospermum gomerae* e *Ilex perado ssp. Lopezlilloi*. Á. Bañares y colaboradores. 2004

Sánchez García, I. & González Lemus, N. “El Teide, de Mito Geográfico a National Park”. Ed. Lemus.

Among the new informative material that is distributed to park visitors, it is worthwhile to mention that which describes the effect that the mouflon has on the vegetation and, somewhat more technical, the climbing guide Publisher by the Canarian Federation of Mountain Climbing.

Marrero, M.V., E. Carqué, Á. Bañares & Á. Palomares (2003): *Bencomia exstipulata* Svent. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 881-882.

Marrero, M.V., E. Carqué, Á. Bañares & Á. Palomares (2003): *Bencomia exstipulata* Svent. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 881-882.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Helianthemum juliae* Wildpret. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 284-285.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Silene nocteolens* Webb & Berthel. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 498-499.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Stemmacantha cynaroides* (Chr. Sm. *in* Buch) Dittrich. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 706-707.

Marrero, M.V., E. Carqué & Á. Bañares (2003): *Gnaphalium teydeum* Knapp. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 706.

Mesa, R., A. Acevedo, J.P. Oval, A. Hernández, M. Marrero & E. Carqué (2003): *Cerastium sventenii* Jalas. *In* Bañares, Á., G. Blanca, J. Güemes, J.C. Moreno & S. Ortiz (eds.): Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Address General de Conservación de la Naturaleza, Madrid. 634.

## Advocates of the Proposal to Inscribe Teide National Park on the World Heritage List

In order to be included on the World Heritage List it is necessary have the voluntary support of institutions, the help of non-governmental organisations and the backing of all sectors of society (associations, businesses, individuals, etc.) on the national and international level.

### *Mechanisms used*

The mechanisms that the park administration is using to permit advocacy of the Proposal to Inscribe Teide National Park on the World Heritage List are the following:

- Documents soliciting advocacy have been remitted to the 87 municipalities of the Canarian Archipelago, the Cabildo of Tenerife (Island Government), scientific institutions, environmental NGOs, sporting organisations, businesses, etc.

- A petition supporting the Proposal to Inscribe Teide National Park on the World Heritage List has been placed in the visitor centres of the national parks and in different events that Teide National Park has participated in.

- The availability of a web page written in various languages linked from the Ministry of the Environment's web site: www.mma.es/parques/lared/index.htm.

### *Advocates of the inscription proposal*

According to the archives of the park administration, initiatives promoting the inscription of Teide National Park on the World Heritage List have existed for years, but this movement only really gained currency in 2002.

In a meeting on October 7, 2002, the Patronage of Teide National Park approved a timetable of actions whose objective was the inscription of this protected natural space on the World Heritage List. Subsequently, in a meeting on October 25, 2002, the Canarian National Parks Mixed Management Commission also approved the timetable of goals to reach between September of 2002 and January of 2004 for the initiative to have Teide National Park inscribed on the World Heritage List.

The Council of the National Parks Network agreed on October 30, 2004 to propose the inscription of Teide National Park on the World Heritage List.

Currently, the following are advocates of this proposal:

- Of the 87 municipalities in the Canarian Archipelago, 68 have advocated the Proposal to Inscribe Teide National Park on the World Heritage List. Those municipalities are the following:

- The twelve municipalities that have land within the borders of the National Park: La Orotava, Los Realejos, Icod de Los Vinos, La Guancha, San Juan de La Rambla, Garachico, Santiago del Teide, Guía de Isora, Adeje, Granadilla, Fasnia and Vilaflor.

- Other municipalities of the archipelago that have supported the initiative:

- In Tenerife: San Cristóbal de La Laguna, El Sauzal, La Matanza de Acentejo, La Victoria de Acentejo, Tacoronte, Puerto de la Cruz, Candelaria, Güímar, Arafo, Santa Ursula, Arico, San Miguel de Abona, Los Silos, El Tanque, El Rosario, Arona, Tegueste and Buenavista del Norte.

- In Gran Canaria: Telde, Santa Brígida, Arucas, Teror, Santa María de Guía, Tejeda, Santa Lucía, Gáldar, Valsequillo, Mogán, Ingenio, Agüimes, Agaete, Las Palmas de Gran Canaria, Valsequillo, Valleseco, Artenara and Firgas.

- In Fuerteventura: Puerto del Rosario, Antigua, Tuineje, Pájara, La Oliva and Betancuria.

- In La Palma: Puntagorda, Tazacorte, Barlovento, Breña Alta, Santa Cruz de La Palma and Tijarafe.

- In El Hierro: Frontera and Valverde.

- In La Gomera: Agulo, Vallehermoso and Valle Gran Rey.

- In Lanzarote: Teguise, Arrecife and Tías.

- The Plenum of the Cabildo of Tenerife, in an extraordinary session held in April of 2003 approved the motion of Coalición Canaria to support the declaration of Teide National Park as world heritage and in consequence adopted the following accord: "The Cabildo of Tenerife advocates the Proposal to Declare Teide National Park a World Heritage, through its inscription on the World Heritage List.

  The Autonomous Organisations of the Cabildo of Tenerife that have advocated the initiative are the following: Presidency of the Autonomous Organisation of Museums and Centres, the Museum of Natural Sciences of Tenerife, the Museum of Science and the Cosmos, the Archaeological Museum of Tenerife, the Museum of History of Tenerife, the Insular Council of Tenerife Water and the *Casa de la Miel* of the Cabildo of Tenerife.

- During a session on October 21, 2003, the Canarian Government agreed to advocate the "Proposal to Declare Teide National Park a World Heritage" by UNESCO.

- Scientific institutions:
    - The Superior Council of Scientific Research (CSIC). The Jaume Almera Earth Sciences Institute.
    - The Institute of Natural Products (CSIC). Department of Volcanoloy.
    - The Doñana Biological Station (CSIC).
    - The Geological and Mineral Institute of Spain.

- Environmental non-governmental organisations:
    - Greenpeace - Spain.
    - World Nature Defence Fund.
    - Spanish Phytosociological Association (AEFA).
    - Spanish Royal Society of Natural History.
    - Friends of the Earth.
    - Spanish Ornithological Society (SEO/Birdlife).
    - EUROPARC-España

- University:
    - Geography and History Faculty of La Laguna University
    - Department of Art History, History and Pre-History, Anthropology and Ancient History of Laguna University
    - Biology Faculty of La Laguna University
    - Agrarian Engineering Technician School of La Laguna University
    - Department of Geography of Las Palmas de Gran Canaria University.

- Professional Colleges and Associations:
    - Canarian Official College of Biologists
    - Canarian College of Mountain Engineers
    - College of Geologists
    - College of Geographers
    - Spanish Geographers Association (AGE)

- Sporting Organisations:
    - Canarian Federation of Aerial Sports
    - Canarian Federation of Speleology
    - Tenerife Federation of Mountain Climbing
    - Tenerife Mountaineers Group
    - Benisahare Canarian Speleology Group
    - Nivaria Mountaineers Club

- Business Organisations and businesses:
    - Santa Cruz de Tenerife Provincial Association of Travel Agencies
    - Hotel and Extra-Hotel Association of the Province of Santa Cruz de (ASHOTEL)

  - *TUI AG y España*
  - *Buffet Teide* restaurant

- Others that have advocated the proposal:

  - Territorial Meteorological Centre in Western Canaries (National Meteorological Institute)
  - Apicultural Association of Tenerife (APITEN).
  - Professional Association of Tourist Guides of Tenerife (APIT)
  - General Administration of the Guardia Civil. General Sub-Administration of Operations, Canary Islands (Ministry of the Interior).
  - Real Sociedad Económica de Amigos del País de Tenerife.
  - CC.OO. Huesca (Federación de Servicios y Administraciones Públicas).
  - Asociación ADOTLEN.
  - Paradores de Turismo de España, S.A.
  - Profesor Dr. D. Theodoor Verstappen (International Institute for Geo-Information Science and Earth Observation).
  - D. Francisco Hernán Reguera, Coordinador de la Unidad de Docencia e Investigación de Geología. Universidad de La Laguna.
  - Federación Internacional de Centros para la Conservación del Patrimonio CICOP de España, Italia, Portugal, Argentina, EEUU, Paraguay, Uruguay, Bolivia, Colombia, Perú, Cuba y Méjico.
  - VIII Congreso Internacional de Rehabilitación del Patrimonio Arquitectónico y Edificación. Lanzarote, 2004.
  - IX Simposium de Centros Históricos y Patrimonio Cultural de Canarias. La Laguna, 2005.
  - Centro Internacional para la Conservación del Patrimonio CICOP ESPAÑA.
  - 2nd H&M International Conference on “Vulnerability of 20th Century Cultural Heritage to Harzards and Prevention Measures” Kos Grecia.
  - Oficina del Historiador de la ciudad de La Habana. Cuba.

- 17,623 individuals have signed their support for the Proposal to Declare Teide National Park a World Heritage.

- 95 individuals, associations and educational entities have advocated the proposal using the form located on the web page of the Ministry of the Environment’s website: www.mma.es/parques/lared/index.htm. The following is a breakdown of this group:

  - Individuals: 82
  - Education Centres: 13
    - *Colegio Hogar Escuela*
    - *Colegio Pureza de María*
    - *Colegio Nuestra Señora del Buen Consejo*
    - *Centro de Educación Obligatoria Tijarafe*
    - *Centro de Educación Secundaria Jinamar*
    - *Colegio La Salle San Idelfonso*
    - *Colegio Nuryana*
    - *Instituto de Educación Secundaria de Arico*
    - *Instituto de Educación Secundaria Faro de Maspalomas*

- *Instituto de Educación Secundaria Añaza*
- *Centro de Educación Obligatoria Manuel de Falla*
- *Instituto de Enseñanza Secundaria San Matías*
- *Instituto de Enseñanza Secundaria El Mayorazgo*

***Participation in events***

***2003***

With the objective of explaining the Proposal to Inscribe Teide National Park on the World Heritage List and find support, the following events were participated in:

- 7th Symposium of Historic Centres and Cultural Heritage of the Canary Islands held on April 3 and 5, 2003 in Santa Cruz de La Palma.
- The Park had an information booth at the 2003 La Orotava Environmental Week Fair where signatures were collected.
- 5th National Parks World Conference held in South Africa (Durban) on September 8-17, 2003.
- 7th Sessions on Municipalities and National Parks held on September 23-28, 2003 in Tenerife.
- UNESCO Forum: University and Heritage. 8th International Seminar: *Natural spaces, development, sustainability and ethics* held on November 24-29 in the *Paraninfo del Aulario del Campus de Guajara* (University of La Laguna).

***2004***

- The Park had an information booth at the 2004 La Orotava Environmental Week Fair where 17 signatures were collected (April 17).
- The Director-Curator explained the Proposal to Inscribe Teide National Park on the World Heritage List at the 3rd Biodiversity Forum (Spanish Committee of UICN). *Integration of Cultural and Natural Heritage as an incentive for Conservation*, held in La Rioja on May 27-29, 2004.
- Participation in the 7th International Conference of Architectural and Building Heritage held in Lanzarote on July 12-16, 2004. July 15 the Proposal to Inscribe Teide National Park on the World Heritage List was explained.

# Cartography and Posters

Maps (provided in Din A0 format) to the different heritage thematics are provided. This cartography has the following characteristics:

**UTM Zone:** 28 N
**Ellipsoid:** GRS80 (WGS84)
**Projection:** UTM Datum REGCAN95
**Base cartography:** GRAFCAN (2002).
**Original Scale A0:** 1:25,000. Except the Geological Synthesis map (scale 1:100,000), the geology map (scale of 1:40,000) and the Property Limits and Buffer Zone map (scale of 1:50,000).

## Thematic elements

***Property Limits and Buffer Zone:*** this map shows the boundaries of the Park, in accordance with the description found in Annex II of the October 14, 1999 Resolution by the General Secretary of the Environment, and those of the Buffer Zone, constituted by the Teide National Park Peripheral Protection Zone and the Coronal Forestal Natural Park.

***Zonification:*** this map contains the spatial distribution of the territorial zoning of the Park in accordance with the currently applicable Management and Usage Administration Plan.

***Topography***: this map considers the most important orographic aspects, such as the distribution of height isolines, hydrographic network, connection routes and forest paths, buildings and population centres, etc.

***Geology (two maps)***

- **Geological Synthesis** (Geological and Mineral Institute of Spain, IGME): The synthesised geological map of Tenerife encompasses the principle volcanic edifices and units of the island: the old mountain masses (Miocene-Pliocene), the Cañadas Edifice, the dorsals of the Teide-Pico Viejo Complex.

- **Geology** *(Carracedo et al., 2005, unpublished):* Geological map of the central and north-eastern area of Tenerife which includes Teide National Park, its principle geological elements, part of the Cañadas Edifice, the Caldera an the Las Cañadas landslide valley, the NW and NE rifts and the Teide-Pico Viejo Complex. These last two represent the last phase of eruptive activity in Tenerife.

***Vegetation***: this map displays the different vegetation communities present in the National Park according to the phytosociological typology of Braun-Blanquet, with a hierarchical

specification to the *de facie* level. The information was provided by the Vascular Flora Inventory of Teide National Park (Wildpret and Martín, 2003 unpublished).

***Vascular flora***: this map is a simplified representation of the distribution of the taxonomic categories that best represent the vascular flora of the National Park. The information was provided by the Vascular Flora Inventory of Teide National Park (Wildpret and Martín, 2003 unpublished).

***Landscape***: (Martínez de Pisón, E., Arozena, M.E., Beltrán, E. and Romero,C., 2005 unpub.): this map contains the different landscape units of Teide National Park.

***Archaeology***: this is a map of important archaeological areas displaying the density of the discoveries in Teide National Park by square kilometre, in the areas surveyed as of the publication of this document. It distinguishes between high, medium and low discovery-concentration areas (Arnay, 2005 unpublished).

***Land tenure***: this map displays the distribution of property in Teide National Park on three levels: state, municipal and private.

***Public Use***: this map indicates the different infrastructures that exist within Teide National Park and the Protective Buffer Zone, as well as the different Public Use services. It also displays the distribution of the principle and secondary path network.

***Orthophotographic vision***: this map provides a panoramic vision of Teide National Park derived from orthophotographs taken in 1998. It also includes various 3D photorealistic simulations obtained from the orthophotographs mentioned earlier and a digital model of elevations.

## Posters

Four posters are attached in Din A0 size with photographs, maps and illustrations of landscape as well as the geological and structural elements of Teide National Park, that compliment section 3 of the Proposal to Inscribe Teide National Park on the World Heritage List, called Justification for Inscription, as well as the sections covering geology and geomorphology and landscape contained in this annex documentation.

# Audiovisual material

The following audiovisual material specified in section 7.a of the inscription proposal is provided:

**Nº 1. DVD Teide National Park**

We present the Proposal for the Enrollment of the National Park of El Teide to the World Heritage List based on the quality of the extraordinary aesthetical values shaped by its landscapes (criteria vii) and in the geological processes that form its volcanic nature (criteria viii). In addition to this, is the singularity of its fauna, flora and vegetation, its atmosphere and climate, as well as the stamp of the human occupation felt throughout its history.

This DVD has been produced by "Televisión Española" in January 2006, it has an approximate duration of 15 minutes and is presented in two languages: English and Spanish.

**Nº 2. CD-ROM about Teide National Park**

The CD-ROM about Teide National Park created by Fon-3, S.A, was published by the Autonomous Organisation of National Parks in October, 2001.

This CD-ROM contains information in Spanish about the national Park divided in four topics: information (regulations, general information and advice), itineraries (landscape photographs organised by routes, audiovisuals and virtual routes), fauna and flora (these last two sections include photographs and descriptions of species).

**Nº 3. Collection of twenty slides from the National Centre for Environmental Education (CENEAM) photo-library**

Published by the Autonomous Organisation of Spanish National Parks in 2003, this collection gives an overview of Teide National Park, including the most representative images of its landscape, flora and fauna.

The following is a description of the slides along with a brief commentary about its content or caption.

- Slide 1: El Roque Cinchado, along with El Teide, is one of the most representative landscape elements of the National Park.

- Slide 2: In winter, the landscape is covered by a cold and white blanket of snow, highlighting even more the majesty of El Teide.

- Slide 3: Badlands are the most common lava flows from Las Cañadas, creating a chaotic landscape that makes it impossible to cross.

- Slide 4: Los Huevos del Teide are accretion balls formed during the Pico del Teide eruption, located on the slope of Montaña Blanca.

- Slide 5: The wall of El Circo borders the immense Las Cañadas caldera, which is 16 km in diameter.

- Slide 6: The interior walls of Las Cañadas are formed by different layers that were emitted in different eruptive processes.

- Slide 7: The cliffs at the base of Guajara were shaped b water and wind.

- Slide 8: Retama del Teide *(Spartocytisus supranubius),* the most abundant plant species on the summit of El Teide, has aromatic white and pinkish flowers that fill the air with a sweet smell in spring.

- Slide 9: The codeso de cumbre *(Adenocarpus viscosus var. viscosus)* is a leafy shrub with very striking yellow flowers that can live on rocky terrain.

- Slide 10: The hierba pajonera *(Descurainia bourgaeana)* is the first to give colour to the landscape and announce the coming of spring to the National Park.

- Slide 11: Tajinaste picante *(Echium auberianum*), with its blue flowers and total adaptation to the environment is a unique and rare species in Las Cañadas.

- Slide 12: Cardo de plata *(Stemmacantha cynaroides),* one of the most endangered species that today is still only found in the National Park.

- Slide 13: Margarita del Teide *(Argyranthemum teneriffae),* another species only found on the summit of Tenerife.

- Slide 14: Bejeque *(Aeonium smithii),* a plant that specialises in living in rocky substrate.

- Slide 15: El tajinaste rojo *(Echium wildpretti)* is a plant that has a conical blossoming of small red flowers that can grow up to two metres high.

- Slide 16: The violeta del Teide *(Viola cheiranthifolia)* is one of the botanical jewels of the National Park, that only grows on the slopes of El Teide above 2,500 m.

- Slide 17: Lagarto tizón *(Gallotia galloti*), one of the most common reptiles in the National Park and also one of the best adapted to the presence of humans.

- Slide 18: Perenquén *(Tarentola delalandii),* small nocturnal reptile that is able to climb walls and ceilings.

- Slide 19: The búho chico *(Asio otus*) is a nocturnal predator who thrives on some of the species that were introduced into the Park like mice and small rabbits.

- Slide 20: with its characteristic blue feathers, the pinzón azul del Teide *(Fringilla teydea ssp. teydea)* is one of the most striking birds in the National Park.

**Nº 4. CD-ROM Spanish National Parks. Presentation**

Published in 2002 by the Autonomous Organisation of National Parks, it contains a general presentation in video as well as a map of the corresponding location of each of the National Parks. There is a Spanish and English version of this CD-ROM.

**Nº 5. DVD of the series entitled "Nuestros Parques Nacionales. Red de Vida".**

This DVD is the number two of a three DVD collection presented by Miguel de la Cuadra Salcedo and produced by Divisa Home vides in 2004, with the collaboration of TVE Radio Televisión Española and the Autonomous Organisation of National Parks of the Ministry of the Environment.

In this DVD the Teide National Park is covered, and can directly display the documentary or a specific menu that contains the following selections: The National Park, Acknowledgements, Routes, Useful Addresses, Ecosystems, Fauna, Flora and Map of the area. Each selection gives an introduction to the topic. The documentary episode that contains information on Teide National Park gives a 27 minute-long overview of the most interesting aspects of the Park. Along with the narrator, various experts explain different scientific fields and the management.

**Nº 6. CD ROM with digital photographs**

This CD-ROM contains ten digital photographs that can be used in the public web to represent the property.

**Nº 7. Collection of 70 Slides**

This collection contains two basic blocks. The first block, composed of 64 slides from the author D. Diego L. Sánchez, is a representative sample of the Teide National Park Slide Archive. These blocks are sub-divided by topics such as: Geology (identified by the letter G and made up of 13 slides), Vegetation (V, 11 slides), Fauna (F, 11 slides), Landscape (P, 10 slides), Archaeology (A, 4 slides), History (H, 6 slides), Public Use (U, 2 slides), Utilisation of natural resources (C, 2 slides), Management of resources (R, 6 slides), and Infrastructures (I, 5 slides).

The other block, that has been titled History (H), is made up of six images related to the National Park that were provided in the 2002 study presented by the National Park entitled "Estudio sobre la Evolución de la Flora y Vegetación del Parque Nacional del Teide" (Study on the evolution of the Flora and Vegetation of Teide National Park) directed by D. Octavio Rodríguez Delgado.

The following is a description of the slides along with a brief commentary on their content or caption.

**Geology (G)**

- G-1 With a diameter of 800 m, Pico Viejo is the largest crater in the Canary Islands.
- G-2 Las Cuevas de Los Roques contain unique species of fauna that are perfectly adapted to the subterranean world.
- G-3 Los Huevos del Teide are accretion balls that mark the tradition climbing path of El Teide.
- G-4 La Catedral is the largest exhumed volcanic chimney in the National Park.
- G-5 The hydrothermal alterations of Los Azulejos. In this case, the changes in the colour of the rock are caused by magma climbing up to the phreatic layer.
- G-6 La Zapatilla de La Reina is a geological structure where the rigours of the Las Cañadas climate and its erosive force can really be seen.
- G-7 Ucanca is the largest *cañada* (hollow) in the National Park.
- G-8 View of the Tabonal Negro badlands lavas.
- G-9 Overview of the Circo de Las Cañadas seen from La Rambleta 3,550 m above sea level.
- G-10 Aerial view of Las Narices del Teide on the slope of Pico Viejo, the last eruption that took place within the National Park (1798).
- G-11 Detailed view of a lava channel from the eruption of Las Narices del Teide.
- G-12 Twisted lava, volcanic flows that wrinkle in creases or strands.
- G-13 The Montaña Rajada dome has the most spectacular block flows in Spain.

**Vegetation (V)**

- V-1 The hierba pajonera (*Descurainia bourgaeana*) changes its straw-like aspect in spring when it becomes a yellow semi-sphere.
- V-2 The alhelí del Teide (*Erycimun scoparium*), with its tiny flowers adds bright colours to the landscape.
- V-3 The tajinaste picante (*Echium auberianum*) is exclusive to the Tenerife summits and is present in the National Park.

- V-4 The name of this plant, “chahora” (*Sideritis soluta*), comes from the native pre-Hispanic language.

- V-5 The violeta del Teide (*Viola cheiranthifolia*) is a small wonder found on the high summits of the National Park.

- V-6 El rosal del guanche (*Bencomia exstipulata*), is one of the most uncommon plants found on the Island of Tenerife.

- V-7 The tajinaste rojo (*Echium wilpretii*), one of the most representative plants of the National Park.

- V-8 During the spring, the hierba pajonera (*Descurainia bourgaeana*) paints the landscape yellow.

- V-9 Lichens, the first colonisers of volcanic rocks.

- V-10 The retama del Teide (*Spartocytisus supranubius*), the best honey plant on the summit.

- V-11 Wonderful detailed view of *Silene nocteolens,* a small jewel of the national Park’s flora.

**Fauna (F)**

- F-1 A small beetle, the *Pimelia ascendens*, extremely well-adapted to its life in the high mountains.

- F-2 Grubs (*Cyphocleonus armitagei*), a relatively common group in the National Park.

- F-3 The Teide mantis (*Pseudoyersinia teydeana*), a small predator.

- F-4 The wet areas hold interesting invertebrate fauna such as the zapatero (*Notolecta canariensis*).

- F-5 Manto de Canarias (*Cyclyrius webbianus*), a small wonder that gives colour to the National Park’s invertebrate fauna.

- F-6 A bumblebee (*Bombus canariensis*) exclusive to the Canary Islands.

- F-7 The tizón lizard (*Gallotia galloti*) is the most common reptile in the National Park and the delight of the Park’s visitors.

- F-8 The caminero (*Anthus berthelotii*) attracts the attention of visitors with its peculiar way of walking.

- F-9 The titmouse (*Parus caeruleus*), is a marvel present in the Canary Islands with four taxons.

- F-10 The Madeira bat (*Pipistrellus maderensis*) is one of the mammals present in the National Park.

- F-11 This common spider (*Aculepeira annulipes*) is known for its amazingly resistent webs.

**Landscape (P)**

- P-1 The "sea of clouds" is one of the most interesting atmospheric phenomenons that can be observed from the National Park. It is also an important water source for the island.

- P-2 One of the most uncommon images of the Teide stratovolcano. Seen from the north face.

- P-3 El Teide rises majestically above a cottony sea of clouds.

- P-4 Aerial view of the Teide summit. At 3,718 m, it is the highest point in Spain.

- P-5 Majestic view of Pico Viejo and its impressive crater, with El Teide in the background.

- P-6 In the northeast part of the National Park, La Fortaleza is the only remaining vestige of the wall of the Las Cañadas amphitheatre.

- P-7 Montaña Guajara, the fourth highest mountain in the National Park, a legendary landmark.

- P-8 Sunset view from the La Palma Island, above a sea of clouds.

- P-9 The national Park has spectacular sunsets that delight visitors.

- P-10 In winter the waters of El Riachuelo freeze.

**Archaeology (A)**

- A-1 There are caves that were once used as pastoral settlements during the summer.

- A-2 Ceramics is one of the most common vestiges of the pre-Hispanic era.

- A-3 Mummification was practised by the aborigines.

- A-4 Mummified remains found in Teide National Park.

**History (H)**

- H-1 During the summer, the pastors took their goat herds to the summit, continuing the activity initiated by the Guanches. Pasturing was practised in Las Cañadas until the Park was declared a National Park in 1954.

- H-2 Cabin built in the Guajara heights by Jean Mascart in order to study the passage of Halley's Comet. He took the first photograph of the comet from this cabin.

- H-3 The Sanatorium was built at the beginning of the 20th Century for the treatment of skin and respiratory diseases.

- H-4 Carving of the historic 1798 eruption of Las Narices del Teide, on the slopes of Pico Viejo.

- H-5 Etching of muleteers in Las Cañadas, painted in the Romantic era by Joseph Mallord William Turner.

- H-6 Old German laboratory and residence built in La Cañada de La Grieta in 1909 and dismantled in the middle of the 20th Century.

**Public Use (U)**

- U-1 The visitor centres are a basic tool for the schoolchildren programme carried out by this protected space.

- U-2 The guided routes are the cornerstone of a visit to the National Park.

**Utilisation of natural resources (C)**

- C-1 The honey elaborated from the flower of the retama del Teide is a delicacy.

- C-2 The carpet that is created with coloured soil from the National Park in the plaza of the Villa de la Orotava Town may is an artistic display that delights visitors every year.

**Management of resources (R)**

- R-1 The Plant Genetic Rescue programme has a greenhouse at its disposal.

- R-2 Plant production, the foundation of the Genetic Rescue programme.

- R-3 Field work is a key factor in the conservation of endangered species.

- R-4 An important sample of the national park's vegetation is found in the El Portillo Botanic Garden.

- R-5 Mouflons, a species introduced in 1971 in order to be hunted.

- R-6 The elimination of introduced species, a continuous process.

**Infrastructures (I)**

- I-1 The Emilio Fernandez Muñoz Activity Centre allows for environmental education activities in an environment near the National Park.

- I-2 Fire Prevention and First Aid Centre located in the El Portillo Alto caserío.

- I-3 The National Park's office in El Portillo Alto is a valuable support and management facility.

- I-4 Cañada Blanca is one of two National Park Visitor Centres that illustrate the intense relationship between man and El Teide throughout the history of man on the Tenerife summits.

- I-5 Three paths in the La Rambleta zone, marked by vistas, allow visitors to have a birds-eye view of the National Park.









Teide National Park limits and buffer zone

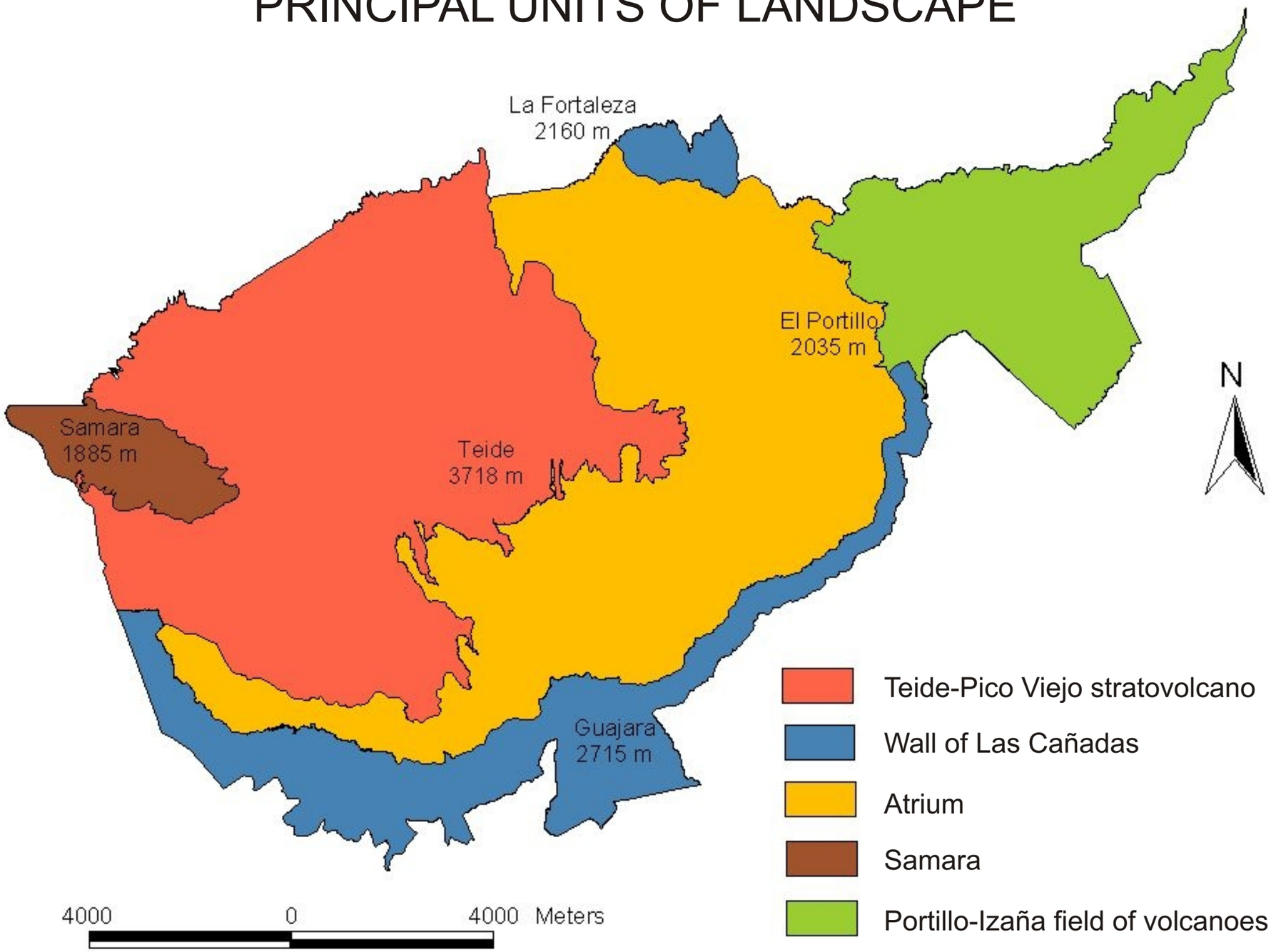
Teide National Park limits

Zona tampón

Limits of Corona Forestal Natural Park

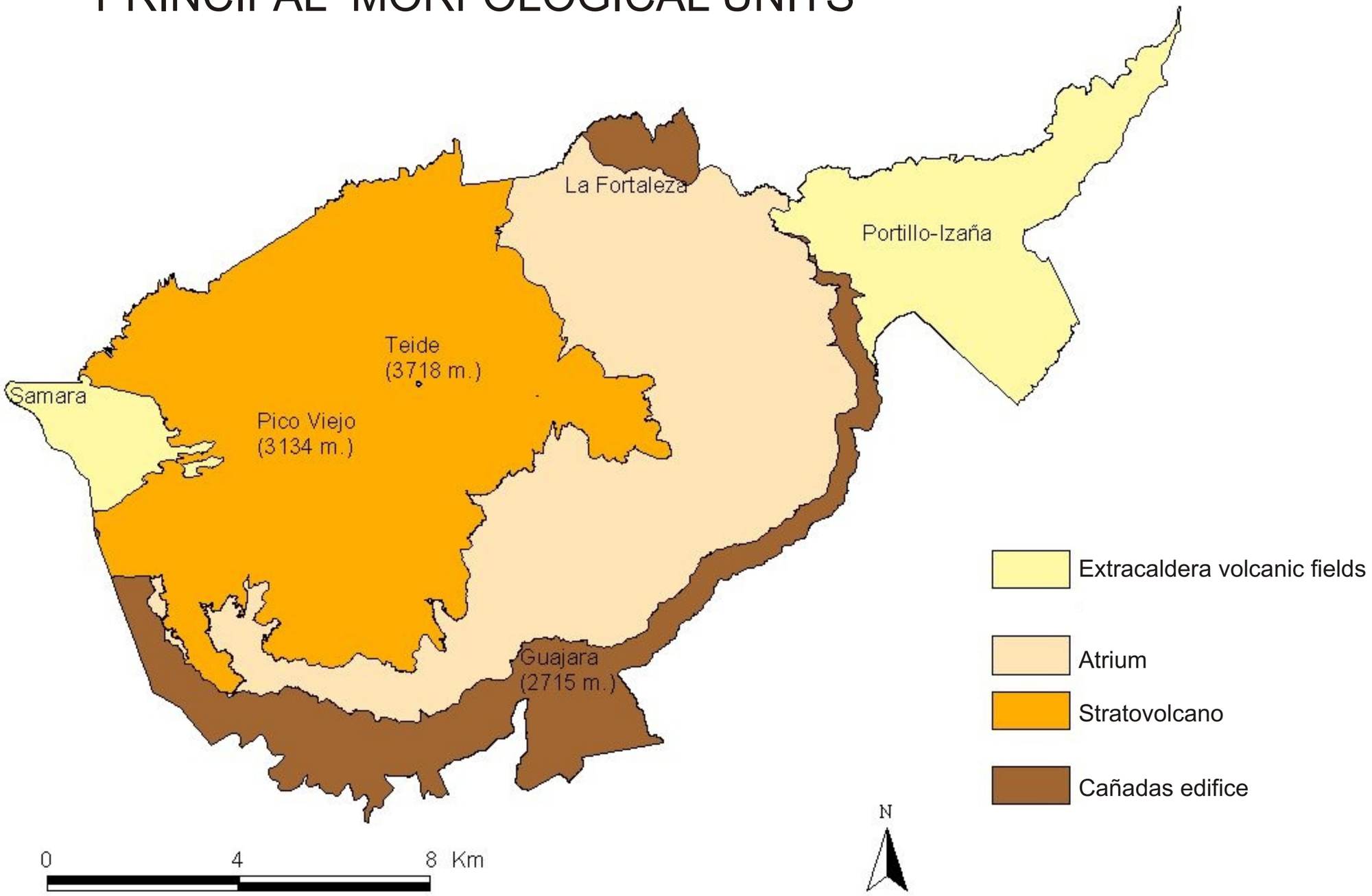
Peripheral Protection Zone of the Teide National Park

# PRINCIPAL UNITS OF LANDSCAPE



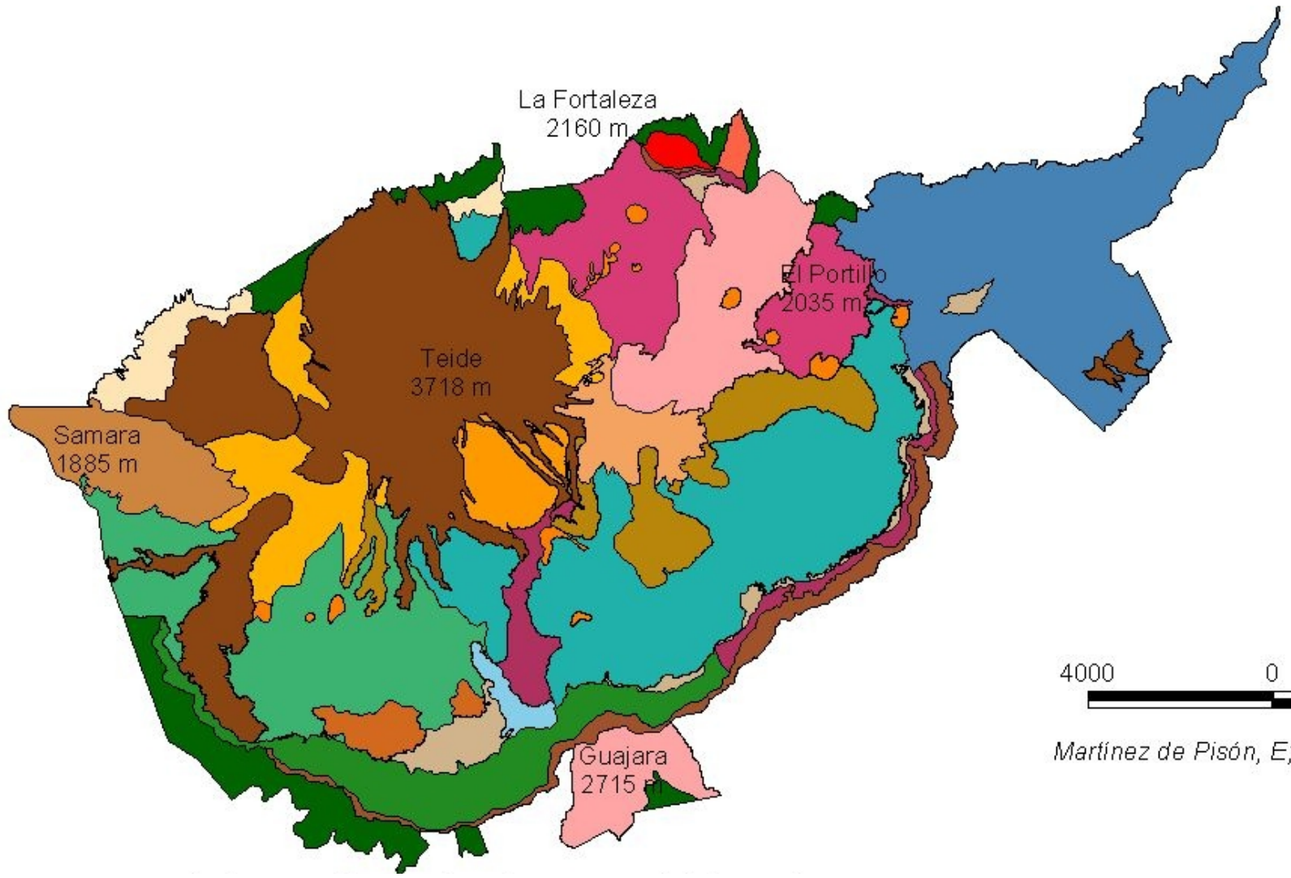

*Martínez de Pisón, E.; Arozena, M.E.; Beltrán, E. and Romero, C. (2005)*

# PRINCIPAL MORFOLOGICAL UNITS




*Martínez de Pisón, E.; Arozena, M.E.; Beltrán, E. and Romero, C. (2005)*

# MINOR UNITS OF THE PLANT LANDSCAPE




*Martínez de Pisón, E; Arozena, M.E; Beltrán, E. y Romero, C. (2005)*

**Areas with no apparent plant cover**

1. Absence or scarce presence of vascular vegetation in the recent volcanic terrains
2. Disperse samples of rupicolous vegetation in the scarps of the wall of Las Cañadas
3. Very disperse samples of Argyranthemum teneriffae in blocky lava flows of the eastern atrium.
4. Disperse samples of Argyranthemum teneriffae and of Tolpis webbii in old outflows of the western atrium
5. Disperse samples of Argyranthemum teneriffae, Adenocarpus viscous and Spartocytisus supranubius in Samara
6. Disperse samples of different species in Montaña Blanca and Montaña Rajada
7. Discontinuous spots of Pterocephalus lasiospermus, Adenocarpus viscous and Spartocytisus supranubius in the endorheic flatlands
8. Isolated young pines of the dome of Roques Blancos

**Areas with scrubland**

9. Single-species scrubland of Spartocytisus supranubius of Teide-Pico Viejo
10. Single-species scrubland of Spartocytisus supranubius with Artyranthemum teneriffae of the south-eastern slope of El Teide
11. Very discontinuous and open scrubland of Spartocytisus supranubius, Descurainia bourgaeana and Pterocephalus lasiospermus in pyroclast edifices of the atrium
12. Open scrubland of Spartocytisus supranubius, Adenocarpus viscous and Descurainia bourgaeana pumice-covered lava flow of the western atrium
13. Multi-speices scrubland of lava flows of Mtña. Corrales and of the sector of Mtña. Las Lajas and Mtña. Negra
14. Closed multi-speices scrubland of sedimentary deposits of the wall and of La Corbata
15. Closed multi-species scrubland with cedars and pines of the summit of La Fortaleza
16. Dense scrubland of Pterocephalus lasiospermus in the control line of La Fortaleza

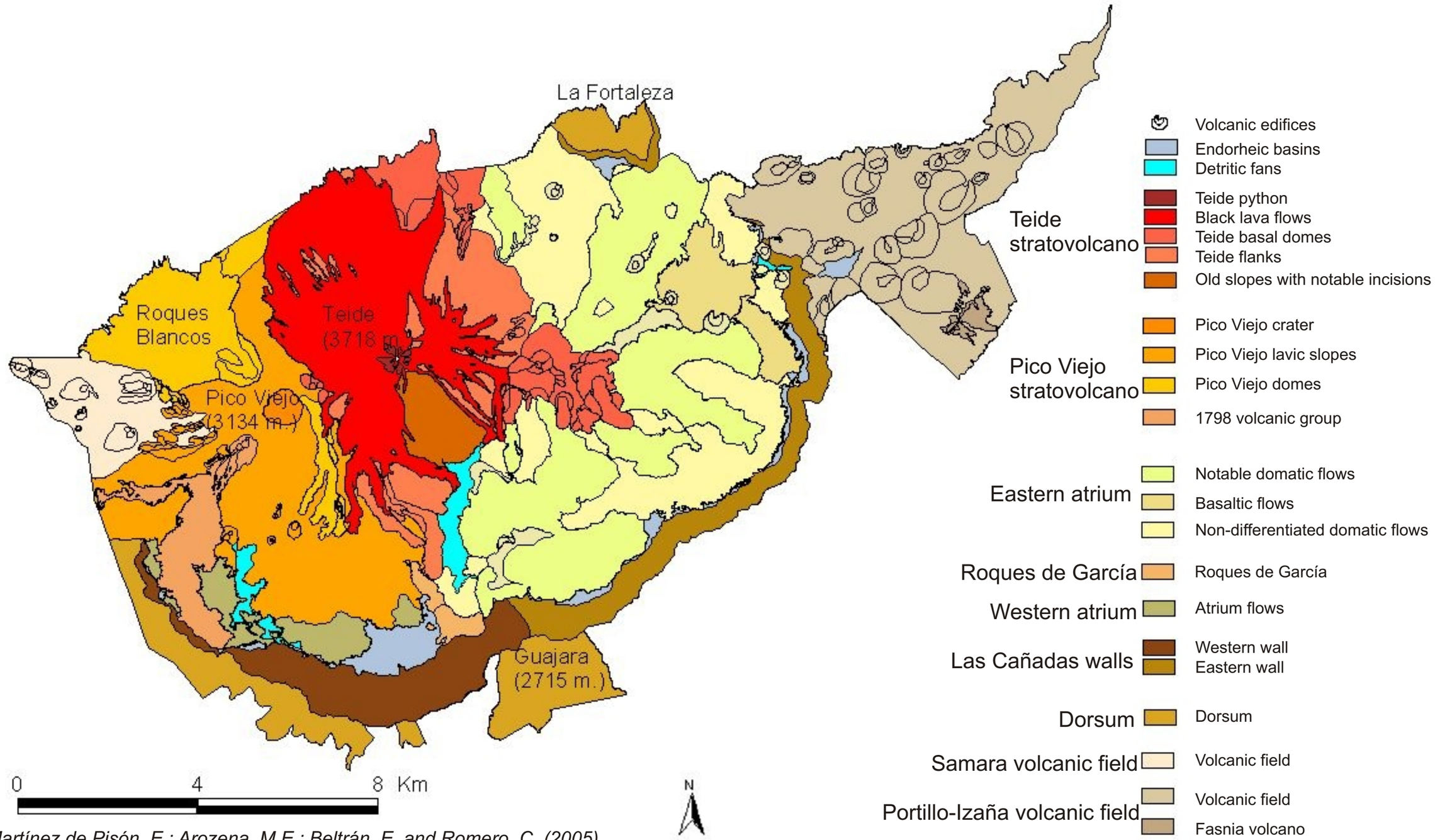
**Areas with scrubland and rock mosaic**

17. Rocky scarp mosaic with multi-species scrubland of Los Roques de García
18. Mosaic of different facies of the scrubland of Spartocytisus supranubius with Pterocephalus lasiospermus scrubland of the Portillo-Izaña field of volcanoes
19. Scrubland mosaic of Spartocytisus supranubius and scrubland of Pterocephalus lasiospermus of the eastern atrium
20. Scrubland mosaic of Spartocytisus supranubius, scrubland of Adenocarpus viscosus and scrubland of Descurainia bourgaeana in the southern flank of Teide-Pico Viejo
21. Mosaic of rocky tall spikes with Spartocytisus supranubius and multi-species scrubland of the central wall of Las Cañadas

**Forest areas**

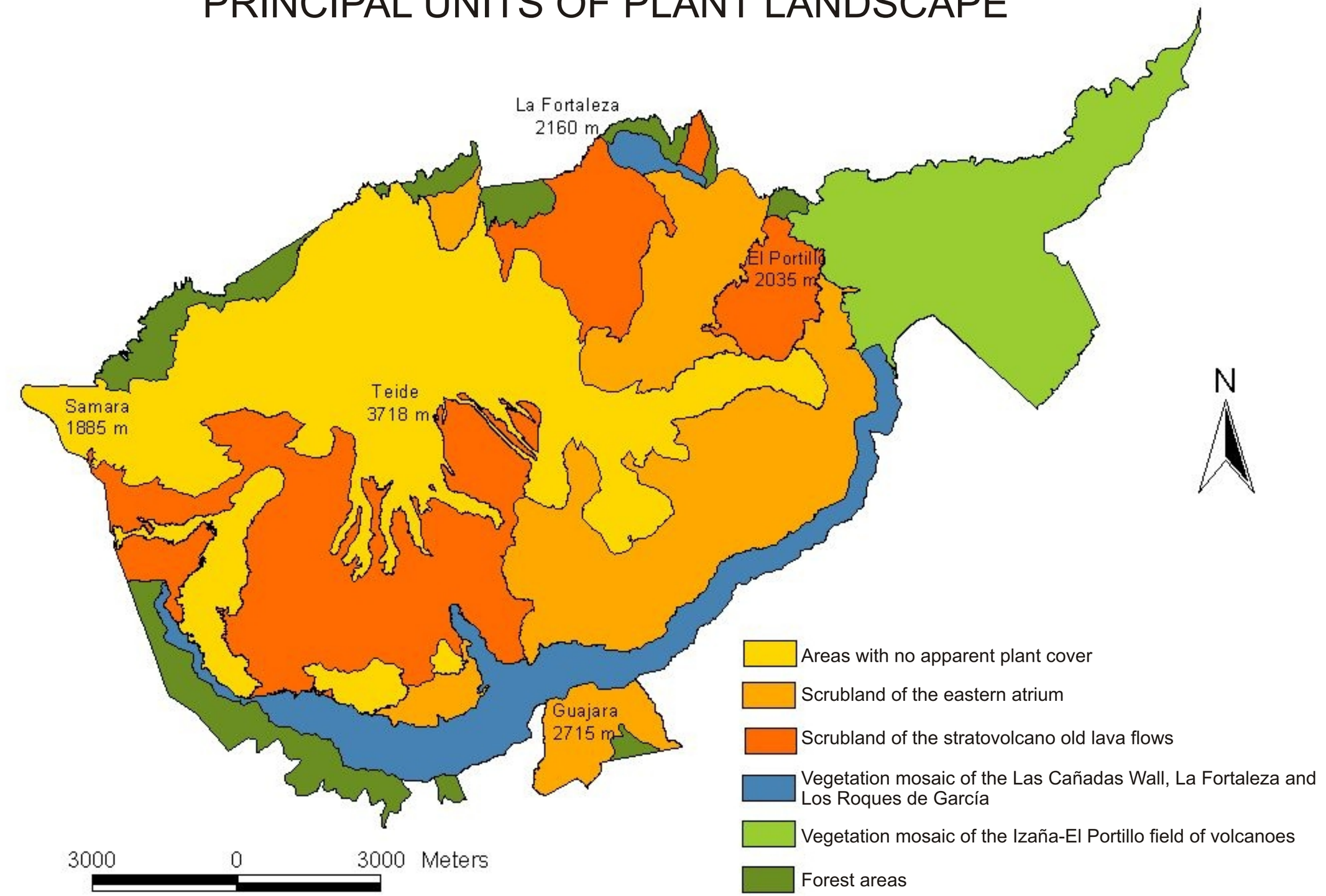
22. Pinus canariensis forest of the borderlines of the National Park

# MINOR UNITS AND NOTABLE MORFOLOGICAL ELEMENTS




*Martínez de Pisón, E.; Arozena, M.E.; Beltrán, E. and Romero, C. (2005)*

# PRINCIPAL UNITS OF PLANT LANDSCAPE




*Martínez de Pisón, E.; Arozena, M.E.; Beltrán, E. and Romero, C. (2005)*

# PAINTINGS WITH EL TEIDE AS CENTRAL MOTIF
## Several authors













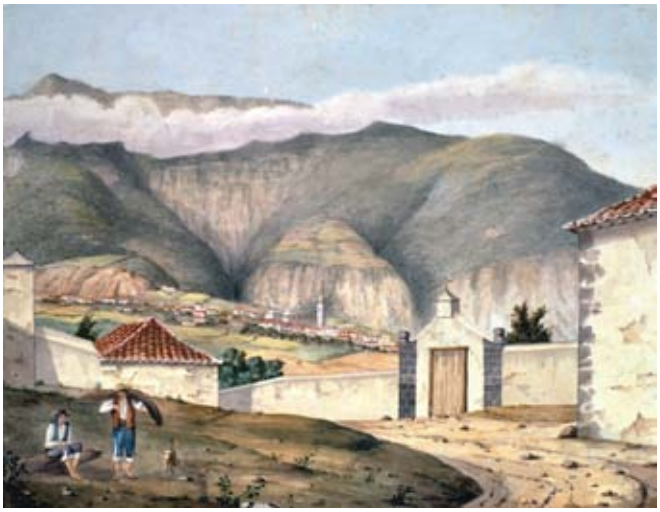







# PAINTINGS WITH EL TEIDE AS CENTRAL MOTIF
## Several authors





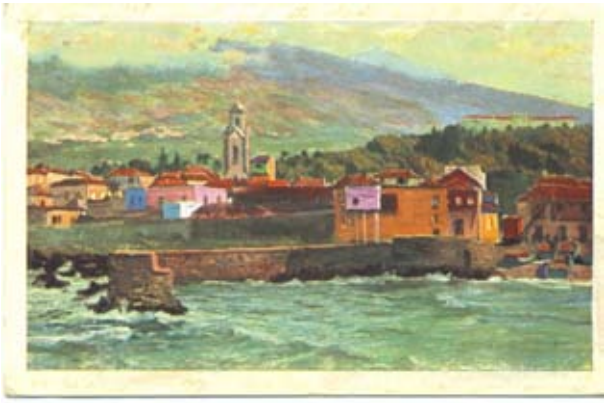




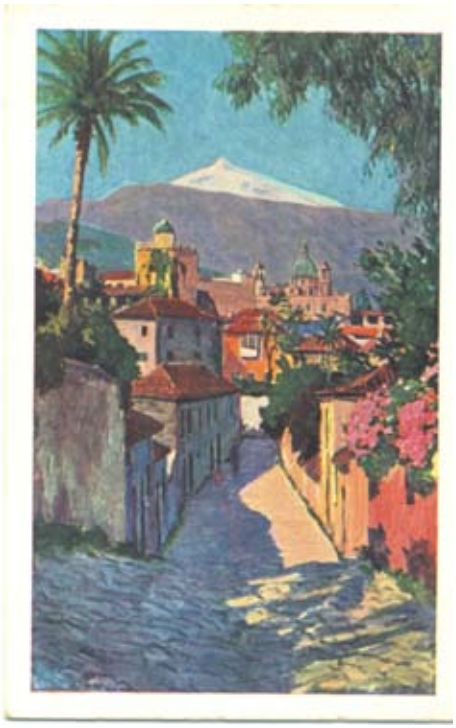




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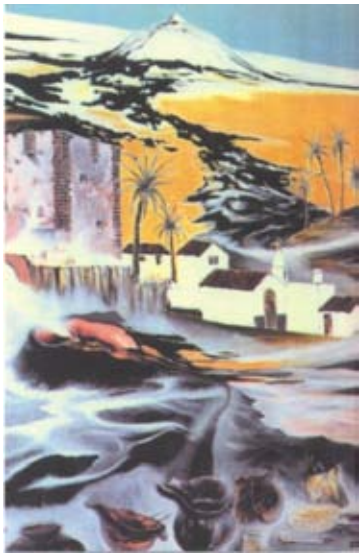


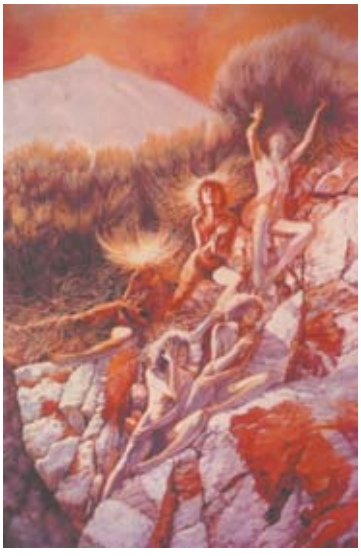












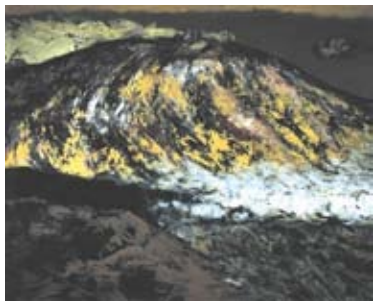


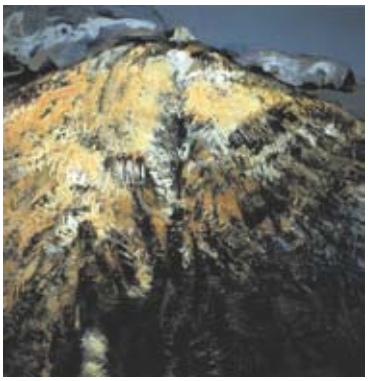
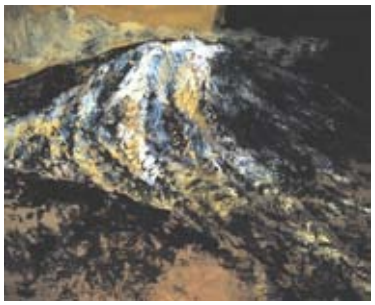
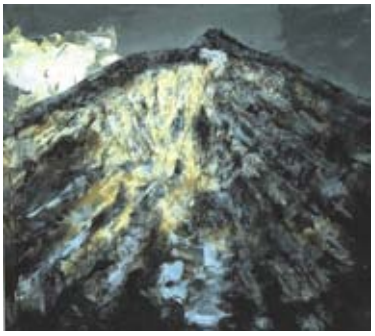
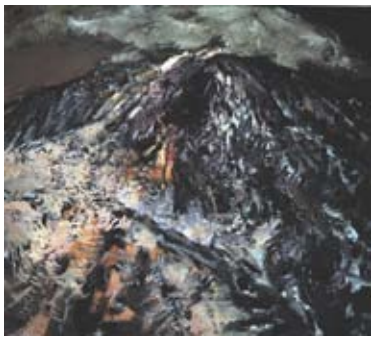
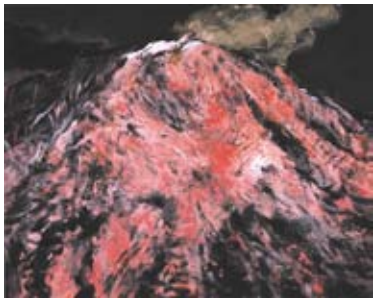


# PAINTINGS WITH EL TEIDE AS CENTRAL MOTIF
## Pedro González



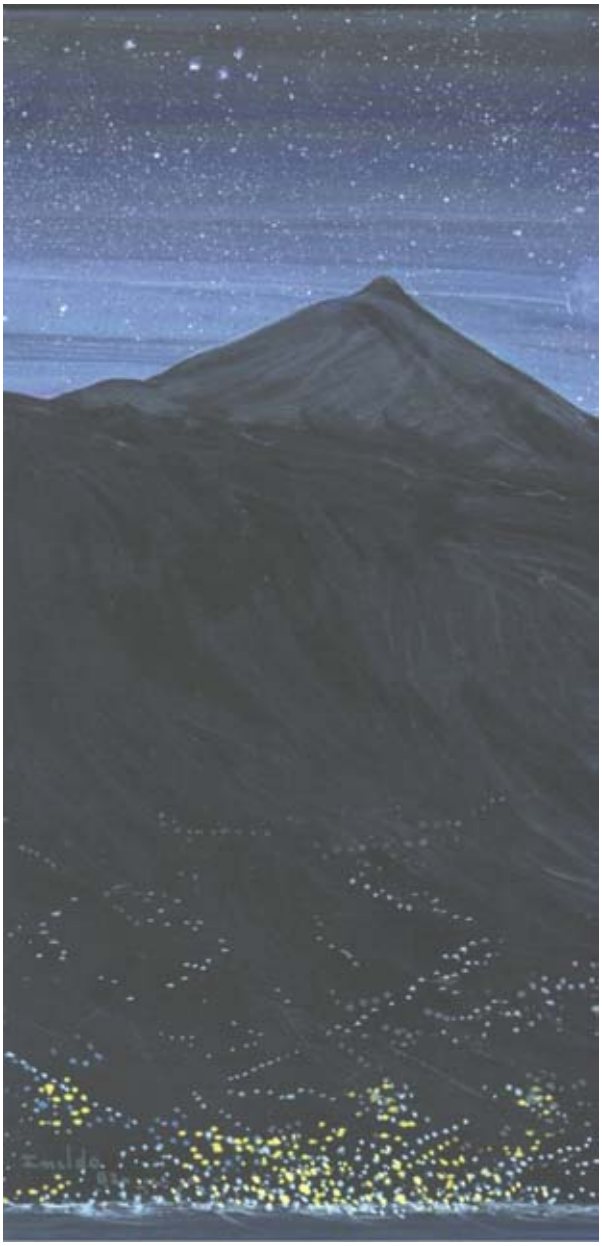




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## Imeldo Bello

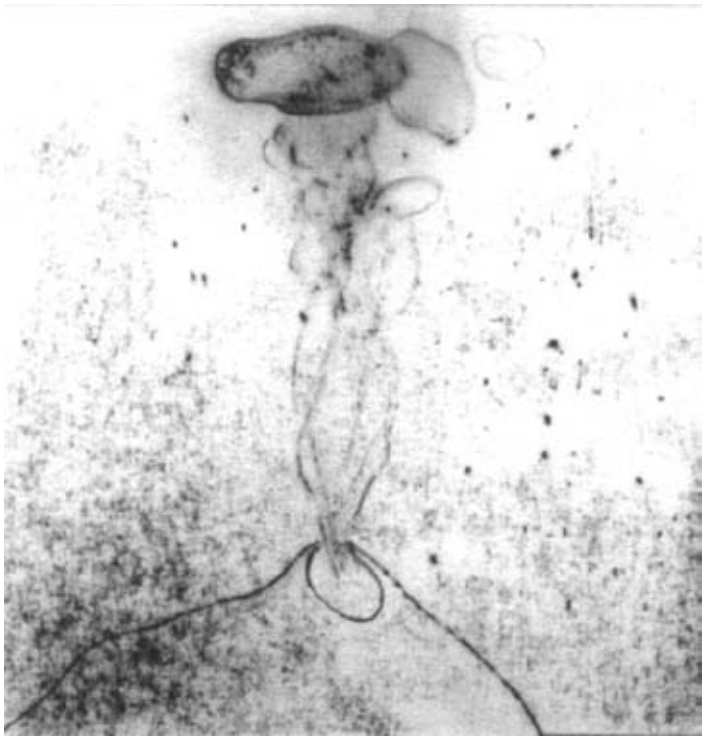


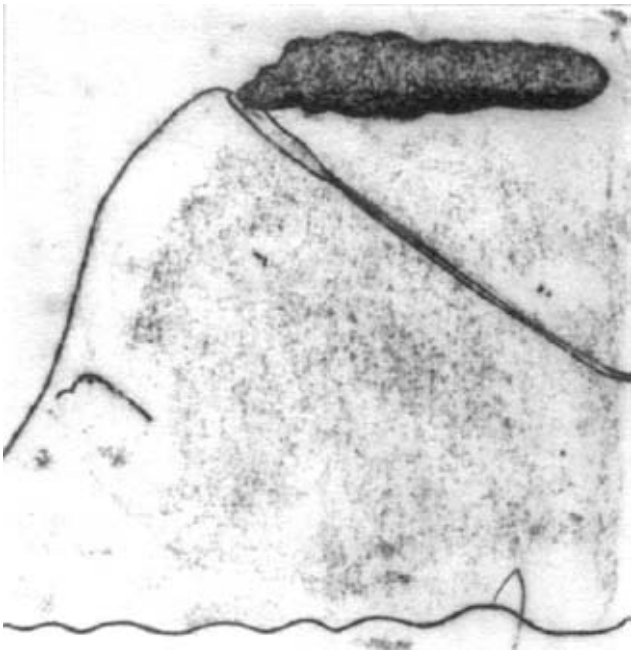


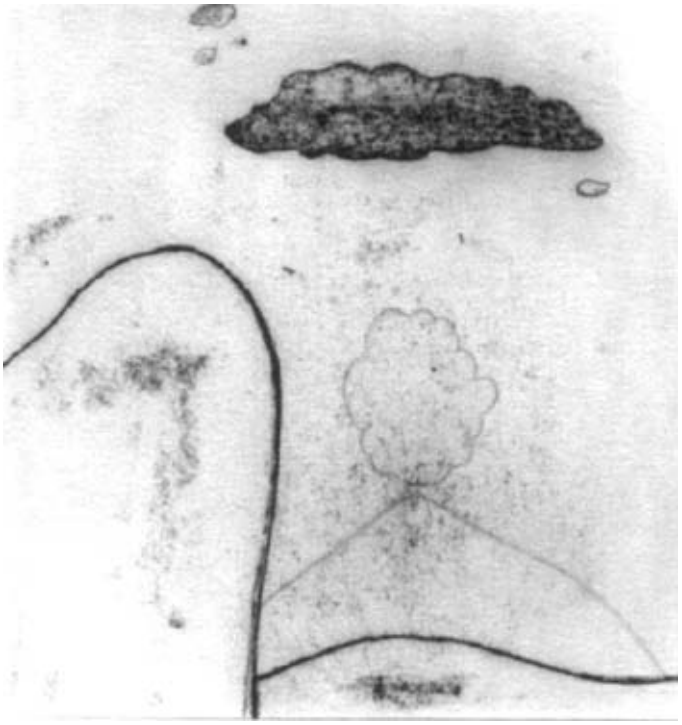


# PAINTINGS WITH EL TEIDE AS CENTRAL MOTIF

## Gonzalo González







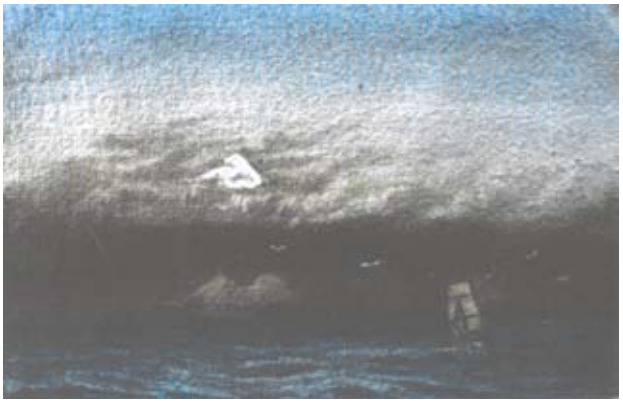
# ETCHINGS WITH EL TEIDE AS CENTRAL MOTIF
## Varios autores

















WHC REGISTRATION
Date 22.11.06
Id N° 1258
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# NOMINATION OF THE TEIDE NATIONAL PARK TO BE INCLUDED IN THE WORLD HERITAGE LIST

## PRELIMINARY QUESTIONS OF Dr. BERNARD SMITH

**Buffer Zone (p12)**

Who are the appropriate organisations that will classify all terrain in the peripheral protection zone as non-buildable land under special protection? Under what powers will this be done, and how will it affect the proposed buffer zone, given that currently it appears to be under two jurisdictions? Why does such protection not exist under current designations and what are the guarantees that it will be forthcoming? In summary, it would be useful to have clarification on the current and future status of the buffer zone, including some background on the Canarian Natural Spaces Laws.

*The Canary Islands Government has the authority to classify the terrain in the peripheral protection zone of Teide National Park as non-buildable through the Coronal Forestal Natural Park Management Plan, pursuant to the stipulations contained in Chapter II, articles 21, 22, 49, 54, 55 and the 5th temporary provision of Legislative Decree 1/2000, 8 May, approving the Revised Text of the of the Canary Islands Territorial Organisation and Canarian Natural Spaces laws (a "revised text" is a law that unifies specific articles from various different laws) (http://www.gobcan.es/boc/2000/060/001.html). The cited articles have been included in the Annex. Because the Corona Forestal Management Plan is currently being prepared by the Canarian Government, at the moment the terrain is being classified in according to the 5th temporary provision (mentioned above) which specifies that so long as no mechanism to organise protected Natural Spaces has been approved, this terrain will be classified as protected rural land, a category that provides the strongest protection for the conservation of natural and ecological values. Moreover, the Teide National Park Reclassification Law (25 March, 1981) establishes an additional protective procedure which prohibits all construction in the Peripheral Protection Zone that is not estimated to be in the "public interest" by a favourable report from the TNP Patronage. This does not mean that the Buffer Zone falls under two jurisdictions, but rather that the part of the Corona Forestal Natural Park that coincides with the Peripheral Protection Zone established by the TNP Reclassification Law has an extra level of protection under the supervision of the Patronage.*

*In addition, the territorial organisation law gives the Canarian Government the authority to classify the terrain in Teide National Park, which it will soon do so through an addendum to the park's Management Plan. The terrain of the Teide Natural Monument located within the park (encompassing the Teide-Pico Viejo stratovolcano) is already classified. In addition, the aforementioned 5th temporary provision is also applicable, as well as the stipulations of the Reclassification Law, which establishes in article 5.3: "All proposed construction, work or utilisation that is not directly covered*

*by the Management and Usage Administrative Plan or its revisions that is considered necessary to carry out, must be duly justified, respecting the directives of the plan and with the authorisation of the National Institute for the Conservation of Nature* and the prior approval of the Park Patronage".*

*(*Note: currently this authorisation would come from the Mixed Management Commission of Canarian National Parks.)*

*There is no doubt over future protection of TNP because the legislation protecting the park will not change; the only difference is that the Canarian Government will be in charge of applying this legislation rather than the Mixed Management Commission of Canarian National Parks.*

**Natural Habitats**

The application identifies that under the criteria of EU Directive 92/43/EEC Conservation of Natural Habitats, Teide National Park (TNP) has 11 community interest habitats occupying 75% of its area. It would be useful to have some information on how this information has informed local designation and conservation strategies. It raises a larger issue, that will be returned to latter, regarding the wider position of local conservation strategies and their relation to international schemes.

*As far as community laws on protected areas are concerned, Spain has already proposed that Teide National Park be named a site of Community importance (SCI). In fact, the park was part of the "Macaronesian list" that was the very first community biogeographic list to be proposed and approved by the Commission (the Commission Decision 2002/11/EC, in which Teide National Park appears under the SCI code ES7020043, can be consulted at http://eur-lex.europa.eu/LexUriServ/site/en/oj/2002/l_005/l_00520020109en00160025.pdf )*

*Therefore, the first two steps of the procedure have already been completed (proposal by the member state and approval by the European Commission); the only step left to be in complete compliance with the Habitats Directive is for the Canarian Government to formally designate the region's special areas of conservation. It should be highlighted that this Directive allows a period of six years from the approval of SCIs for them to be transformed into a SACs; this six-year period ends for the Canaries in 2007, and the work on the Decree that will transform the SCIs into SACs is almost finished. Nevertheless, the directive itself already establishes a precautionary protection system that is in full effect and that absolutely guarantees protection from any possibility of deterioration.*

*The park is also protected by the Birds Directive, with 28.5% (5419 ha) of its territory designated as a special protection area (SPA) under this legislation. The Canarian Government has also made a firm commitment to designate the entire park a SPA in the forthcoming enlargement of these kinds of protected areas in the Canaries.*

*A map has been attached showing where these Community protection areas apply to Teide National Park and its buffer zone.*

*Other directives are also in full effect in the national park, including Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Public Access to Environmental Information and Public Participation in the elaboration of plans and programs, among others.*

*This Community legal corpus creates an extremely effective protective armour that complements the National Park Law very well. We say that it is "complementary" because the National Park Law is actually stricter than the Community legislation in the aspects that it covers, such as the conservation of the integrity of the landscape and the natural values of the national park, along with strong restrictions on any modification of the current use of the land.*

**Publicity**

Some clarification please on the thinking behind the statement that "improving the knowledge of the Island will undoubtedly contribute to reinforce the protective measures already in place". How and why?

*It is a fairly common belief that public awareness leads to greater protection. We have no doubt that giving the local population more access to information will raise their awareness about the universal value of the park and also help them to identify with this natural space as part of their culture, thereby creating stronger personal commitments to its conservation among Canarians.*

*In addition, the visitors that come to the island and the national park present a magnificent opportunity to spark interest and concern in a large number of people about certain issues that they would not normally consider when choosing their holiday destinations. Increasing public awareness of the park's value will make it less important to enact more protection measures, because the measures that already exist will become more effective. Evidently, being included on the World Heritage List would go a long way in spreading the knowledge of the importance and exclusiveness of the proposed property, as well as the knowledge of the specific laws that protect it. To raise awareness, we make sure that visitors to Teide National Park have access to as much useful information as possible and we also stress its importance and the need to conserve it not only within the park itself but also throughout the island.*

*Moreover, the fact that the park has so many visitors offers a great opportunity to educate people on what the World Heritage list represents.*

**Tourism**

It is asserted that ready access to the public is guaranteed since tourism is the main economic activity of Tenerife, one of the best-connected islands in the world. Whilst assured access is important in promoting the wider understanding of sites such as Teide, the integrity of these sites, or parts of them, can ultimately be threatened through visitor pressure. It would therefore be useful to have clarification on:

• The thinking behind the above statement, the role of TNP as a 'tourist attraction'.

*El Teide is considered one of the most important geotourism destinations in the world, despite the fact that the huge number of visitors is conditioned by its location on an island like Tenerife, which receives more than 5 million tourists a year. In any case, Teide National Park should not be considered merely as a tourist spot independent of*

*other considerations such as the conservation of the geological, biological and cultural resources that it contains.*

*It bears repeating that one of the objectives of Teide National Park is to help visitors enjoy its resources in a way that is compatible with and subordinated to its conservation, just as IUCN's definition of a National Park (category II protected area) stipulates.*

• How the concept of 'ready access' is compatible with the designation of protection zones based primarily on visitor carrying capacity.

*The Management Plan (PRUG) does not treat the access roads as simply a quick way into the park, but rather as elements that facilitate a visit, which is why it prohibits their expansion or the modification of their route. One example of how the park would resolve these kinds of issues is that the solution to excess traffic on the access roads would focus on limiting the use of the roads, rather than on expanding their capacity to handle more traffic. See points 3.6.5, 7.2g and 12.1 of the Management Plan in the Annex Documentation of the inscription application.*

*The concept of "ready access" in the proposal refers mainly to the fact that the location of Tenerife, particularly in relation to Europe, makes it an easy destination to reach.*

*Studies on the carrying capacity of the park in relation to the quality of the visit have shown that the current number of visitors has not reached its maximum capacity, although in order to reach maximum capacity the visiting patterns would have to be changed, especially their distribution throughout the day. In addition, we have to keep in mind that the capacity of the island of Tenerife to absorb tourists is not unlimited; that is, although the number of visitors to the island keeps growing, it cannot endlessly increase. Evidently, the number of visitors to Teide National Park is closely tied to the number of visitors to the island of Tenerife.*

*Furthermore, in order to make public enjoyment of the park compatible with protecting its resources and to minimise possible negative impacts, the Management Plan distributes the park's territory in four different kinds of zones according to each area's carrying capacity. It also gives precedence to the conservation of resources over public use, going so far as to prohibit access to some zones.*

• How the balance between access and conservation would be managed if the site were inscribed.

*A significant increase in the number of visits to the national park is not expected if TNP is inscribed on the World Heritage List; in any case, there will probably be a slight modification in the type of visit, resulting in a higher quality experience because the park's new status will attract people with greater interest in nature tourism. A system that guarantees that the carrying capacity of each sector of the park is not surpassed is in the works.*

**Geotourism (p47)**

It is undeniable that TNP receives a very high number of visitors and, as such, that it provides an excellent opportunity to educate the wider public concerning geodiversity. However, it would be useful background to have a 'feeling' for how many visitors come because it is a scheduled 'days outing' as part of a 'sun lust' holiday package, and how

many are 'wander lust' tourists who come specifically because of an interest in landscape, nature and geology.

*Data collected in the park itself shows that most visits to the national park are not simply a day's outing in a sun lust holiday package.*

*Surveys done in the park in 2005 indicate that it is not merely tourism that entices people to visit this protected space; in fact, only 8% of those surveyed cited "Tourism" as the main reason that they visited the park, while 23% cited "Nature/landscape", 8% "See the highest peak of Spain" and 8% "Walk/hike". In addition, 61% of the visitors stated that the cultural/natural attraction of the park was "very important" and 20% said that it was "important".*

*Another telling statistic is that more than 70% of the visits to the park are made in private vehicles (primarily rented cars) and less than 30% arrive in group transportation (busses). In addition, the majority of the visits to TNP are not part of a pre-planned holiday package, but rather the result of visitors deciding to make or contract the excursion once on the island itself.*

*The main conclusions derived from the studies done on visits to the national park include:*

- *The main reasons that people visit Teide National Park are related to the enjoyment of nature and the landscape.*
- *The cultural and natural attractions of the park are the most important reasons why people visit Teide National Park.*

- *More than 80% of the visitors were attracted by a specific volcano or volcanological formation and 75% by an autochthonous flora species and almost half by an animal species.*
- *Visitors to Teide National Park give very high marks to their experience, with an average of 8.82 out of 10.*
- *Those surveyed cited that the "conservation of nature" should be the priority of national park management.*
- *The highest rated aspects of the park are its "state of conservation", "the trails" and the "viewpoints".*
- *80% of the visitors indicate that they are "very satisfied" or "satisfied" with their stay in the national park and would recommend a visit to others.*

As with the previous question, this raises the issue of the relationship between TNP and the wider tourism industry of the island, its function within this economic climate, pressures that it is likely to come under and, for example, the wider receptiveness of possible restrictions on access if pressures were to become too great.

*The tourism industry is of course aware of the changes in management of the park. For several years now this industry has had a permanent representative in the Patronage of the National Park, a joint body that represents all of the social and administrative actors that have interests and competences in the park; this representation has facilitated communication between both parts.*

*In addition, it is worth mentioning that the park organises and funds annual training courses to fix a collective strategy for tour guides that, we must remember, present this natural space to a significant number of our visitors.*

*In general, the tourism industry in Tenerife and Gran Canaria has accepted that quality tourism should be given priority over mass tourism. In this vein, over the past few years it has worked together with the public administration to reach a consensus on a tourism moratorium that limits and organises new construction related to the industry.*

*Finally, Teide National Park has already considered the possibility of reorganising visits to the park (with the creation of the technical rough draft of the Access plan) in order to guarantee the conservation of its resources and to improve the quality of the experience.*

*This plan was elaborated with the participation of all of the sectors that may be affected by changes that may occur in the visitation model. None of these sectors was against the idea of reorganising visits to the park; on the contrary, they considered that the possible restrictions that may arise from the plan, whose objective is to improve the quality of the visit, would benefit the island's tourism industry, even in the short term.*

**Cultural Landscapes (p54)**

Following the 1954 designation of the site there was apparently a programme to eliminate various activities in the area (grazing and white broom cutting). It would be useful to know something of the background to this strategy and how it has related to the preservation of cultural practices and elements in the landscape. What is the balance within the management strategy between conserving natural and cultural landscapes?

*The appearance of the "Teide National Park management bylaw", published as an Order in the State Official Bulletin on November 29 1955, prohibited pasturing, as well as the exploitation of retama (white broom) and culm within the national park. This led to the total elimination of livestock activities in the park and to the eradication of all livestock dispersed within the territory.*

*In this context, the Order establishes a) the need to impede interference in the development of the flora and fauna by taking the necessary measures not only to conserve them but also to ensure that they develop extensively and that they do not disappear, and also b) the need to impede or restrict pasturing within the park. The only objective of this law is to guarantee the protection of natural resources by designating the area a national park.*

*In 2003 the national park funded a study to understand the evolution of its flora and vegetation. Inspired by a national project to track Spanish rural landscapes, this study focused on the spatial analysis of the landscape through aerial photographs in two stages, one spanning the period from 1984 to 1998 and another spanning images from 1964 to 1996. The results of this study are presented in the Annex Documentation of the Proposal to Inscribe Teide National Park on the World Heritage List (pp. 40-52) and they were recently published by the Autonomous Organisation of National Parks (RODRÍGUEZ & ELENA, 2006). These documents reveal a quantitative increase in the surface area covered by summit scrub as well as a qualitative increase in the individual specimens of the flora. These increases are a result of the prohibition of pasturing, because this practice negatively impacts the sexual reproduction of plants (utilisation of young plants).*

**Zoning Strategy (p55 etc.)**

"Exhaustive analysis of the different resources (landscape, geological elements, flora, fauna and archaeological sites) has been carried out in order to create precise zoning of the territory". This approach raises a number of questions.

• How are the criteria under these different headings identified, measured and integrated? For example, do certain criteria have primacy in certain situations? What is the rationale for the system? In short, how is "ecological fragility" assessed?

*As has been mentioned, the zoning was created by analysing different natural and cultural resources. Exceptionally rich or unique enclaves were categorised as Reserve Zones and Restricted Use Zones. The most important characteristic leading to an area being included in one of these categories was the fragility of the proposed enclave. In this case fragility was understood as the susceptibility of the resources to be significantly altered by potentially disturbing agents that could settle in each sector. Under these conditions, enclaves that contained important samples of biological diversity, populations of endangered species or an important concentration of archaeological remains were the main candidates to be categorised as maximum protection zones. Other areas that did not meet these requisites but that contained highly unique geological elements were also included in these categories since they could come under great pressure and therefore needed very strict supervision. One such case is the interior crater of El Teide, an extremely fragile enclave that could have to withstand a great concentration of visitors. In order to avoid conflicts, the number of visitors that climb the trail leading to the summit cone of El Teide is strictly controlled, and at the same time the trail itself is closely monitored.*

• What criteria are used to assess damage or change to zones, how are they monitored and how are restorative measures identified and enforced? Is there, for example, any possible conflict between a single Park body that may be both responsible for causing or allowing damage and for enforcing reparation?

*The national park does not carry out any activities within its territory that could have a negative impact on its ecosystems and cultural values, especially in the reserve and restricted use zones. Therefore damage or changes to these areas are not expected. Despite this, Title 9 of the Management Plan establishes the need to develop a monitoring program used to, among other things, correct the possible negative impacts that different pressures can have on the park. Among other things, it contemplates monitoring the impact, colonisation and population levels of introduced species, monitoring the recuperation of endangered species, monitoring restoration activities in degraded areas, monitoring the impact of visitors on the park's resources, etc.*

*Last of all, it is important to highlight that although a priori the TNP Administration may simultaneously be responsible for causing or allowing damage while at the same time demanding that repairs be made, this administration, like all other administrations, has the obligation to strictly carry out everything that is established in the Management Plan and the rest of the legislation that affects the national park. These documents establish sufficient directives and mechanisms to avoid these kinds of conflicts. For example, in order to carry out any construction it is necessary to obtain a Territorial Qualification Certificate from the Cabildo Insular, a Work Permit from the corresponding municipal government or a Declaration of Impact from the competent organisation.*

*Finally, the Patronage of Teide National Park (which includes representatives from all of the public administrations, the University of La Laguna, scientific institutions, and environmental, sporting and tourist associations) is a joint body that supervises and monitors the actions of the Park Administration and all of the activities that take place within the park.*

• How does the zoning system respond to natural change? This may include positive change brought about by management practices and externally driven change related to factors such as climate change. For example, is there scope for boundary change if local climate zones were to shift?

*Legally the Management Plan must be revised every six years, at which point changes can be introduced to adapt it to the current conditions of the territory. Of course one of the possible changes that could be incorporated at this time are modifications to the zoning boundaries, if some environmental factor arises making this necessary. In this sense, not only is it possible to respond to changes caused by climate change but also to other factors such as the discovery of new species, geological changes caused by volcanic activity, etc. As far as changing the boundaries of the park itself due to climate change, the Spanish Parliament would have to enact a law, a relatively long but not difficult process, if it were necessary to conserve natural resources.*

• How are figures for carrying capacity arrived at? Which algorithm is used to calculate this? Is it, for example, based solely on ecological principles? How is carrying capacity enforced at sites where, for example, visitor numbers are highly variable over time?

Even in the most robust areas is there an ultimate limit to capacity that might breach other criteria (e.g. psychological carrying capacity) that can detract from the visitor experience?

*The carrying capacity of the national park was established with the "quality of the visit" in mind, understood as the level of satisfaction obtained by visitors during their stay in the park. An unusual detail is that despite the existence of peaks on certain days (especially after snowfall), the number of visits to the national park does not vary significantly between different seasons.*

*The following is an extract from the Access Plan, from which the national parks carrying capacity was calculated.*

*The simultaneous carrying capacity of the park*

*The simultaneous carrying capacity of the park is defined as the maximum number of visitors that can be in the park at a given moment while still guaranteeing that their experience is as gratifying as possible and causes the least possible impact on the resources that, in any case, must never be permanent.*

*Similarly, the simultaneous carrying capacity of a visitor facility is defined as the maximum number of visitors that can be in the area prepared for them at a given moment, while still providing an experience that is as gratifying as possible and that causes the least possible impact on the facility and on the surrounding resources that, in any case, can never be permanent.*

*Visits are spatially limited to authorised areas according to current zoning and management directives. Only activities and uses of the space that are strictly permitted by the Management Plan are carried out.*

*Expected percentage of carrying capacity*

*This is defined as the percentage of the carrying capacity that is expected to be filled by visitors to each facility, and it is variable according to the type of facility and to the time of day.*

*The Expected Level of Carrying Capacity is a number between 0 and 1 that represents the expected usage of carrying capacity in a given moment.*

*Simultaneous occupation of the park*

*The simultaneous occupation of the park is defined as the number of visitors that are within the park at a given moment. Similarly, the simultaneous occupation of a visitor facility is the number of visitors using that facility at a given moment.*

*Dividing the carrying capacity into sectors*

*The Access Plan seeks to guarantee that within the contemplated situations the simultaneous occupation never exceeds the global carrying capacity of the park, and that the occupation of a zone never exceeds the carrying capacity of that zone. In order to accomplish these goals, the park has been divided into sectors so that the carrying capacity of each sector can be associated with the sum of the carrying capacities of all of the visitor facilities found in the sector. In this way the number of visitors can be monitored in the entire park and in each of the sectors.*

*Types of facilities where visitors are monitored*

*Facilities and interior areas: according to the average time that a visitor spends there, they are classified in two categories:*

- *Short-stay facilities and visiting areas: this includes all of the viewpoints, short trails, visitor centres, bars, stores and waiting areas located within the area being monitored by the plan and that have been authorised by it.*
- *Long-stay facilities and visiting areas: this includes paths that permit guided mechanised routes, long trails, moderate use zones and overnight facilities that are located within the area being monitored by the plan.*

*Facilities and exterior areas: these facilities, known as service areas, are equipped with information points, restrooms and parking lots, all of which are interconnected and concentrated in a limited area. The objective of these newly built facilities is to hold the automobiles of the visitors to keep them from parking in the interior of the national park, absorb and manage excess visitors during peak hours, give visitors information about the visiting system put into place by the Access Plan and offer interpretation and other basic services.*

*Carrying capacity of the park by sectors*

*Each sector established in the interior of the park has a corresponding visitor carrying capacity, which will be monitored at the very least by a control point within the sector, located in authorised parking lots.*

*The carrying capacity of a sector is determined by the sum of the expected occupation of its short-stay facilities during the peak period (from 12 AM to 1 PM).*

*The following table shows the sectors along with their facilities and carrying capacities:*

*Carrying capacity in service areas*

*The visitor carrying capacity expected in the service areas will be the sum of various factors:*

a) *Maximum number of visitors permitted for long visits, which will be the sum of the expected occupation of the carrying capacity from 12 AM to 1 PM of the long-stay visitor facilities in the interior of the park and the Arenas Negras trail.*
b) *Expected number of waiting visitors, which is 30% of the sum of the expected occupation between 1 PM and 2 PM in long-stay facilities and the Arenas Negras trail.*
c) *Expected occupation of the carrying capacity of the Portillo Alto bars that do not have their own parking area, which will be located exclusively in the Portillo Service Area.*
d) *Estimated number of visitors that are travelling and that will later use the service areas. This is 10% of the sum of the other four factors.*

*Finally, it must be pointed out that in the calculation of the total capacity there are different variables related with the quality of the visit that vary according to the facility or zone analysed. The definition and maximum limit of each variable are assigned based on field work and after reaching an agreement with all of the groups that are directly involved (environmentalists, guides, mountain climbers, tourist industry, etc.).*

| | *Variable* |
|---|---|
| *TRAILS* | - *Distance between groups*<br>- *Type of trail*<br>- *Number of people in a type of group* |
| *PATHS* | - *Amount of contact between people and vehicles*<br>- *Number of times a person or group is passed* |
| *VIEWPOINTS* | *Usable longitude of the viewpoint and the waiting area* |
| *VISITOR CENTRES* | *Total area and design set by an official appraisal* |
| *OVERNIGHT FACILITIES* | *Carrying capacity fixed for these facilities* |
| *RESTAURANTS* | *Number of seats available – official appraisal* |
| *MODERATE USE ZONES* | *Visual areas from two points of view, from within the area and from outside of the area* |
| *ROADS* | *Percentage of the global carrying capacity of the park* |

*The great number people that visit this protected space every year may lead one to think that its carrying capacity is at its limit, but the truth is that according to the rough draft of the Access Plan and the maximum allowable limits assigned to the defined variables, Teide National Park could handle even more visitors. According to these studies on carrying capacity (which is based on the quality of the visit to the park) 4,380,000 people could visit the park every year without affecting the natural resources, as long as visiting patterns change, particularly their distribution throughout the day.*

*Moreover, in compliance with the stipulations of the Management Plan, the rough draft of the Access Plan establishes that if any resource degradation is noted, access to the zone in question can be reduced or even prohibited.*

• This section (p58) mentions development controls under S/1981 and identifies what cannot be constructed. For illustrative purposes it would be useful to have some idea of what has been permitted and constructed under these controls since 1981.

*Regarding the issue of construction, from 1981 to the present the following construction has been carried out:*

- *Only one new facility has been constructed, the El Portillo Fire and First Aid Station, which is essential for fighting fires and ensuring the safety of the visitors. It was built in 1989 and it is located in an area that on the date of its construction was not part of the national park.*
- *The following structures have been enlarged or re-utilised: the El Portillo Visitor Centre (in an area that was also not part of the national park at that moment), the Cañada Blanca Visitor Centre on top of an existing structure (a remodelled wing of the Parador hotel) and the El Portillo Office (an unfinished building acquired in 1987, which like the other two El Portillo facilities is located in an area that was not part of the national park at the time).*
- *The following structures have been demolished: a petrol station located near the cableway, wards of the Sanatorium, the Cañada Blanca restrooms and recreational area, and six cabins without any specific use or known legal owner.*

- *In addition, the La Fortaleza, La Carnicería and El Capricho paths were eliminated and the surrounding landscape was restored (removing asphalt).*
- *The landscapes were restored in areas that were affected by the old mining activities in Montaña Blanca, Minas de San José and Volcán de Fasnia, in areas affected by the creation of certain facilities decades ago, restoring taluses along the roads and the cableway station, or that were affected by particular reforestations using exotic species.*

• It is stated that there is limited risk of fire, but is there any history of fire damage and what effects did it have?

*Over the course of the last several years (2000-2006) only two fires have occurred in Teide National Park: 1) La Fortaleza, 4.5 ha (2004), 2) La Fortaleza-Lomo de los Chupaderos, 11.37 ha (2006).*

*The very low incidence of fire and the fast reactions of the Teide National Park fire-fighting unit mean that the majority of the outbreaks (affecting an area of less than 1 ha) have been controlled before they became full-blown fires. During this same period there have been six outbreaks in Teide National Park, which altogether have only affected 1.19 ha of terrain (Source: Teide National Park Archives and the Cabildo de Tenerife Environment Area's Forest Service).*

*Until now these outbreaks and fires have not affected endangered plant populations (partly because the habitats of these populations are frequently located on cliffs, flows or places where it is difficult for fire to spread because there is very little plant material to burn and what little there is to be found is intermittent). The species that are most affected by fires in this space are common species of high-mountain scrub that regenerate after the fire.*

*Because of this set of circumstances the impact of fire on the park has been largely irrelevant.*

**Cross Compliance of Conservation Strategies (p71 *et seq.*)**

The principal conservation strategies in place are essentially area-based, integrative in style and local in origin. There is nothing to say that these approaches are necessarily inappropriate and ineffective for local conditions. However, it would be useful for any assessment of their effectiveness if these conservation strategies were placed in their wider, international and political context. In particular, great play is made that Teide is the highest peak in Spain, but it appears that environmental conservation is not bound by the same requirements for mainland Spain, which has, for example, to conform to EU directives on this topic. Thus, whilst local policies are scoped against EU directives and Council of Europe strategies, they are not precisely driven by them. This is especially important given the largely habitat based philosophy of EU directives related to, for example, Special Areas of Conservation and the holistic approach taken by, for example, the Water Framework Directive. Apart from the differences in philosophy and the requirements for data collection and monitoring, these schemes are also externally policed and the penalties for breaching them are draconian. It would be extremely useful therefore, if there is a thorough explanation of the relationship between environmental policy within the autonomous region of the Canary Islands, the Spanish mainland and other international bodies and designations. For example, who would take forward any proposal for International Biosphere Reserve or Geopark status?

*Apart from what has already been commented in response to the second question of this document, it is also needs to be pointed out that European legislation takes priority over any national or regional legislation that can be applied to Teide National Park. It even takes priority over the Spanish Constitution, which means that if our Constitution were to impede the full application of community law, the Constitution would have to be amended. This is derived from the EC Treaty and from the interpretation of the Court of Justice. Therefore, there should be no doubt whatsoever that all community legislation is fully applicable in the entire national territory, including the national park, with no exceptions in the territory of the Canary Islands.*

*Regarding the directives that were expressly mentioned, the holistic approach of the Water Framework Directive has been completely integrated into the territory of Teide National Park through the obligation to adopt programmes of measures (article 11 of the directive) and the basin plans that the Canarian authority on water is developing and which must be approved before 2009, in accordance with the timetable of the directive. Teide National park must appear in the registry of protected areas of the hydrographic demarcation to which it belongs; this protected status imposes additional conditions on the management of water in this basin, so the management of the water resources depend on the environmental objectives of the national park. It is also important to note that all of the community directives on water (such as Directive 76/464 on dangerous substances) are also applicable to the park.*

*Teide National Park forms part of different regional, national and international Protected Area Networks and it is also included in different national and international environmental registries:*

- *The territory of Teide National Park is considered an "Ecologically Sensitive Area" according to point 1 of the First Additional Provision of Law 11/1990, 13 July, for the prevention of ecological impacts, of the Canary Islands Autonomous Community.*
- *It is also included within the Canarian Network of Protected Natural Spaces, according to point 4 of article 48 of Legislative Decree 1/2000, 8 May, which approves the Revised Text of the Canarian Territorial Organisation and Canarian Natural Spaces Laws.*
- *Included in the Spanish National Parks Network according to the First Additional Provision of Law 4/1989, 27 March, for the conservation of natural spaces and wild flora and fauna (this provision was created by Law 41/1997, 5 November, which modifies Law 4/1989, 27 March, for the conservation of natural spaces and wild flora and fauna).*
- *Included in the Europarc Spain Network (from its creation in 1993) and Europarc International, through the Autonomous Organisation of National Parks (Spanish Ministry of the Environment) and the Canarian Government, which are both members of these organisations.*
- *Included in the European Council's European Diploma of Protected Areas Network through Resolution (89)10E 19 June 1989 (.pdf document: https://wcd.coe.int/com.instranet.InstraServlet?Command=com.instranet.CmdBlobGet&DocId=701802&SecMode=1&Admin=0&Usage=4&InstranetImage=72783) adopted by the Committee of Ministers which awards the European Diploma of protected spaces to Teide National Park. This award was renewed in 1994, 1999 and 2004.*
- *Included in the Natura 2000 Network through a Commission Decision of 28 December 2001 adopting the list of sites of Community importance for*

*the Macaronesian biogeographical region pursuant to Council Directive 92/43/EEC (DOCE L5 of 9 January 2002). The entire territory of Teide National Park is considered to be a site of Community importance (SCI). In addition, 5,429 ha of the park's land have been designated as a SPA and there is a firm commitment by the Canarian Government to designate the entire park as a SPA in the near future.*

- *Selected as European Laboratory Volcano and Volcano of the decade by the International Association of Vulcanology and Chemistry of the Earth's Interior (IAVCEI) within the framework of the Mitigation of Natural Disaster Decade (1990-2000) (16 volcanoes were selected).*
- *Included in the European EMAS registry in compliance with "Regulation (EC) No 761/2001 allowing voluntary participation of organisations in a Community eco-management and audit scheme (EMAS)", and it has received an environmental certification pursuant of UNE-EN ISO 14001:2004 that guarantees that the park's activity is carried out in accordance with the preservation and conservation of its natural resources, respecting the applicable legislation and the established environmental policy.*
- *Included in the Iberian-American National Parks and Protected Areas Network since 2002.*

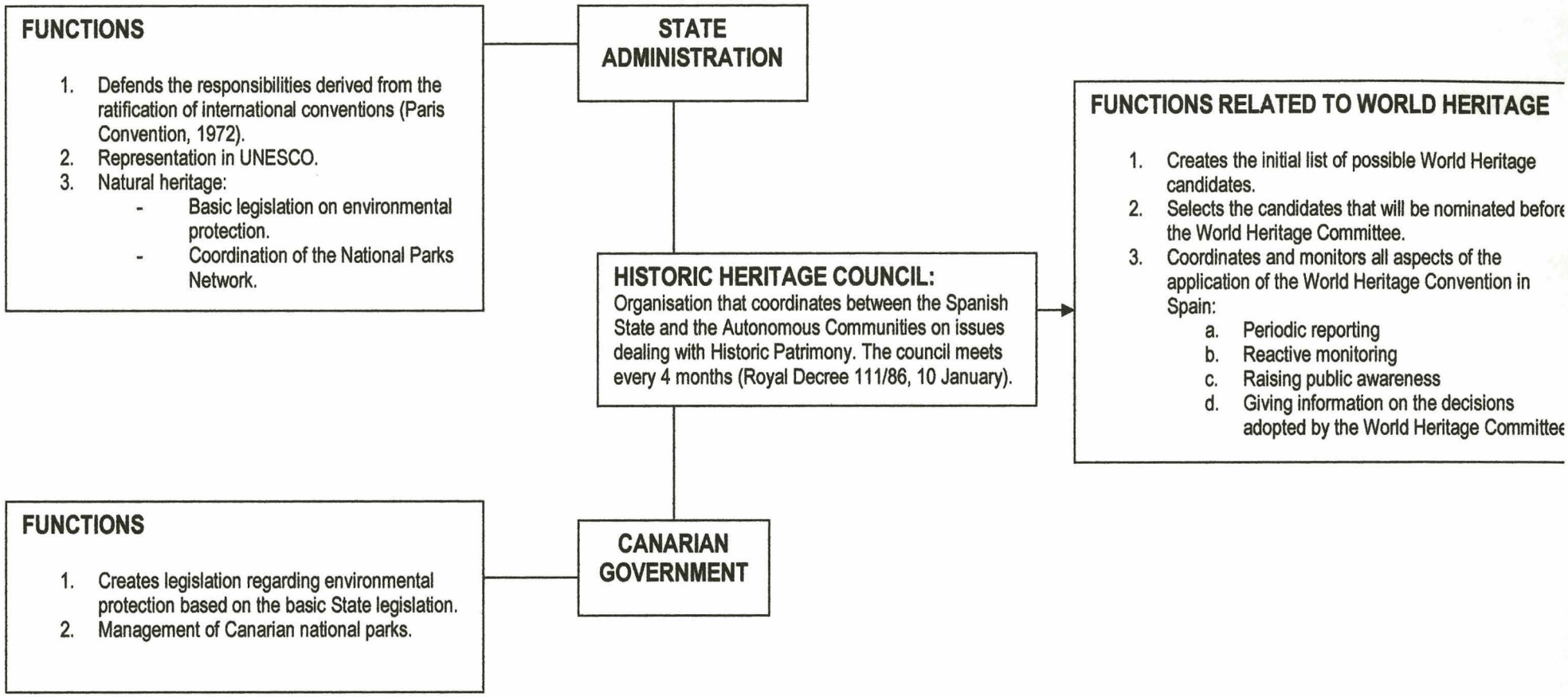
*The proposal or management of additional protection status could occur via any of the mechanisms that are established in applicable international laws. The designation of a new protection status would establish new protection guarantees and new responsibilities for the administration responsible for the management of this unique territory, but it would never lead to the reduction of any conservation regulations.*

**Responsible Authorities (p72)**

It is stated that by 2006 it is expected that direct responsibility for TNP will pass from the Spanish Government to the autonomous government of the Canary Islands. In relation to this change in responsibilities:

• Who at a Regional and State level would have responsibility for a World Heritage Site, as opposed to a National Park? What would be the relationship between Regional, State and International authorities in this regard?

*The transfer of the management of Teide National Park from the Spanish state to the Autonomous Community of the Canary Islands is currently being negotiated by both administrations and it is expected that this will take place in 2007. The management of a World Heritage site would correspond to the Autonomous Community of the Canary Islands, and the Spanish state would be the authority that responds to UNESCO. The coordination between both administrations on issues regarding World Heritage will take place in the Historic Heritage Council, as shown in the following diagram:*


FUNCTIONS
1. Defends the responsibilities derived from the ratification of international conventions (Paris Convention, 1972).
2. Representation in UNESCO.
3. Natural heritage:
- Basic legislation on environmental protection.
- Coordination of the National Parks Network.
STATE ADMINISTRATION
HISTORIC HERITAGE COUNCIL:
Organisation that coordinates between the Spanish State and the Autonomous Communities on issues dealing with Historic Patrimony. The council meets every 4 months (Royal Decree 111/86, 10 January).
FUNCTIONS RELATED TO WORLD HERITAGE
1. Creates the initial list of possible World Heritage candidates.
2. Selects the candidates that will be nominated before the World Heritage Committee.
3. Coordinates and monitors all aspects of the application of the World Heritage Convention in Spain:
a. Periodic reporting
b. Reactive monitoring
c. Raising public awareness
d. Giving information on the decisions adopted by the World Heritage Committee
FUNCTIONS
1. Creates legislation regarding environmental protection based on the basic State legislation.
2. Management of Canarian national parks.
CANARIAN GOVERNMENT

*This is the normal state of affairs for the majority of Spanish properties that have already been declared World Heritage sites and should not create any additional problems.*

*The relationship between the regional and state authorities on issues regarding the management of the national park will be carried out through the National Parks Network Council and the Spanish Ministry of the Environment, which is responsible for coordinating the National Parks Network and creating the network's Administration Plan. This plan will establish the strategic objectives of the network and the general basic directives for the organisation and the conservation of the national parks. It will also organise the actions taken to achieve these goals, both for material on cooperation and collaboration with other national or international administrations and organisations and materials common to the National Parks Network, or in the determination of the public interest projects that the State might finance. It also will include the actions necessary to maintain the image and internal coherence of the network, to permanently monitor the parks and to evaluate the level of compliance of the stated objectives every year.*

*The relationship between the state and international authorities in matters regarding the national park will be carried out through the Ministry of the Environment and in matters regarding World Heritage, through the Ministry of Culture.*

• Although the normal administration carried out by the Park authorities will not change with the shift in responsibilities, how would the local management structure change if the Park were to be inscribed as a World Heritage Site? Will there be a separate World Heritage Management Team? If not, how would World Heritage issues be dealt with within the existing management structure? Would there, for example be a separate person to deal with these matters? Is it envisaged that there may be times when National Park strategies conflict with the ideals of a World Heritage Site (e.g. p81)? If so, how would they be resolved? Is it possible that there may be a different stakeholder grouping for the two designations/inscriptions?

*A service dependent on the Direction of TNP will be created which will be in charge of the specific aspects of managing the park as a World Heritage site and of designing and implanting an action plan that horizontally integrates the strategies of managing a World Heritage site in all of the organic structures and strategies of the national park. There are absolutely no conflicts expected between the strategies of the national park and those of World Heritage site, since both are centred on the conservation of Teide National Park.*

• With regard to the above point it would be useful to have a diagram of the present and predicted management structures for the site (as opposed to a list of members).

*A flowchart is attached outlining the current and future management structures.*

**Management Plan (p80)**

The management plan of October 2002 is scheduled to run for 8 years. What is the procedure for renewing it? Under the changed jurisdiction, who is responsible for the

preparation of a replacement plan and its approval? What is the timescale for plan preparation and, based upon experience of the existing plan and possible World Heritage inscription is it possible to suggest those sections of the plan that might require modification or any new additions? In terms of the details of the plan:

*The work on revising the current Management Plan (which runs for 6 years) will begin in the middle of 2007, in accordance with the preparation and approval methodology that is detailed in the Annex. This process is regulated by the National Parks Administration Plan and contains various phases: a) gathering information, b) diagnostic document (which includes substantial and alternative questions) and c) the preparation and approval of the definitive document. From start to finish this is a completely transparent process that is legally bound to make all of its information public and that will include the participation of a large number of the social organisations and sectors that are implicated. The Canarian Government is the authority responsible for approving this document. Some of the topics that will be dealt with more in depth include the regulation of the access points and the improvement of the quality of the visit.*

• It establishes an aspiration to "improve the survival capacity of endangered animal and plant species". Is it possible to expand on what this means and how it will be achieved outside of a habitat-based conservation system?

*The recuperation of endangered species will not be undertaken outside of the habitat-based conservation system. This is because Teide National Park and its buffer zone encompass the entire Tenerife summit scrubland ecosystem. The Management Plans of Teide National Park and La Corona Forestal Nature Park, the Conservation norms of the Teide Natural Monument and the TRLTENC (the Revised Text of the Canarian Territorial Law and Canarian Natural Spaces Law) create a legal framework that is more than sufficient for the conservation and management of this habitat, establishing a regimen of appropriate uses to guarantee it preservation. That said, it must be pointed out that the rarest species need specific and focused conservation activities because even with the maximum protection of their habitat, their survival is not guaranteed. This is because occasionally, when the number of individual specimens is low enough, the survival of a taxon is largely dependent on estocastic phenomena that can lead to extinction even when the habitat is well conserved. This is why certain activities such as the protection of local populations, reinforcements, storage in seed banks, etc. are employed, all of which are contained in specific recuperation plans, which pursuant of Law 4/1989 are prepared by the Autonomous Community of the Canary Islands with the consensus of the TNP Administration and the Cabildo Insular de Tenerife.*

• How is it envisaged that the authorities can prevent volcanic eruptions, and is this an appropriate aim of a dynamic natural site?

*The main directives that organise and manage areas of volcanic and seismic risk are currently contained in the Territorial Emergencies and Civil Protection Plan of the Autonomous Community of the Canary Islands and the Insular Territorial Emergencies and Civil Protection Plan of Tenerife. Perhaps in the information we provided to UNESCO it was not made clear that the planning contained in these documents is*

*heavily focused on detecting risk zones and planning evacuation activities. In addition, Article 3.2, point 8 of the TNP Management Plan defines natural catastrophes as just another ecological process of the park, meaning that preventative or corrective measures will only be applied when the security of people are in danger. A doctrine of non-intervention is also in place in the case of fires caused by volcanic eruptions, as long as they are contained within the area of the volcanic activity.*

• An aim of TNP is to promote socio-economic development of the communities within its environment. Give a permanent population of three persons, are we to assume that this refers to the wider economic catchment of the Park? If so, have any actual or potential conflicts been identified between the economic development of those living outside of the Park (but economically dependent on it) and nature conservation? In this context, which aims have primacy and how are/would such conflicts be resolved.

*Exactly; this statement alludes to a broader economic development extending outside of the national park and which contains two fundamental aspects. First of all, the Ministry of the Environment's policy on subsidies includes all of the municipalities that are represented in the territory of the national park and the Peripheral Protection Zone. This policy is focused on giving technical, economic and financial aid designed to promote sustainable development in these municipalities and among their populations. This aid is regulated by RD 940/1999 and RD 1229/2005 and, as the preamble to RD 940/1999 indicates, it must always be compatible with the conservation of nature. Therefore, none of the conflicts that have been mentioned will be a problem as far as these subsidies are concerned. Furthermore, to date the subsidies that have been awarded correspond with municipal or private actions taken outside of the national park that have never had a negative impact on the parks resources.*

*Secondly, there are economic sectors that depend either directly or indirectly on the national park. Tourism is the most obvious example and, to a lesser degree, apiculture. Of course, the national park does not impede the development of tourism, far from it, its resources (especially its landscape) help to promote this sector. As far as apiculture is concerned, the Management Plan allows for these activities to take place within the park, although they are subject to regulations established in apicultural norms and the criteria derived from the Special Plan for Apiculture. This guarantees the development of this activity without interfering with the conservation of the natural resources of the park.*

• Primary funding for TNP has come from the Environment Ministry (presumably a State body), how will the level of funding be set in future and its application administered once responsibility is passed to the Autonomous Region? Is it possible to identify at this stage any threats to the maintenance of adequate funding, any additional costs that might accrue from inscription (for example re-branding and resigning of the site) and how these cost would be met?

*The Ministry of the Environment is a state organisation. Regarding future funding, once responsibility is transferred to the Autonomous Community, all of the resources, equipment and personnel that the national park currently controls will also be transferred; in addition, the annual funding that until now has been provided directly by the Ministry will be diverted to the Autonomous Community of the Canary Islands from the State General Budget with the goal of guaranteeing the maximum conservation of*

*the natural and cultural resources of the park. In the end, the Autonomous Community will be in charge of administering these resources.*

*In light of the experience of other national parks whose responsibility has already been transferred (Doñana National Park, for example) and keeping in mind that the Canarian Government has expressed the desire to assume the competences and responsibilities of conservation, there is no foreseeable danger of losing funding. Furthermore, there is a possibility that positive synergies may be produced in the economic, technical and personnel provisions given the current tendencies of the Autonomous Government. In addition, the Canarian Government is prepared to manage and fund any additional costs that may arise from being named a World Heritage site.*

• What is the difference between commercial expenditure and investments?

*Unfortunately, there was an error in the English translation of the proposal. In reality, "commercial expenditures" refers to "current expenditures". "Current expenditures" refer to the expenditures indicated in Chapter 2 of the economic regulations of the Public Administration: perishable goods, goods that are not expected to last throughout the budget's fiscal year and reiterative expenditures. "Investments" are included in Chapter 6 of the cited resolution and include expenditures acquiring capital goods that can be inventoried and non-material expenditures that can be amortised. In brief, current expenditures are necessary to run the national park, while investments correspond to expenditures such as remodelling, adaptation or the creation of facilities and studies.*

• There appears to be a very commendable outreach programme to local educational institutions. Is it possible to enlarge on the role of Park staff in the delivery of the programme, in particular the degree of direct co-operation with teachers in the delivery of the programme? Do staff, for example, accompany and work with teachers on tours of the Park?

*Various aspects of our laws and regulations indicate that Teide National Park needs to elaborate its own educational project, which we have entitled "Teide para la Didáctica" ("Teide for Didactics"). This document, which has already been prepared, is the rough draft of an educational project from which the definitive "Teide para la Didáctica" plan will emerge. This plan will mark the general lines of educational activities that will be carried out by Teide National Park until the park's new Management Plan is prepared and enacted. In fact, this educational project will eventually be incorporated into the Management Plan; therefore, although this is not the definitive document, this does not impede using it as a working document and basing our activities on it.*

*The following are among the general objectives of the project:*

- *Promote environmental education and public understanding of the ecological and cultural value of the park and it means.*
- *Convert Teide National Park into a site that promotes solutions for environmental problems in the Canaries.*
- *Inform, train and sensitise the Canarian educational community on issues relating to the public use, conservation and improvement of Teide National Park and encourage this group to take action along these lines.*
- *Involve teachers, parents and personnel working "in" and "for" the park in the activities established in the "Teide para la Didáctica" project.*

*This project seeks to involve everyone affected by the Canarian educational community and its different organisational structures. The Canarian educational community includes not only students and their teachers, as most people believe, but also everyone effected by formal education, those that make up non-formal education and, of course, the parents of the students and the people who work in the different services of the educational system.*

*There is a great deal of direct cooperation with teachers, with many activities directed especially at this group: talks, specific routes, presentations in the Teacher Centres (there are 6 geographically distributed centres on the island that serve as coordination centres for educational activity), training and assistance in preparing complementary activities for their students, etc.*

*In addition, park personnel most certainly do accompany the teachers during their visits: they accompany them on the routes carried out within the activities specifically programmed for the educational community and also on guided routes that are designed for the general public (many schools ask for this service without receiving a talk beforehand in their workplace and there are also groups of teachers who ask for this service for themselves, without their students) or in trips to the Visitor Centres (that do not imply a route before or after the visit to the centre).*

• Within the application there are only two mentions of disability (a reference on p94 to 'handicapped' visitors and a similar reference in the additional material). Does the Park have a disability access strategy? Are there legal requirements regarding disability access? Are management policies tested for discrimination against different groups?

*The following extract of Section 2 of the "Management Criteria" defined in Decree 153/2002, 24 October, approving the Teide National Park Management Plan, relates to public use of the park and visitor attention (point 3.3):*

> *"Visitor needs will be met by establishing different routes with different levels of difficulty and by offering disabled people the opportunity to enjoy the natural resources of the park with the goal of providing them, as far as possible, the same opportunities as non-disabled people. Discrimination of visitors will be strictly avoided".*

*In order to comply with the general and specific legislation of the national parks, the park's Visitor Management team has created an internal working document entitled "Adaptation of the Facilities and Services of Teide National Park for Disabilities Project". The different Disabled Persons Associations of the island gave technical advice on the creation of this document, including FUNCASOR (Canarian Foundation for the Hearing disabled and their Families), ONCE (Spanish National Organisation for the Blind), SIMPROMI (Insular Society for the Promotion of Disability), PSICOARTE (Association of the Promotion of the Culture of the Learning Disabled) and FASICAN (Canary Islands Federation of Associations for the Hearing disabled).*

*In accordance with this internal document and the Management Plan, the national park has been adapting its existing facilities, equipment and services. In addition, the blueprints of all new construction include designs that provide the greatest accessibility possible, while at the same time respecting the principle of conservation that is meant to preserve this natural space for future generations.*

*The national park currently has different facilities that all have an acceptable level of accessibility. In particular the two Visitor Centres (El Portillo and Cañada*

*Blanca), the current administrative offices (Santa Cruz de Tenerife and in the Caserío de El Portillo de la Villa) and the future TNP Administrative and Services Centre in La Orotava (currently under construction) are all highly accessible.*

*The trail network currently contains a trail that has been adapted to visitors with limited mobility, consisting of a straight 450 meter route. Over the past few years the park has collaborated with UMET and HANDI CAP EVASION, which are not for profit associations which organise environmental activities for people with reduced mobility. These activities are carried out using an adapted single-wheel wheelchair known as a "joelette" which is guided by two people and carries one disabled passenger; using these special wheelchairs they are able to take some of the main trails.*

*Throughout the year various activities are held which allows the blind to travel almost all of the trails if they are accompanied (21 trails total), with the collaboration of the national park's interpreter-guides.*

*In addition, Teide National Park is the only Spanish national park that has an interpreter-guide that can communicate using Spanish Sign Language. This allows the park to carry out various activities throughout the year with groups of hearing-impaired visitors.*

*The national park also has a Botanical Garden annexed to the El Portillo Visitor Centre covering 4 ha containing a sample of the flora and vegetation of the park. The garden has 1,250 meters of linear paths which are practically free of obstacles and that can be easily traversed by a person with reduced mobility.*

*Based on our experience and studies, architectural projects have been contracted to adapt all of the facilities that have not already been adapted. These projects are expected to be carried out in 2007.*

*The national park's Guide Service carries out many activities throughout the year with disabled groups or individuals. For example, the activities carried out during the acts commemorating the 50th anniversary of the declaration of El Teide as a national park, which are listed in the document of the project to declare El Teide a World Heritage site.*

*Regarding non-discrimination against certain groups, the management of the park is in complete compliance with the European, national and regional legislation prohibiting discrimination. The application of this legislation is supervised by the Direction of the park, the Patronage and the organisations that have competences over this material. In addition, the management of the park applies policies to ensure equality between genders, for example, the tribunals that judge candidates for job openings in the park are made up of an equal number of men and women. Women have been completely integrated alongside of men in the management structure of the park, occupying technical and administrative positions, as well as positions involved in security, public use, maintenance, fire fighting, etc.*

• In the brief section on monitoring, it states that 16 reports have been prepared according to the instructions of the Council of Europe. What are these instructions? Do they have any legal basis?

*Since 1989 Teide National Park has received the European Diploma of Protected Areas, awarded by the Council of Europe. When it was first awarded, and in later renewals (1994, 1999 and 2004), the Council of Europe not only specified the content and structure of the reports that the national park was required to provide, but it also established a series of recommendations.*

*The legal basis of the recommendations of the Council of Europe can be consulted on their web site (http://www.coe.int). In addition, the resolution that renewed the TNP's European Diploma in 2004 for an additional five years has been included in the Annex.*

## *ANNEX DOCUMENTATION*

1. *Articles of the Revised Text of the of the Canary Islands Territorial Organisation and Canarian Natural Spaces laws*
2. *Map indicating the areas where the Habitat Directive is applicable in Teide National Park and its Buffer Zone.*
3. *Commitment letter from the Canarian Government stating that it will declare all of Teide National Park a SPA.*
4. *Organisational charts outlining the current and future management structure of Teide National Park.*
5. *Methodology employed to prepare and approve the Management and Usage Administration Plan (PRUG).*
6. *Resolution renewing Teide National Park's European Diploma.*

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## *ANNEX DOCUMENTATION*

1. *Articles of the Revised Text of the of the Canary Islands Territorial Organisation and Canarian Natural Spaces laws*
2. *Map indicating the areas where the Habitat Directive is applicable in Teide National Park and its Buffer Zone.*
3. *Commitment letter from the Canarian Government stating that it will declare all of Teide National Park a SPA.*
4. *Organisational charts outlining the current and future management structure of Teide National Park.*
5. *Methodology employed to prepare and approve the Management and Usage Administration Plan (PRUG).*
6. *Resolution renewing Teide National Park's European Diploma.*

***ARTICLES 21, 22, 49, 54, 55 AND THE 5TH TEMPORARY PROVISION OF LEGISLATIVE DECREE 1/2000, 8 MAY, APPROVING THE REVISED TEXT OF THE OF THE CANARY ISLANDS TERRITORIAL ORGANISATION AND CANARIAN NATURAL SPACES LAWS***

***ARTICLES 21, 22, 49, 54, 55 AND THE 5TH TEMPORARY PROVISION OF LEGISLATIVE DECREE 1/2000, 8 MAY, APPROVING THE REVISED TEXT OF THE OF THE CANARY ISLANDS TERRITORIAL ORGANISATION AND CANARIAN NATURAL SPACES LAWS***

**Article 21.**- Protected Natural Space Plans and Regulations

1. The organisation of Protected Natural Spaces, which includes the way in which they are used throughout their territory, can be carried out using the following mechanisms:

a) Management Plans for National, Natural and Rural Parks.
b) Administration Plans for integral and special Nature Reserves.
c) Special Plans for Protected Landscapes.
d) Conservation Regulations for Natural Monuments and Sites of Scientific Importance.

2. The preparation and content of Management Plans for National Parks will be governed by their specific legislation.

**Article 22.**- Plans and Regulations for Protected Natural Spaces: content and resolutions.

1. The Plans and Regulations for Protected Natural Spaces must establish resolutions that thoroughly organise the space throughout its entire territory in enough detail as to legitimise the executive actions that will be taken.

In addition to binding resolutions, they can establish guiding policies, directives and criteria, setting objectives.

2. The preparation and content of Management Plans for Protected Natural Spaces will also contain at the very least the following planning and organisational resolutions:

a) The division, when necessary, of the territory in different zones according to their protection needs, defining their uses in accordance with those defined in point 4.
b) The classification of each territory from among the different classes of land regulated in Title II of this Revised Text according to its protection needs.
c) The detailed and exhaustive regulation of the uses and interventions of each area that are derived from its organisation. In addition, when necessary, the regulation of requirements for the execution of the different actions that can be authorised.

3. In addition to organisational resolutions, Management Plans will contain the management, development and action resolutions that are necessary to reach the objectives that justify the declaration of the corresponding Protected Natural Space and, among them, those originating from the following:

a) Policies, directives and criteria that organise the management of the Protected Natural Space.

b) Directives and content that formulate specific programmes for protection, conservation, research, environmental education, public use, visitor enjoyment and the socio-economic progress of the populations that live in the Natural Space or in its area of influence to be developed by the Administration responsible for its management.
c) An account of the technical and economic aid given to the effected population designed to compensate for the limitations derived from the protection and conservation measures.
d) Identification of areas and materials that, for specific problems, need programmes that develop the planning and organisation established in the Management Plan, indicating the criteria that must be followed.
e) Creation, when necessary, of integrated management areas.
f) Prevision of the actions needed to reach the objectives and, when necessary, the scheduling and financial study of those actions.
g) Indication of the criteria or conditions by which the viability of the plan and the need to revise it will be evaluated.

4. Management Plans can establish different zones within the territory of the protected space, according to the following zoning criteria:

a) Exclusion or prohibited access zones: these are made up of areas containing the greatest biological value or that contain the most fragile, endangered or representative biotic or abiotic elements. Access to these zones will be regulated based on scientific or conservationist goals.
b) Restricted use zones: these include areas that have high biological value or that have fragile or representative elements whose conservation allows for only limited public use, always on foot, while also prohibiting modern technological infrastructure.
c) Moderate use zones: these include areas whose conservation is compatible with recreational activities or those related to environmental education.
d) Traditional use zones: these include areas used for traditional agricultural or fishing activities that are compatible with their conservation.
e) General use zones: these include areas that, due to their relatively low value within the Protected Natural Space, or because they allow for a greater influx of visitors, can be used for the placement of facilities, activities and services that benefit the communities that are integrated within or near the Natural Space.
f) Special Use Zones: the objective of these zones is to give space to pre-existing rural or urban settlements and the facilities and equipment that are foreseen by territorial and urban planning.

5. All of the resolutions of the Protected Natural Spaces Plans and Regulations must respect the resolutions that the Organisational and Planning Directives and the respective Insular Organisation Plan mandate for their territories and, in turn, they will take precedence over all other territorial and urban planning instruments. Therefore, territorial and urban plans have to include the resolutions established in the Protected Natural Spaces Plans and Regulations and develop them if so required.

6. Management Plans for Rural Parks and Special Plans for Protected Landscapes can establish some or all of the following territorial planning resolutions:

a) Place rural land classified by a general planning instrument into any of the categories for rural land listed in this Revised Text.
b) Reclassify urban or buildable land as rural land, placing it within the category of rural land that fits its characteristics, when the organisation and protection of natural resources requires it.
c) In general or special use zones, land that has been classified as rural or non-buildable by a general planning instrument can be reclassified as buildable land or as rural or agricultural settlements when the characteristics of the existing urbanisation and edification demand it, and the conservation of the natural resources and environmental value allow it.
d) Also in general or special use zones, land that has been classified as rural or non-buildable by a general planning instrument can, in exceptional cases, be reclassified as buildable land when it is considered necessary to absorb foreseeable growth in permanent residency, as long as the conservation of the natural resources and environmental value allow it. Only the amount of land exclusively needed to build a population settlement will be reclassified.

7. Management Plans for Natural parks, Administration Plans for nature reserves and Conservation Regulations can only classify the land in their territory as rural.

8. In any case, when formulating, interpreting and applying Plans and Regulations, environmental resolutions will take precedence over resolutions that are related purely to territorial or urban planning and organisation, in fact they must serve as instruments to complete the environmental objectives and criteria of the planning.

9. The minimum content, documental requisites and specific procedural regulations with which the Protected Natural Space Plans and Regulations must comply will be developed according to the category of Protected Natural Space.

This content will be outlined in a descriptive Report that will also contain a study of the Natural Space's ecosystems, as well as define the boundaries of the different zones, their regimen of protection and utilisation of their resources, when applicable, and specify the rules applicable in each of them. The necessary cartography and a financial study of the foreseeable actions will also be incorporated along with this Report.

**Article 49.-** Classes of land

1. In accordance with the planning and organisation of natural and territorial resources, the General Plan will classify the land in each municipality, within a framework of sustainable development, in all or some of the following classes:

a) Urban (land that has already been built on).
b) Buildable.
c) Rural (non-buildable).

2. The instruments used to organise territorial or natural resources, in the cases foreseen by the Revised Text, can directly place land in one of the classes established in the prior

point, as well as establish binding classification criteria that must be introduced into the General Plan for specific areas of a municipality.

3. The land in each class will be categorised according to its specific use. Land that is mainly used for tourism must be categorised as tourist regardless of its class.

**Article 54.**- Rural land: definition.

Rural land includes all terrain that is classified as rural for one of the following reasons:

a) It is a natural public property or subject to limitations or obligations to protect its integrity.
b) It is protected by a specific law, especially because of its environment, mountains, cattle trails, agriculture, Protected Natural Spaces, fauna and flora and the historic heritage of the Canaries.
c) It is protected by a territorial or natural resources organisation plan, due to one of the aspects mentioned in the letter b).
d) It is protected to maintain its natural, landscape, cultural, scientific, historic, archaeological or, in general, environmental value.
e) It must be preserved for agriculture, forests, cattle, hunting or its natural resources.
f) Its natural characteristics must be maintained to protect its integrity and the usefulness of its infrastructure, equipment and public facilities or because it is of public interest.
g) It is not suitable for building, according to the criteria established in the corresponding Technical Regulations for Urban Planning, due to the great cost of transforming it or due to the risk of erosion, landslides or similar phenomena brought about by its geotechnical or morphological characteristics.
h) It is necessary not to build on it to protect the insular ecosystem, in order to avoid surpassing its capacity for urban development.
i) It is necessary not to build on it to maintain its territorial model, as well as its essential or specific peculiarities as a non-occupied rural area or certain traditional kinds of villages.

**Article 55.**- Rural land: categories.

Land classified as rural by territorial planning and organisation, in accordance with the legally defined criteria, will be established within all or some of the following categories:

a) When the terrain contains natural or cultural values that have been specified for environmental protection:

1) Natural Protection rural land, for the preservation of natural or ecological values.
2) Landscape Protection rural land, for the conservation of either natural or manmade landscapes, and of the physiographic characteristics of the terrain.

3) Cultural Protection rural land, for the preservation of archaeological sites and that of buildings or infrastructure of historical, artistic or ethnographic value, as well as their immediate surroundings.
4) Environment Protection rural land, for the preservation of ecological perspectives or processes, differentiating environments in Protected Natural Spaces from population centres and itineraries.
5) Coastal Protection rural land, for the organisation of maritime, inland and *servidumbre* (obligation to allow passage or to protect) areas of public land when they are not classified as urban or buildable. Assignation to this specific category will be compatible with any of the other categories listed in this article.

b) When the terrain needs to be protected for its economic value, because it is ideal, at least potentially, for agricultural, cattle, forest, hydrological or mining uses and for the establishment of infrastructure:

1) Agricultural Protection rural land, for the organisation of its use, or potential use, for agriculture, cattle, or fishing.
2) Forest Protection rural land, for the organisation of the use of forests or the repopulation of the forest.
3) Hydrological Protection rural land, for the protection of basins, to avoid erosion and increase and rationalise the use of hydric resources both in the soil and subsoil.
4) Mining Protection rural land, for the organisation of the exploitation of mineral resources.
5) Infrastructure Protection rural land, for the establishment of protection and reserve areas that guarantee the functionality of infrastructure related to roads, telecommunication, energy, water, supplies, drainage and the like. This category will be compatible with any of the others foreseen in this article.

c) When the terrain contains traditional rural villages, and in accordance with the acknowledgement and delimitation criteria that insular planning and organisation establishes for each county:

1) Rural Settlement rural land, referring to existing villages that are generally not tied to primary activities, whose characteristics do not justify their classification and treatment as urban land in accordance with the criteria established in the Urban Planning Technical Regulations.
2) Agricultural Settlement rural land, referring to areas used for agriculture and cattle raising where residential building has taken place related to these activities, for a proportional organisation between the buildings and the corresponding agricultural and cattle activities.
3) Territorial Protection rural land, for the preservation of a territorial model, its essential and specific peculiarities and the value of the non-occupied rural environment, as well as to safeguard the insular ecosystem and its capacity to withstand urban development.

**TEMPORARY PROVISIONS. Fifth.-** The Classification and Categorisation of land until the final approval of the Protected Natural Spaces planning and organisation instruments.

1. As of the enactment of Law 9/1999, which plans and organises the territory of the Canary Islands, the following resolutions will be applied to land classified as urban, buildable or suitable for building, or categorised as a rural settlement:

a) Urban land and rural settlements will be maintained, although they will be adapted to the environmental values of the corresponding Protected Natural Space when necessary through the Special Planning and Organisation Plans.
b) Land classified as buildable or suitable for building will be reclassified as natural protection rural land, as long as they are not already governed by a partial plan or, in the case that they do have a partial plan, the stipulations of said plan have not been carried out in the specified time periods for reasons attributed to the developers and with a previous declaration of expiry by the Territorial and Environmental Planning and Organisation Commission of the Canaries.

2. Natural Parks and nature reserves are classified as natural protection rural land, in accordance with the stipulations of this Revised Text, until their corresponding planning and organisation instrument comes into effect.

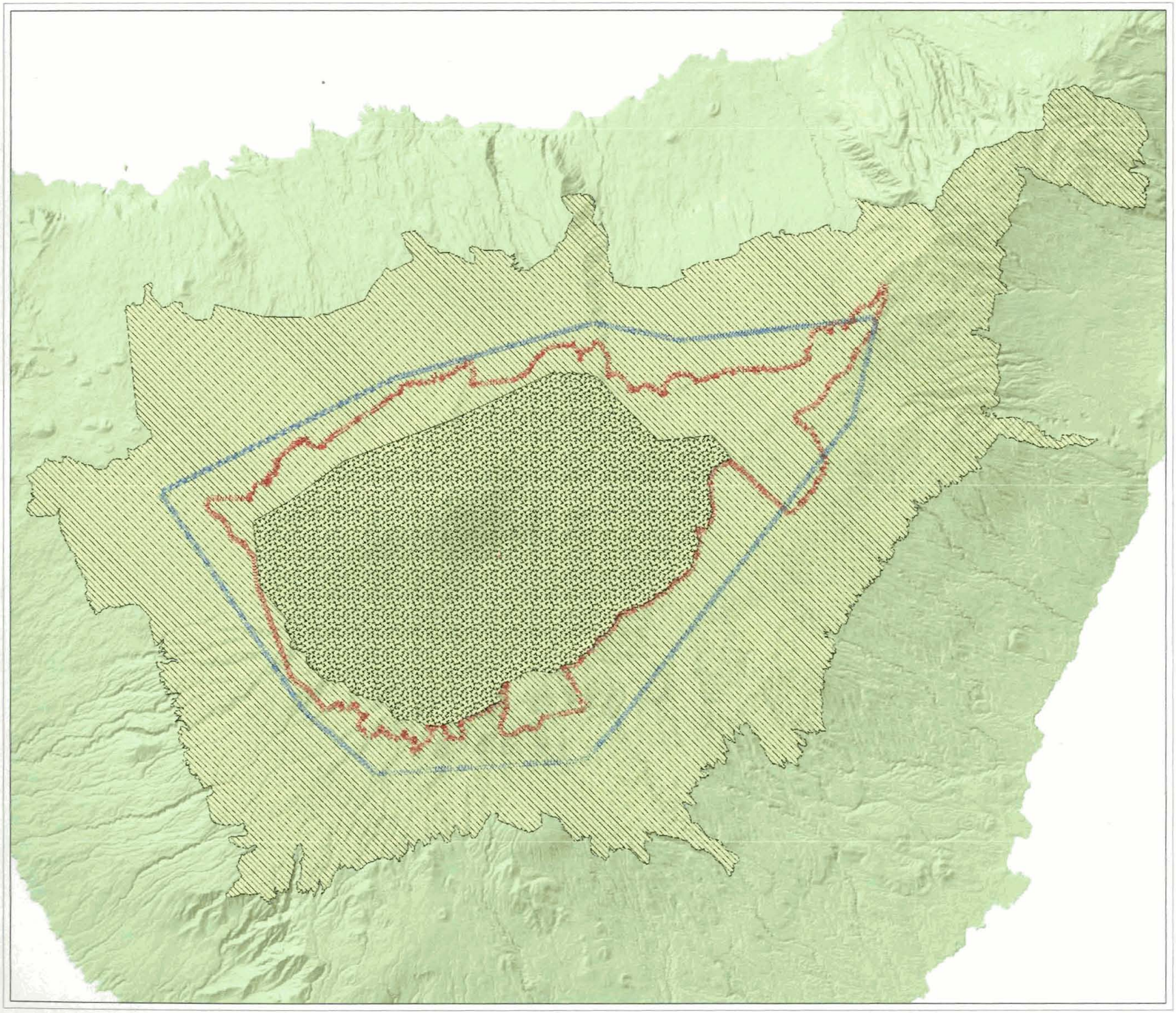
3. The organisation of Protected Natural Spaces through territorial planning instruments when Law 9/1999, which plans and organises the territory of the Canary Islands, came into effect will be considered temporary until the corresponding plans or regulations take effect, at which time their resolutions will substitute the prior ones, without the need to expressly adapt the planning instrument.

4. As long as the Plans and Regulations for Protected Natural Spaces have not yet been prepared, the classification and categorisation of the land by the General Plans will be governed by the following rules:

a) New urban land can only be classified or rural settlements established in accordance with the stipulations of the Insular Planning and Organisation Plans.
b) All land not affected by the classifications or categorisations indicated in section 1 or the preceding paragraph, must be temporarily categorised as natural protection rural land. If the Insular Planning and Organisation Plan does not specify other resolutions, the use of land in this category will fall under the heaviest restrictions indicated by the General Plan for rural land.

5. The territorial planning and organisation resolutions established by the Plans or Regulations for Protected Natural Spaces will substitute those that were temporarily established for the land declared as such, without it being necessary to expressly adapt those instruments to the final organisation.

***Map indicating the areas where the Habitat Directive is applicable in Teide National Park and its Buffer Zone.***



## Localización



## Datos cartográficos



MINISTERIO DE MEDIO AMBIENTE

Gobierno de Canarias

## Simbología utilizada

- LIC
- Z.E.P.A.
- Futura Z.E.P.A.
- Límite del Parque Nacional del Teide
- Zona Periférica de Protección

***Commitment letter from the Canarian Government stating that it will declare all of Teide National Park a SPA.***

Government of the Canaries
Presidency of the Government
General Secretary

ANTONIO A. CASTRO CORDOBEZ, SECRETARY OF THE CANARIES GOVERNMENT,

CERTIFIES: that outside of the day's agenda the following resolution, among others, is recorded in the minutes of the meeting held by the Government on 17 October 2006 and is here transcribed literally:

"F.O.D. (outside of day's agenda) 20.- PROPOSED RESOLUTION TO APPROVE THE PROPOSAL TO DESIGNATE NEW AREAS AS SPECIAL PROTECTION AREAS (SPAs). (ENVIRONMENT AND TERRITORIAL ORGANISATION COUNCIL).

In order to fully comply with Council Directive 79/409/ECC, of 2 April 1979 on the conservation of wild birds, the Environment and Territorial Organisation Council of the Government of the Canaries has adapted some spaces designated as special protection areas (SPA) or designated new SPAs, having considered that to date there has been insufficient area designated as SPAs in the Canaries, a fact that has already been pointed out by the European Commission.

The proposal of these areas has been submitted to the Cabildo of each island to allow them to express their opinions, and it has also been made available to the public for the period of one month through the publication of an announcement in the Official Bulletin of the Canaries Num. 234, 1 December 2004. All of the allegations received have been analysed.

Next, a new document was made public for the period of one month, through the publication of an announcement in the Official Bulletin of the Canaries Num. 77, 21 April 2006, referring exclusively to the island of Fuerteventura and containing important modifications to the original published proposal and the allegations made on this document were also analysed.

The current proposal has been prepared based on this institutional consultation, as well as the evaluation of the allegations presented by individuals and entities via the public information process described above.

Having regard to Council Directive 79/409/ECC, of 2 April 1979 on the conservation of wild birds, article 3 of which obligates Member States to create special areas of protection for birds, and to the Position Letter SG (2000) D/100892 sent by the Secretariat-General of the European Commission to the Spanish Ministry of Foreign Affairs regarding the application of this Directive in Spain in relation to Action 1999/2212 brought against the Spanish State by the European Commission.

Having regard to the Organic Regulation of the Environment and Territorial Organisation Council approved by Decree 20/2004, 2 March, article 3 of which stipulates that the Counsellor has the responsibility to direct the environmental and

nature conservation policy, as well as the territorial and urban planning and organisation in the Autonomous Community of the Canary Islands, in accordance with the directives of the Government.

By virtue of the Government, after deliberation, and at the proposal of the Counsellor of the Environment and Territorial Organisation, the following resolution has been adopted:

First.- To approve the "THE PROPOSAL TO DESGINATE NEW AREAS AS SPECIAL PROTECTION AREAS (SPAs) IN THE CANARIES", the text of which is attached as an annex.

Second.- The Environment and Territorial Organisation Council will remit this resolution to the European Commission through the Environment Ministry of Spain.

Third.- The Environment and Territorial Organisation Council will publish this resolution in the Official Bulletin of the Canaries and notify the Cabildo of each island of its contents.

For the general record and to be used as necessary, I dispatch this certification in Santa Cruz de Tenerife, 17 October 2006.

*Stamped by the Secretariat of the Government.*

**ANTONIO A. CASTRO CORDOBEZ, SECRETARIO DEL GOBIERNO DE CANARIAS,**

**CERTIFICA:** que en el Acta de la reunión celebrada por el Gobierno el día diecisiete de octubre de dos mil seis, fuera del orden del día, figura, entre otros, el siguiente acuerdo, cuyo tenor literal se transcribe:



**O.D. 20.- PROPUESTA DE ACUERDO POR EL QUE SE PROCEDE A LA APROBACIÓN DE LA PROPUESTA DE NUEVAS ÁREAS PARA SU DESIGNACIÓN COMO ZONAS DE ESPECIAL PROTECCIÓN PARA LAS AVES (ZEPA). (CONSEJERÍA DE MEDIO AMBIENTE Y ORDENACIÓN TERRITORIAL).**

La Consejería de Medio Ambiente y Ordenación Territorial del Gobierno de Canarias, con el objetivo de alcanzar el nivel de cumplimiento de la Directiva 79/409/CEE, del Consejo, de 2 de abril de 1979, relativa a la conservación de las aves silvestres, ha elaborado una adecuación de algunos espacios designados zona de especial protección para las aves (ZEPA) o la designación de nuevas áreas ZEPA, habida cuenta de la hasta ahora insuficiente designación de áreas ZEPA en Canarias, que ya había sido puesta de manifiesto por la Comisión Europea.

La propuesta de estas áreas ha sido remitida a los distintos Cabildos Insulares para que expresasen su opinión, así como ha sido expuesta a información pública durante el plazo de un mes, mediante publicación del correspondiente anuncio en el Boletín Oficial de Canarias nº 234, de 1 de diciembre de 2004. Se han analizado las alegaciones recibidas al efecto.

Posteriormente, se sometió a información pública por otro plazo de un mes, mediante publicación del anuncio en el Boletín Oficial de Canarias nº 77, de 21 de abril de 2006, un nuevo documento referido exclusivamente a la isla de Fuerteventura que contenía importantes modificaciones respecto de la propuesta anteriormente expuesta en información pública, e igualmente se analizaron las alegaciones presentadas.

Del resultado de la consulta institucional, así como de la valoración de las alegaciones presentadas por particulares y entidades en sendos trámites de información pública, se redacta la presente propuesta objeto de este acuerdo.

Vista la Directiva 79/409/CEE, del Consejo, de 2 de abril de 1979, relativa a la conservación de las aves silvestres, cuyo artículo 3 impone a los Estados miembros la creación de zonas de protección para las aves, y la Carta de emplazamiento SG (2000)

D/100892 de la Secretaría General de la Comisión Europea al Ministerio de Asuntos Exteriores relativa a la aplicación en España de dicha Directiva en relación con el expediente 1999/2212 incoado por la Comisión Europea.

Visto el Reglamento Orgánico de la Consejería de Medio Ambiente y Ordenación Territorial, aprobado por el Decreto 20/2004, de 2 de marzo, que dispone en el artículo 3 que corresponde al Consejero dirigir la política medioambiental y de conservación de la naturaleza, así como la ordenación territorial y urbanística en el ámbito de la Comunidad Autónoma de Canarias, conforme a las directrices del Gobierno.

En su virtud, el Gobierno, tras deliberar y a propuesta del Consejero de Medio Ambiente y Ordenación Territorial, acuerda:

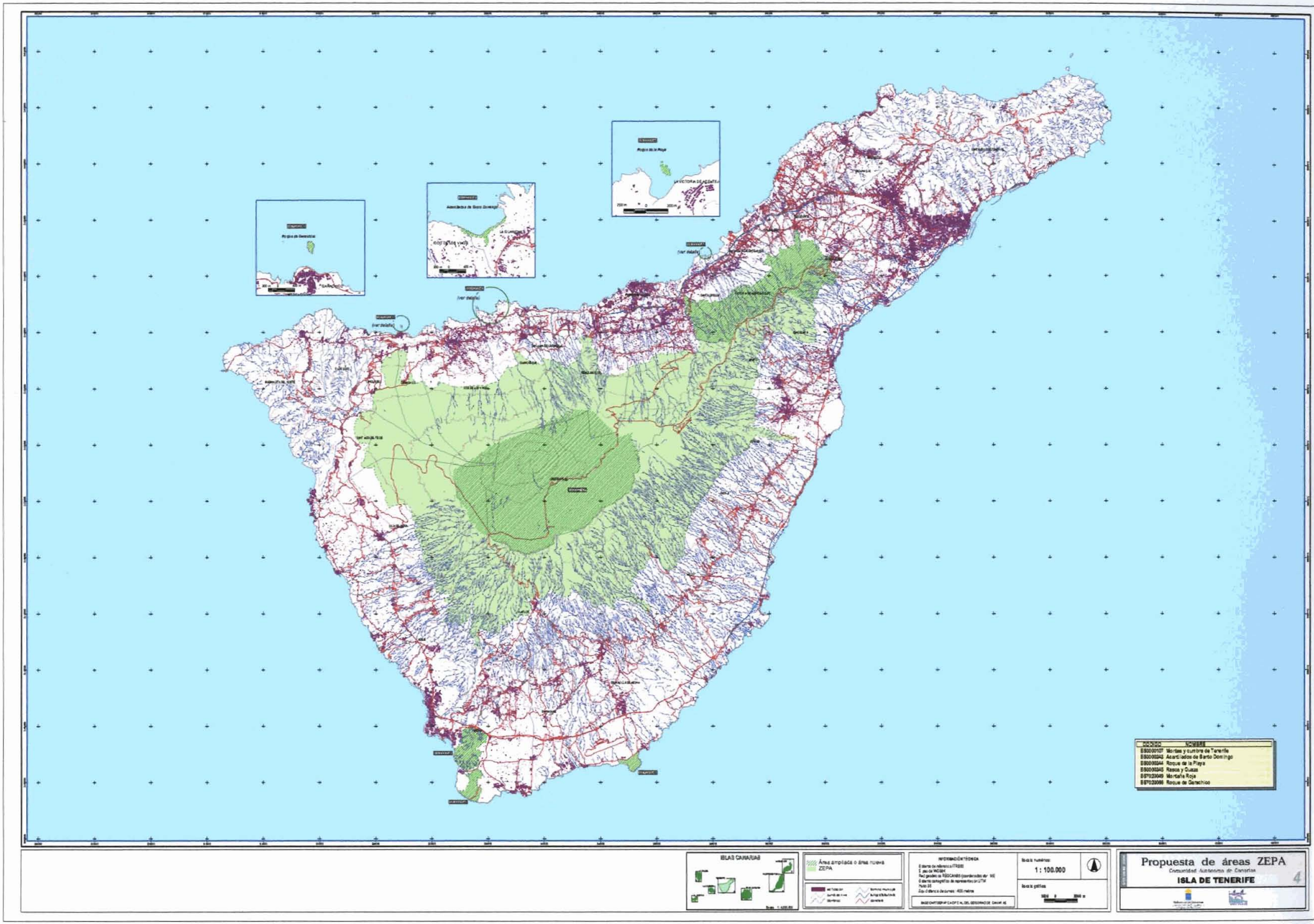
**Primero.**- Aprobar la "Propuesta de Nuevas Áreas para su Designación como zonas de especial protección para las aves (ZEPA) en Canarias", cuyo texto se acompaña como **anexo**.

**Segundo.**- La Consejería de Medio Ambiente y Ordenación Territorial remitirá el presente acuerdo a la Comisión Europea a través del Ministerio de Medio Ambiente.

**Tercero.**- La Consejería de Medio Ambiente y Ordenación Territorial procederá a la publicación del presente acuerdo en el Boletín Oficial de Canarias y a su notificación a todos los Cabildos Insulares."

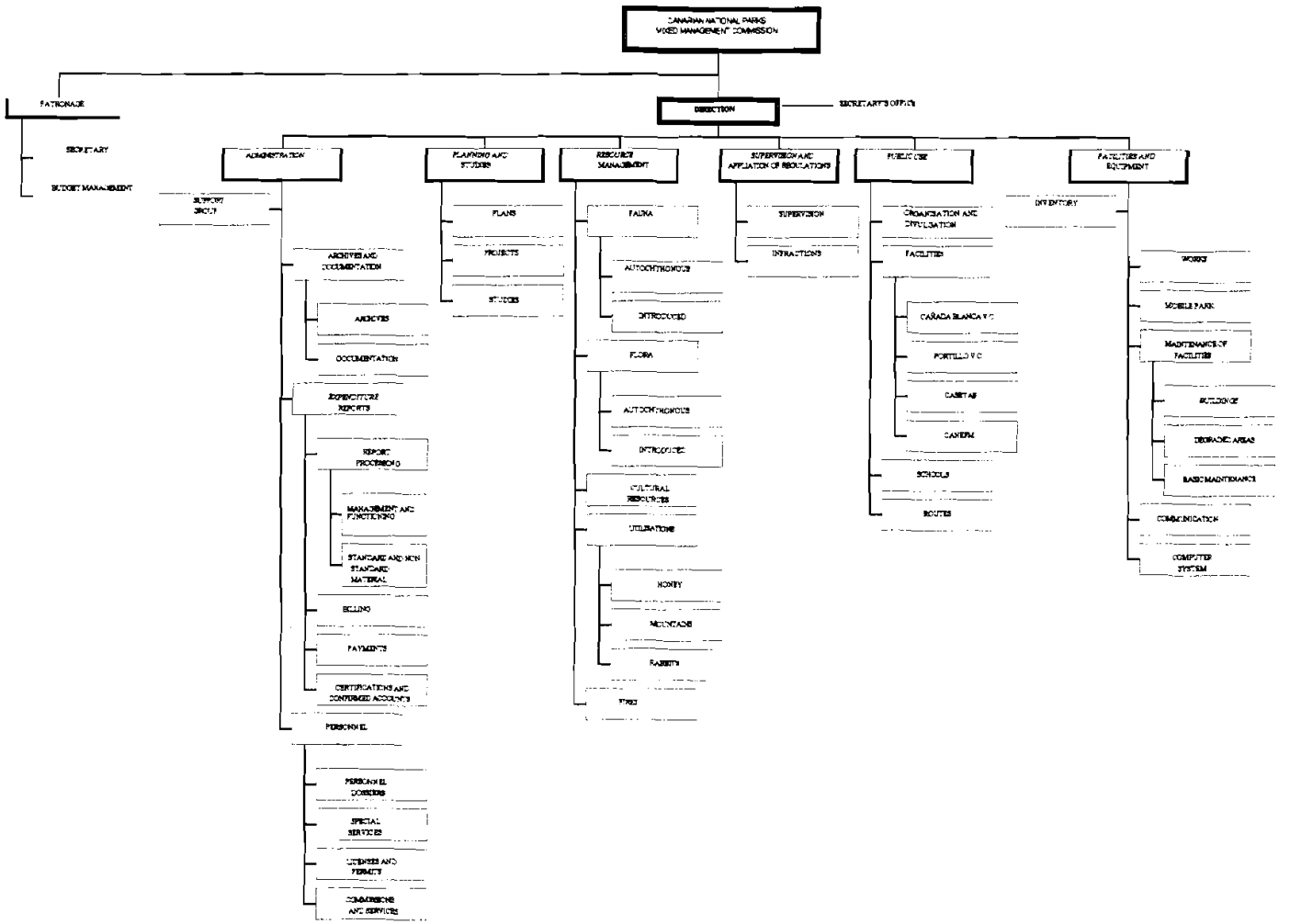
Y para que conste y surta los efectos procedentes, expido la presente en Santa Cruz de Tenerife, a diecisiete de octubre de dos mil seis.

Secretariado del Gobierno

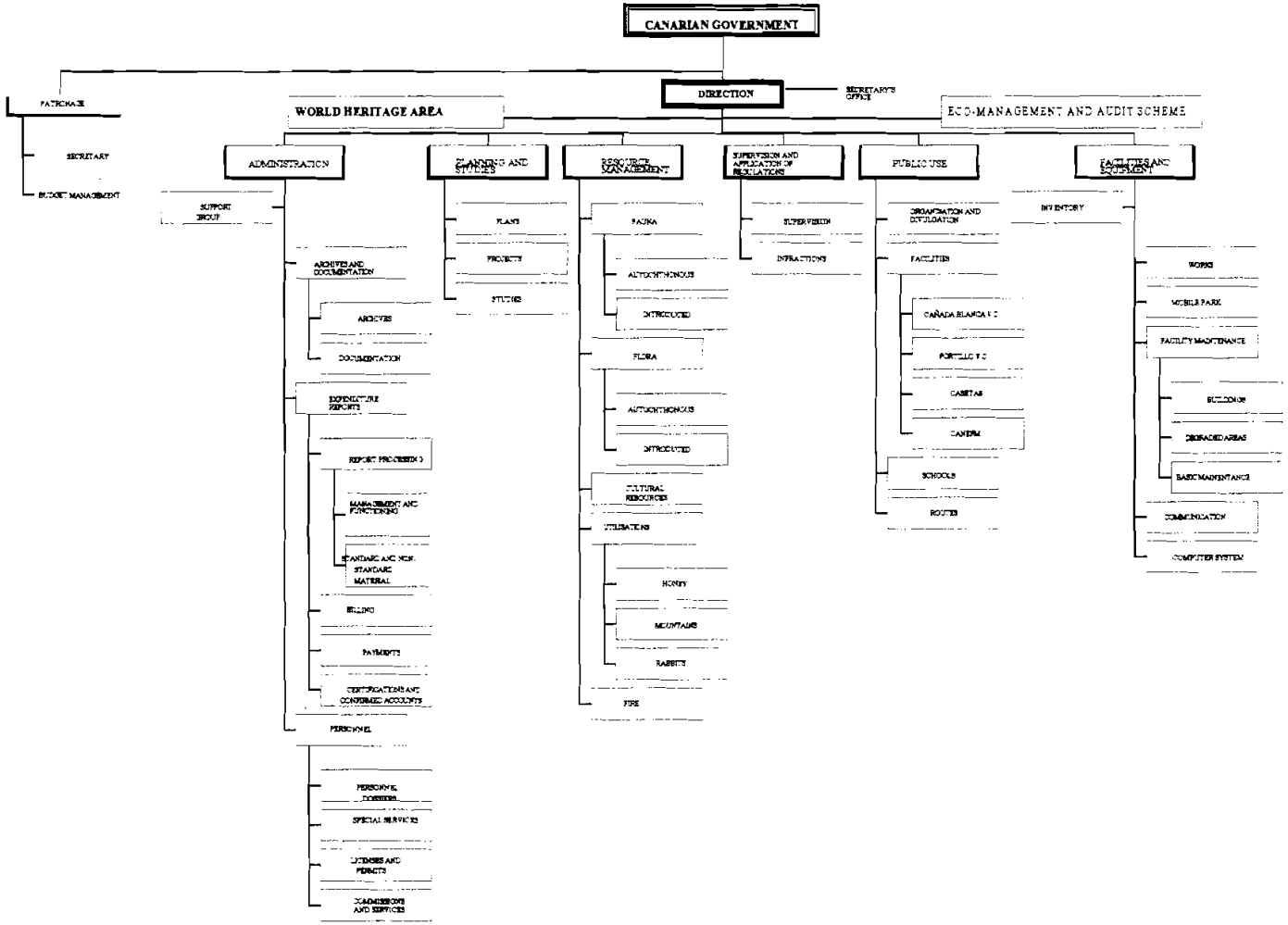

Reserva de la Playa
Acantilados de Santo Domingo
Reserva de Garachico
Áreas ampliadas o áreas nuevas ZEPA
1 : 100.000
Propuesta de áreas ZEPA
Comunidad Autónoma de Canarias
ISLA DE TENERIFE
4

***Organisational charts outlining the current and future management structure of Teide National Park.***

# Teide National Park Flowchart
# (Current)



# TEIDE NATIONAL PARK FLOWCHART
# (FUTURE)



***Methodology employed to prepare and approve the Management and Usage Administration Plan (PRUG).***

**PREPARATION AND APPROVAL OF THE TEIDE NATIONAL PARK MANAGEMENT AND USAGE ADMINISTRATION PLAN**

- The following information provided on the preparation of the Management and Usage Administration Plan (henceforth simply Management Plan) and the outline of the procedure are based on *Royal Decree 1803/99, 26 November, which approves the Executive Plan of the National Parks Network.*
- The Mixed Management Commission of the Canarian National Parks is in charge of the preparing the Management Plan and the different sectoral plans that are derived from it.
- The preparation process has different stages which combine the actual writing of the documentation with public consultation and participation involving all of the different stakeholders, all of which is integrated into a single coherent process.

  It is important to underscore that the process of public consultation and participation includes meetings with entities, groups and everyone affected by the plan, all of whom are informed of the issues prior to the meetings: they are provided with a document that explains the problems facing the park, all of the possible alternatives that may be employed to resolve problematic issues, an outline of the Management Plan, etc. This documentation is prepared in a simple and straightforward way that allows all stakeholders to participate in the creation of the plan: institutions, apiculturists, tour guides, mountain climbers, businessmen, etc.

  It takes several years of work and meetings to prepare the various documents that are needed to draft the proposed Management Plan and to complete the process of public consultation and participation. Once the consultation period is over, an evaluation of the participation throughout the process is carried out in order to take stock of the aspects that produced positive results.

- Once the process of preparing the Management Plan is completed, the administrative procedure begins. This final goal of this second phase is to have the plan approved and to put it into action. *Decree 153/2002, 24 October, which approves the Management and Usage Administration Plan of Teide National Park* is currently in affect for six years starting from the date it was enacted. The revision process must be started with enough time so that the new plan can be enacted when the old plan is no longer applicable. The duration of the different sectoral plans are determined by the Management Plan.

**PREPARING THE MANAGEMENT PLAN** ↔ **PUBLIC CONSULTATION AND PARTICIPATION**

**1ST Step: INITIAL DOCUMENTATION**

- Report including documentary and cartographic information
- A list of stakeholders that will participate in the preparation of the Management Plan[1].
- Document explaining the important issues of the park, a detailed evaluation of its state of conservation and the main problems it faces.

[1] This list includes the Central, Autonomous and Local Administration, different entities that have interests in the park, sports federations, scientific institutions and all those that express interest in participating.

**Start of the public consultation and participation process:** includes providing information to interested parties on how the plan is being prepared, the methodology being employed and the creation of a simple and straightforward document explaining the problems of the park.

**Possible modifications and additions resulting from the public consultation and participation**

**2nd Step: DEFINING THE MANAGEMENT PLAN'S GOALS**

- The goals of the Management Plan over the period it will be in effect.

**3rd Step: DESIGNING THE MANAGEMENT PLAN**

- This entails preparing a document including alternative ideas, an institutional and social assessment of environmental and economic issues as well as the overall viability of the proposed plan.

**Continuation of the consultation and participation process:** Reason for the consultation:

- To discuss the goals of the Management Plan

- To allow for public participation in the drafting and development of the document outlining alternatives for the different problems of the park; this document will also explain the pros and cons of each of these alternatives. In addition, this public forum can come up with new solutions, in addition to those proposed by the Administration.

**Possible modifications and additions resulting from the public consultation and participation**

**4th Step: DRAFTING THE PROPOSED MANAGEMENT PLAN**

- The proposed Management Plan is drafted based on the solutions that were selected from among the alternatives. The first section outlines the objectives and criteria of the plan; the second section focuses on the legislation governing the park, as well as the regulation of activities; and the third section programs the activities to be carried out by the administration.

**Continuation of the consultation and participation process:**
Reason for the consultation: to discuss the proposed Management Plan.

**Possible modifications and additions resulting from the public consultation and participation**

**ADMINISTRATIVE PROCESS:** PROPOSED MANANAGEMENT PLAN

The **PARK PATRONAGE** issues a report on the proposed Management Plan.

**PUBLIC INFORMATION** the proposed plan is published in the *Bulletín Official del Estado* (Official State Bulletin) for at least 30 days, during which time allegations about the proposed plan can be filed.

The proposed plan is sent to the **ADMINISTRATION RESPONSIBLE FOR TERRITORIAL PLANNING** so that in a period no greater than 60 days it can hand down a mandatory ruling


FINAL APPROVAL
by the Government Council of the Autonomous Community of the Canary Islands

***Resolution renewing Teide National Park's European Diploma.***

# COUNCIL OF EUROPE
## COMMITTEE OF MINISTERS

**Resolution ResDip(2004)8**
**on the renewal of the European Diploma of Protected Areas awarded to the Teide national park (Spain)**

*(Adopted by the Committee of Ministers on 5 May 2004 at the 883rd meeting of the Ministers' Deputies)*

The Committee of Ministers, under the terms of Article 15.*a* of the Statute of the Council of Europe,

Having regard to Resolution (65) 6 instituting the European Diploma, as amended by Resolution (98) 29 on the Regulations for the European Diploma of Protected Areas;

Having regard to Resolution (89) 10 on the award of the European Diploma to the Teide national park (category A);

Having regard to the proposals of the Committee for the Activities of the Council of Europe in the field of Biological and Landscape Diversity (CO-DBP);

Taking into consideration the discussions held between the Secretariat and the park's director, and the visit to the park carried out on 15 February 2003,

Renews until 18 June 2009 the European Diploma of Protected Areas awarded to the Teide national park,

Attaches the following recommendations to the renewal:

1. the new "*Plan rector de uso y gestión*" (exploitation and management leading plan) should be fully implemented by 2006;

2. an agreement on technical co-operation between the Government of Tenerife and the park's governing board (*Comision mixta de gestion de Parques de Canarias* – joint committee for the management of the Canary Parks) should be concluded, including appropriate co-ordination of the management of both the Corona Forestal nature park and the Teide national park, in particular as regards the conservation of the endemic fauna and flora, the eradication of the moufflon and the control of the wild rabbit population;

3. moufflon eradication from the park should be continued and increased, aiming at total eradication by 2007; such efforts are to be extended to the Corona Forestal nature park, and the wild rabbit population control should continue;

4. the areas around the cable car should be urgently "ecologically" restored; blending the installations with their surroundings, defining the conditions under which they are to function in the best interests of the natural environment, and excluding all activities or commercial developments in the area at the top of the cable car;

5. the provision of the management plan aiming at the demolition of the remaining buildings near the Sanatorium (*el Sanatorio*) should be urgently implemented;

6. genetic and ecological studies on endangered endemic or indigenous plant species should be continued; in order to ensure that plans to restore these species are carried out, the legal provisions concerning the implementation of these programmes should be applied with the co-operation of the regional authorities; the extension of these programmes to all endangered or vulnerable species should be considered;

7. access of visitors to the park should be strictly controlled, and the Access Plan (*Plan de Accesos*) adopted by the end of 2004, as required by the Management Plan;

8. the Public Use Plan (*Plan de uso publico*) should be adopted by the end of 2004;

9. the budget should be increased to meet the park's greater needs and new staff hired to ensure that the park is managed in compliance with the provisions of the new exploitation and management leading plan.

## SUMMARY OF THE EXPERTS IN DIFFERENT FIELDS

### Geology

There is great diversity among the many volcanoes in the world. In general, they can be separated into two main groups, one that includes volcanoes located on plate boundaries and another comprised of volcanoes that have arisen in the interior of lithospheric plates.

Most famous volcanoes belong to the first group, including Vesuvius, Etna, Fuji and Mount St. Helens and many others in the Andean belt, Japan, Indonesia, etc. However, the intra-plate volcanoes generated by mantle plumes or hotspots that make up the second group are much less known and appreciated.

Among these volcanoes, which are known as ocean island volcanoes because they often form volcanic island chains, the most well-known are those found on the island of Hawaii (Mauna Loa, Mauna Kea and Kilauea) and El Teide, located on the island of Tenerife. These Hawaiian volcanoes and El Teide, which are the tallest volcanic structures on the planet, are quite different because they represent opposite ends of the Ocean Island Basalts (OIB) series.

The Hawaiian volcanoes were created by an extraordinarily fertile mantle plume located below very young and flexible oceanic crust that is moving very quickly, faster than 10 cm/year. Under these circumsances massive shield volcanoes are quickly formed that, due to their weight, bend the crust, submerge and disappear before generating a large amount of the volcanic products and formations that are typical of evolved magmas from this magmatic series.

In contrast, the Canary Islands were created in opposite geodynamic conditions; these islands were produced by a low-intensity hotspot located below one of the oldest (>150 million years old) and least flexible oceanic crusts on the planet, which is moreover practically stationary. This is why Canarian volcanoes (among which El Teide is currently at its maximum point of development) do not submerge, but rather they have an evolutionary period lasting tens of millions of years, over which time the OIB magmatic series is able to culminate.

Evidently, within the ocean island volcano group El Teide is an extraordinarily valuable example because it offers the greatest collection of volcanic products, structures and forms belonging to the intermediate and evolved magmas of this magmatic series on the planet, elements that are absent from or only minimally represented in the Hawaiian Islands and the majority of volcanic ocean islands on Earth.

It is also important to note the great number of visitors to Teide National Park and the enormous amount of advanced scientific research that is carried out there, making it a decisive site for understanding, developing and disseminating modern volcanology.

Teide National Park offers an astonishing geological collection within a relatively small territory, in which various extraordinary structures stand out. Today the Las Cañadas Volcano (possibly unique among ocean islands for its geological history which includes highly explosive Plinian eruptions) appears decapitated by a giant gravitational landslide which created a huge depression (the Las Cañadas Caldera and the Icod-La Guancha Valley which stretches down to the ocean) around 200,000 years ago. The internal structure of this volcanic edifice can be seen in vivid detail on the scarp of the caldera, which reaches up to 600 m. The depression was later filled by the continued volcanic activity of the two active rifts (the northeast and northwest dorsals), eventually creating the 3,718 m high Teide stratovolcano, the third highest volcanic structure on Earth after Mauna Loa and Mauna Kea.

## Landscape

Teide National Park has an original and exclusive landscape that can be classified as a sub-tropical high-mountain volcanic landscape. Its originality stems from the remarkable concentration and particular spatial organisation of its extremely diverse volcanic formations of different ages that correspond to different dynamics and that provide irregular ecological habitats to the species that make up the mountain scrub. The majority of these formations still maintain their original freshness and in general it is far easier to read landscapes of different ages in this space than in any other high mountain: successive landscapes that are juxtaposed and that overlap, from totally demolished edifices to eruptions that took place during the historical era, revealing a changeable landscape functioning on different interrelated levels, all of which creates an authentic palimpsest.

## Ecology

From an ecological point of view, the biodiversity of Teide National Park is exceptional, as evidenced by the large concentration of endemic flora and fauna that it contains in such a small area. This concentration of endemic species is caused by a unique situation where two insular phenomena converge, first of all the insularity of an ocean island like Tenerife and secondly, the ecological island created by its great altitude.

The great altitude of the El Teide peak allows the national park to contain two of the six ecosystem zones known to exist in the Canary Islands: the Canarian summit scrub and the Peak ecosystem. Although it has totally different species, from a biogeographical perspective Tenerife high-mountain scrub is similar to the mountain scrub found in mountain ranges of alpine orogeny that have similar altitudes in the southern part of the Iberian Peninsula and Northern Africa. As occurs in these mountain ranges, TNP is dominated by nitrogen-fixing Leguminosae that is semi-spherical and pillowy.

Another important aspect that should be noted is the presence of non-synchronised primary ecological succession that depends on the age of the lava flows that have been emitted and that takes place very slowly due to the adverse temperatures and lack of precipitation.

## Flora

The vascular flora of Teide National Park is made up of 220 taxons, 73 of which are endemic to the Canarian Archipelago and 33 of which are endemic to Tenerife. This means that around 50% of the taxons are endemic. It is also worth noting that 16 taxons are exclusive to the park itself. The most characteristic endemic elements are *retama del Teide* (*Spartocytisus supranubius*), *codeso* (*Adenocarpus viscosus*), *hierba pajonera (Descurainia bourgeauana), violeta del Teide (Viola cheiranthifolia)* and *rosalillo de cumbre (Pterocephalus lasiospermus).*

Non-vascular flora is present in a wide variety of environments. Bryophytes and hepatic species tend to remain very local, generally associated with humid environments such as wellsprings, fumaroles, etc. To date 74 moss species and 8 hepatic species have been registered. Almost 100 species of lichens have also been registered and they are much more abundant in the park than the other non-vascular species, in some areas they are the only plants covering the park's recent lava flows.

**Fauna**

The native vertebrate fauna includes 24 species: 3 reptiles, 16 birds and 5 bats. All of the reptiles, one bird and one bat are endemic to the Canary Islands, although none of them are exclusive to the park. There are also five introduced mammals: the rabbit, house mouse, black rat, Algerian hedgehog and mouflon and at least the rabbit can be considered an invasive species.

The invertebrate fauna includes 1,037 different species (6 snails, 34 spiders and relatives, 6 crustaceans, 10 millipedes and centipedes, and 981 insects). Of these, 451 of them (49%) are endemic to the Canary Islands, 106 are endemic to Tenerife and 71 are exclusive to the national park. Few invertebrate species are introduced, and none can be considered invasive. Honeybee hives are artificially installed every spring and summer, but the honeybee is most likely not a permanent natural inhabitant of the Park.

There are lava tube caves with a cave-dwelling fauna that includes 25 adapted species (troglobites) endemic to Tenerife, 4 of them are species exclusive to a single cave in the park (Cueva de los Roques). This cave has the highest density of troglobites and the highest ratio of troglobitic vs. non-troglobitic species in the Canary Islands

**Archaeology**

1. The geology and landscape of the territory contained within Teide National Park has been important factor throughout the entire history of this region.
2. This region has been witness to a long historical evolution spanning more than 2000 years, during which time two significant cultural traditions converged (African proto-historical and European) creating social structures that are unique in the way that they adapted to and exploited volcanic resources.
3. El Teide has been a historical reference point for:
    - Antiquity, in terms of ocean navigation
    - Religion, for the Guanches and other indigenous peoples in the archipelago
    - Transatlantic navigation, particularly as it relates to the conquest and colonisation of America
    - Scientific research
    - Its landscape in present times
4. The human occupation has left two large groups of archaeological remains:
    - The first group is related to the prehistoric Guanche occupation (first millennium BC to the 15$^{th}$ Century) and includes living structures, burial compounds, obsidian quarries and workshops, *escondrijos* (hiding places used to store tools and personal belongings) and ceramic and lithic utensils.

- The second group is related to the traditional utilisations of the region that were incorporated after the Spanish conquest of the island (1496) and lasted until the creation of the national park (1954), including structures, material derived from pasturing, coal making, the commercial exploitation of snow, mule routes, etc.

5. The park contains archaeological sites that are especially important due to their number, conservation and significance for the Cultural and Historical Heritage of the Canarian Archipelago.
6. The national park has properly managed these cultural and archaeological resources and the creation of the Archaeological Catalogue (1500 sites inventoried) is an effective tool for the understanding, management and dissemination of the archaeological heritage of the park, a heritage which is perfectly integrated in its natural environment.

**History of Science**

El Teide is set apart from other volcanic areas by its history, especially its role in the history of knowledge. It was used as the zero point for the coordinates of Greco-Roman cartography, while at the same time the archipelago was identified as the Garden of the Hesperides, converting El Teide into Mt. Atlas.

It was thought to be the tallest mountain in the world during the Renaissance and its study is tied to the birth of modern science. The Royal Society of London, the first scientific society, included it in its first publications and also used it to test Torricelli's invention, the barometer.

The calculation of the height and position of El Teide was a constant concern throughout the 18$^{th}$ Century and all of the important scientific expeditions passed through Tenerife so that their researchers could see the mythical El Teide and the spectacular volcanic formations of Las Cañadas covered with rare endemic plant species. This is the reason why Alexander Von Humboldt coined the expression "layers of vegetation" in Tenerife, to describe the succession of different plant landscapes created by the climatic changes as the altitude increased.

Modern volcanology began with Leopold Von Buch's study in the Canaries where he established his theory of elevation craters and it continued with the work of Lyell or other great geologists of the 19$^{th}$ Century. The existence of large gravitational landslides has been one of the most important contributions to modern volcanology, providing a coherent explanation for the existence of enormous calderas like that of Las Cañadas. The debate over its origin has been pioneering in the creation of this theory.

The exceptional clarity of the atmosphere has been an advantage that has marked the history of El Teide and ever since the stay of the astronomer Piazzi Smith, it has been an important astronomical observation centre. Atmospheric and heliotherapeutic studies carried out on El Teide have scientifically described the structure of the Trade Winds, as well as the effect that ultraviolet radiation has on human beings.

## Sky

Teide National Park is an extraordinary site that allows researchers to gain an active understanding of one of the greatest threats currently facing humanity, climate change; a threat with grave social and economic repercussions. The park is a unique natural laboratory which allows us to monitor changes in the chemical composition of the atmosphere and atmospheric processes, the first step in the detection and study of climate change. The effect of climate change on ecosystems (global change) is also studied by monitoring the modifications in plant populations in the national park. In addition, the Canaries Astrophysics Institute (IAC) carries out studies in astronomy and astrophysics in the park, as well as monitors volcanic activity in the El Teide volcanic system.

Scientists must have access to a high-quality environment in order to carry out this long list of important research, as well as an absolute guarantee that the environment does not change over the next few decades. Therefore, in order to ensure their own survival, the same research activities that make Teide National Park one of the most privileged and unique natural laboratories in the world demand that the environmental management of the park is held to a high standard, which is a decisive factor in the proper management of the park as a World Heritage site. For instance, this is why the National Meteorological Institute, through the Izaña Atmospheric Observatory, has made a commitment to serve as an advisor and at times co-manager along with TNP of a possible air quality monitoring network that will allow us to monitor and detect anthropic pollution processes; such a network would be an important factor in guaranteeing the proper management of the national park.

## Visiting and Public Use

The national park receives around three million visitors a year, making it the most visited geotourism destination among all the volcanic sites in the world. At the same time, the data that has been collected indicates that visits to the park are highly rated in terms of visitor satisfaction.

This fact, which is closely tied to its geographic location which allows it to be accessed easily, quickly and comfortably, creates a magnificent opportunity to publicise the importance and exclusivity of the proposed property, as well as to educate people on what World Heritage means.

Along these lines, the legislation that governs Teide National Park guarantees that the public can enjoy the natural values of the park in a way that is always compatible with the conservation of those values.

Based on this premise, the park organises visits and public use through different programmes and policies related to the promotion of TNP to two basic types of park visits: a Regulated Education Programme, directed at the scholastic community of Tenerife, and a Public Use Programme, which has a complete network of facilities, activities, material and equipment at its disposal.

Finally, it should be pointed out that a document has been prepared entitled “Teide for Didactics” which defines the general lines of action taken by the park in educational material and also the special attention paid to disabled visitors based on the “management criteria” specified in the Management Plan, including specific actions that have been agreed upon with the advice of the most important disabled persons associations; these actions include:

- The adaptation of facilities and equipment to special needs
- Specific activities designed specifically for these groups
- The availability of specialised personnel

MEETING WITH THE EXPERTS IN GEOLOGY AND LANDSCAPE. REPRESENTATIVES OF THE MINISTRY OF CULTURE AND THE DIRECTION OF TEIDE NATIONAL PARK

2 October, 2006

- Juan Carlos Carracedo Gómez, Instituto de Productos Naturales y Agrobiología del Consejo Superior de Investigaciones Científicas (CSIC, Tenerife).
- María Eugenia Arozena, Facultad de Geografía e Historia, Departamento de Geografía de la Universidad de La Laguna.
- Manuel Durbán Villalonga, Director Conservador del Parque Nacional del Teide
- Angel Bañares Baudet, Jefe de Conservación del Parque Nacional del Teide.
- Esther Rodríguez, Consejera Técnica de la Subdirección General de Protección del Patrimonio Histórico del Ministerio de Cultura
- Pilar Sánchez, Técnica de la Subdirección General de Protección del Patrimonio Histórico del Ministerio de Cultura.

MEETING WITH THE MIXED MANAGEMENT COMMISSION OF CANARIAN NATIONAL PARKS

2 October, 2006

- Miguel Castroviejo Bolíbar, representante de la Administración General del Estado. Representación Permanente de España ante la UE.
- Pedro Sosa Martín, representante de la Comunidad Autónoma de Canarias. Consejería de Política Territorial y Medio Ambiente del Gobierno de Canarias.
- José Miguel González Hernández, representante de la Comunidad Autónoma de Canarias. Parlamento de Canarias
- Isidoro Sánchez García, representante de la Comunidad Autónoma de Canarias.
- Milagros Luis Brito, representante de la Comunidad Autónoma de Canarias. Viceconsejería de Medio Ambiente del Gobierno de Canarias.

MEETING WITH THE PRESIDENT OF THE CABILIDO DE TENERIFE

2 October, 2006

- Sr. Presidente del Excmo. Cabildo Insular de Tenerife, D. Ricardo Melchior Navarro.

MEETING WITH THE PATRONAGE OF TEIDE NATIONAL PARK
2 October, 2006-10-14

The Patronage of Teide National Park is a joint body that in administrative terms depends on the Spanish Ministry of the Environment. This organisation allows the

different stakeholders of the park to ensure that the regulations that govern TNP are being complied with.

The Patronage has representatives from the public administrations and the institutions, associations and organisations that have some relation with Teide National Park or whose objectives are in accordance with the principles put forth by Law 4/1989, 27 March, on the conservation of natural spaces and wild flora and fauna.

The Patronage of TNP has representatives of the State Administration, the Autonomous Administration and the Local (insular and municipal) Administrations, the Public University, CISC, Conservation Associations, the Tourism Professionals Associations of Tenerife, the Canarian Federation of Mountain Climbing, the Direction of Teide National Park, the personnel from the TNP plant nursery and security and the Civil Guard's Nature Protection Service.

MEETING WITH MEMBERS OF THE TOURISM INDUSTRY
2 October, 2006

- Juan Vicente Ledesma de Taoro, Presidente de la Asociación Profesional de Guías de Turismo (APIT)
- Ricardo Fernandez , Representante de la Asociación Hotelera y Extrahotelera de la Provincia de Santa Cruz de Tenerife (ASHOTEL).
- Alejandro Hidalgo, Director de Medio Ambiente y Desarrollo sostenible del Consorcio TUI España.
- Alberto Bernabé Teja, Gerente de la Sociedad de Promoción Exterior de Tenerife (SPET)
- Pedro Cruz Díaz, Director del Parador de Turismo de Las Cañadas del Teide.

MEETING WITH THE MAYORS OF THE MUNICIPALITIES THAT MAKE UP THE TERRITORY OF TEIDE NATIONAL PARK AND NEIGHBORHOOD GROUPS

4 October, 2006
Representatives from the municipal governments of La Orotava, Vilaflor, Icod de los Vinos and Granadilla participated in the discussion, as well as representatives from various neighbourhood groups.

MEETING WITH REPRESENTATIVES FROM SCIENTIFIC INSTITUTIONS
October 4, 2006

- Casiana Muñoz-Tuñón. Técnico del Instituto de Astrofísica de Canaria. (IAC).
- Emilio Cuevas
- Manuel Nogales CSIC

MEETING WITH ENVIRONMENTALIST GROUPS
5 October, 2006

- Zeidy González Marante, Presidenta de la Asociación Tinerfeña de Amigos de la Naturaleza. (ATAN)
- Eustaquio Villalba Moreno, Miembro de ATAN.
- Cristina González, Delegada Territorial de Canarias de la Sociedad Española de Ornitología (SEO/Birdlife)
- José Trujillo, Delegado en Canarias de WWF/Adena.

MEETING WITH THE CANARIAN SCHOLASTIC COUNCIL AND THE PROFESSIONAL ASSOCIATIONS

5 October, 2006

- Humberto Gutiérrez, Representante en Canarias del Colegio Oficial de Ingenieros de Montes.
- José Luis Audicana, Representante en Canarias del Colegio Oficial de Ingenieros Técnico Forestales.
- Fermín Garcia Melo, Representante del Colegio Oficial de Arquitectos
- Carlos Silva Heuschkel, Representante del Colegio de Biólogos.
- Miguel Jaoberg Gómez, Decano del Colegio Oficial de Químicos
- Puri Toste, Presidenta de la Federación de Padres y Madres de Alumnos de Tenerife y Escuela Canaria.
- Ana María Palazón, Representante de la Comisión del Consejo Escolar de Canarias.

MEETING WITH THE EXPERTS THAT WORKED ON THE WORLD HERITAGE APPLICATION
5 October, 2006

- José María Fernández Palacios, Facultad de Biología. Departamento de Ecología de la Universidad de La Laguna.
- Matilde Arnay de la Rosa, Facultad de Geografía e Historia. Departamento de Prehistoria, Antropología e Historia Antigua de la Universidad de La Laguna.
- Pedro Oromí Masoliver, Facultad de Biología, Departamento de Biología Animal de la Universidad de La Laguna.
- María Eugenia Arozena, Facultad de Geografía e Historia, Departamento de Geografía de la Universidad de La Laguna.
- Juan Carlos Cariacedo Gómez, Instituto de Productos Naturales. Consejo Superior de Investigaciones Científicas (CSIC, Tenerife)
- Angel Bañares Baudet, Jefe de Conservación del Parque Nacional del Teide.

MEETING WITH PERSONNEL FROM TEIDE NATIONAL PARK AND EXPERTS
5 October, 2006

- Manuel Durbán Villalonga, Director-Conservador del Parque Nacional del Teide
- José Luis de la Rosa García, Director Adjunto del Parque Nacional del Teide.
- Angel Bañares Baudet, Jefe de Conservación del Parque Nacional del Teide

- Lucía Casado Saenz, Técnico del Parque Nacional del Teide.
- Juan Carlos Hernández Alvarez, Servicio de Uso Público
- Guillermo Ayala, guía intérprete
- Pedro Sánchez, guía intérprete
- Julia Reverón Gómez, Asistencia Técnica Planificación
- Anabel Piñero, Asistencia Técnica EMAS

EUROPE / NORTH AMERICA

# TEIDE NATIONAL PARK

SPAIN



# WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

# TEIDE NATIONAL PARK (SPAIN) – ID No. 1258

## 1. DOCUMENTATION

i) **Date nomination received by IUCN:** April 2006

ii) **Additional information officially requested from and provided by the State Party:** IUCN requested supplementary information on 19 September 2006 before the IUCN Evaluation Mission. The State Party response was submitted on 21 November 2006, including responses to all the issues raised by IUCN.

iii) **UNEP-WCMC Data Sheet:** 1 reference (nomination)

iv) **Additional literature consulted:** Arana, V. and Carracedo, J.C. (1978). **Los Volcanes de las Islas Canarias.** Editorial Rueda, Madrid. Carracedo, J.C. et al. (2002). **Cenozoic volcanism II: the Canary Islands.** In: W. Gibbons and T. Moreno (eds.). The Geology of Spain. Geological Society Special Publication, London: 439-472. Day, S. and Carracedo, J.C. (2002). **Canary Islands (Classic Geology in Europe 4).** Terra, Harpenden. Decker, R. and Decker, B.C. (1997). **Volcanoes.** W.H. Freeman, New York. Editors of Chambers (2005). **Chambers Book of Facts.** Chambers Harrup. Gill, R. and Thirlwall, M. (2003). **Tenerife (Geologists' Association Guide 49).** Geological Society, London. IUCN (2005). **Geological World Heritage: A Global Framework.** IUCN. Ollier, C. (1988). **Volcanoes.** Blackwell, Oxford. Smithsonian National Museum of Natural History (2007). **Global Volcanism Program.** Accessed online: www.volcano.si.edu/index.cfm.

v) **Consultations:** 14 external reviewers. Extensive consultations were undertaken during the field visit with: representatives of the Ministry of Culture and Directorate of Teide National Park, Joint Management Commission of the Canaries National Parks (Ministry of Environment and Canaries Government), Teide National Park Patronato, and Mayors and Residents' Associations of the areas covered by the park; tourism stakeholders including SPET Assoc. Guías de Turismo, TUI and ASHOTEL; geology and landscape experts; representatives of scientific institutions such as Universidad de La Laguna, Consejo Superior de Investigaciones Científicas, Instituto de Astrofísica de Canarias, and Observatorio Atmosférico de Izaña; representatives of NGOs including Amigos de la Tierra, Amigos de la UNESCO, ATAN, CICOP, Greenpeace, Seo Birdlife and WWF; and the School Council of Canaries.

vi) **Field visit:** Bernard Smith, September – October 2006

vii) **Date of IUCN approval of this report:** April 2007

## 2. SUMMARY OF NATURAL VALUES

The nominated property comprises Teide National Park (TNP), which is situated on the island of Tenerife in the Autonomous Community of the Canary Islands, Spain. It covers 18,990 ha and spans an altitudinal range from 1,650 to 3,718 m above sea level. A buffer zone (Corona Forestal Natural Park) of 54,128 ha surrounds the nominated property.

The dominant feature of TNP is the Teide-Pico Viejo stratovolcano that, at 3,718 m, is the highest peak in Spain. The volcano stands at some 7,500 m above the ocean floor and is thus regarded as the world's third tallest volcanic structure. Seen from the sea, Teide has been renown throughout the centuries as a navigational marker for its distinctive silhouette that seems to float above the 'Alizé' clouds.

Tenerife is composed of a complex of overlapping Miocene-Quaternary stratovolcanoes that have remained active into historical times. Examples of relatively recent volcanism include the Fasnia Volcano (1705) and the eruption of the parasitic 'Narices del Teide' (Teide's Nostrils, 1798). The older and more complex crater of Pico Viejo dates from the Pleistocene. The stratovolcano is located in the centre of a large depression known as Las Cañadas Caldera, which is delimited to the east, south and part of the west by abrupt escarpments of up to 650 m that display the geological history of the area along their 25 km length.

In the east the Las Cañadas escarpment comprises alternating layers of lava and explosion debris, followed by an arc of pumice deposits and, finally, outflow deposits. The landscape continues to develop through active erosion and deposition as exemplified by features such as the Corbata del Teide torrent and the talus slopes of the Las Cañadas wall. To the north and north-west of the

stratovolcano the wall of the caldera is absent apart from a limited escarpment at La Forteleza. This is considered by many to reflect the lateral collapse of a proto-volcano via massive and complex avalanche-like collapses in the direction of Icod and Oratava.

Between the base of the stratovolcano and the foot of the wall is an extensive field of lavas (including obsidian – volcanic glass) and recent pyroclastic material. This area also contains numerous medium and small forms including ridges, cones, craters, volcano fields, domes, fissures, blocks, needles, tubes, channels, badlands and lahars. The geology of TNP represents the entire range of the magmatic series, with a large amount and variety of fully differentiated acid (felsic / phonolitic) volcanic materials as well as basic (basaltic) materials.

The nominated property thus presents a complex assemblage of geological features and is noted for the variety of structures present and the processes they represent within a limited and accessible space. As such it is an important scientific resource that has provided and continues to provide excellent opportunities for researchers to study and understand the evolution of volcanic terrains in detail and earth history in general.

The physical isolation of an oceanic island and the high mountain environment combine to produce a complex biological environment with a high degree of adaptive radiation and endemism. High altitude means that Tenerife is one of the few volcanic islands to have a zonal ecosystem above the tree-line. These are the unique summit *retamar* (white broom scrub) and peak ecosystems. Together with the lower slopes of the mountain these provide, as in Hawaii, an archetypal ecological succession that was first recognized by Alexander von Humboldt and was instrumental in his development of the concept of 'geobiology'. The vascular flora of TNP comprises 220 taxa, of which 73 are endemic to the Canaries and 33 to Tenerife, including 16 taxa that are exclusive to TNP. The most characteristic endemics are the Codeso, Rosalillo de Cumber, Teide Flixweed, Teide Violet and Teide White Broom. TNP also contains three endemic species of reptiles: a lizard (*Gallotia galloti galloti*), a salamander (*Tarentola delalandii*) and a skink (*Chalcides viridanus viridanus*), and twenty bird and five bat species. TNP also displays high levels of endemism within invertebrate populations with 70 species that are exclusive to TNP.

## 3. COMPARISONS WITH OTHER AREAS

The Global Volcanism Program at the Smithsonian Institution notes the existence of some 1,546 volcanoes active since the start of the Holocene. Depending on counting method there are currently at least 454 and possibly 1,343 active volcanoes on earth with the majority found within the 'Pacific Rim of Fire'.

The geological processes that shaped (and continue to shape) TNP are the result of a combination of factors associated with intra-plate ocean island volcanism and the prolonged volcanic history of the island. Because of these conditions, the Canary Islands have a high diversity and variety of volcanic products, features, structures and eruptive processes. Geological expert reviewers have emphasised the long history of evolution of TNP, the concentration of volcanic deposits and morphological features and structures, the unusual example of caldera formation processes involving massive landslides, and the unusual and diverse geochemical and magmatic evolution in an ocean-island setting as amongst the features of the nominated property that are both significant and distinctive in relation to other comparable sites. Although other islands in the Canary Islands archipelago contain significant features which rival those of TNP in value, it is in Tenerife, currently at the peak of its geological development, that these features are best represented. One other natural World Heritage property is inscribed in the Canary Islands: Garajonay National Park on La Gomera. The property is distinctly different to TNP and is listed on the basis of its unique Laurel forest community.

Volcanic systems are already well represented on the World Heritage List. Around 13 properties have been inscribed primarily for their volcanic values, making volcanic systems the best represented of the themes identified in IUCN's global theme study on Geological World Heritage, completed in 2005. The range of properties is diverse including Virunga National Park (Democratic Republic of the Congo), Sangay National Park (Ecuador), Tongariro National Park (New Zealand), Giant's Causeway and Causeway Coast (UK) and Yellowstone National Park (USA). It should also be noted that some volcanic properties have been inscribed solely for their aesthetic values (criterion vii) rather than geological values – most notably Kilimanjaro National Park (United Republic of Tanzania). There are a number of volcanic properties on the World Heritage List which are of greater scale compared to TNP, most notably the Volcanoes of Kamchatka property (Russian Federation) which far exceeds all other volcanic properties in the number and diversity of volcanoes included, but it, and a number of the other World Heritage properties, are located in an entirely different tectonic and landscape setting.

Direct comparisons may be made with the eight existing World Heritage properties that include volcanic features on island systems. These include the Hawaii Islands, Galapagos Islands, Aeolian Islands, Gough and Inaccessible Islands, Heard and McDonald Islands, Morne Trois Pitons and Pitons. Some of these contain stratovolcanoes, but none of these rivals the Mt Teide stratovolcano in its combination of size, complexity, age, depth of study and ongoing relevance to science. There are other intra-plate oceanic stratovolcanoes (e.g., Pico do Pico, Azores; Fogo, Cape Verde Islands) not included on the World Heritage List, but few are located on slow-moving or stationary lithosphere and TNP exceeds them in scale. The closest direct comparison in terms of intra-plate oceanic volcanoes is that between TNP and the Hawaii Volcanoes National Park. The latter contains shield volcanoes which exhibit volcanic eruptions involving the least evolved magmas of the intra-plate oceanic island magmatic series. On purely geological grounds, a strong case is made that, whilst both represent intra-plate volcanic complexes, Hawaii and Teide define the two ends of a spectrum in terms of development. From the relatively young, fast-moving, geologically simple islands of Hawaii, to the older, slower-moving, geologically complex and mature stratovolcano of Mt Teide.

The nominated property compares favourably to other World Heritage properties in relation to the scale and diversity of its geological and geomorphological features and its additional distinctive landscape values. Teide remains a scenically striking and remarkable landscape in some respects attributable to its barren slopes and spectacular volcanic features. Most striking of these is the Las Cañadas Caldera itself, but features such as the isolated pillar of Roque Cinchado when viewed against the profile of Mt Teide are equally iconic for most Spaniards, and many visitors. The park's high levels of visitation also provide supporting evidence of the draw of this visually spectacular landscape. In addition, local atmospheric conditions frequently create a unique visual dynamic, the 'sea of clouds' phenomenon that forms below the caldera. This creates a visual backdrop to the mountain, and also acts as a 'gateway' through which visitors must pass to arrive at the park, a natural phenomenon of exceptional beauty. The case for inscription is further supported by the long history of scientific investigation at the site and especially its importance in the development of modern geology and volcanology. TNP has attracted the interest of naturalists and geoscientists from all over the world, including pioneer work at the beginning of the 19th century by researchers such as Alexander von Humboldt, Leopold von Buch and Charles Lyell, who established basic concepts of geology and volcanology while studying this island.

In summary, although there are sites with comparable features, the diversity of volcanic features found in the nominated property and their impressive scale certainly place it in the category of other volcanic World Heritage properties. IUCN notes, however, the increasingly limited potential for further inscriptions of volcanic sites on the World Heritage List and has made recommendations on this issue in its evaluation of Jeju Volcanic Island and Lava Tubes (Republic of Korea) which is also currently under consideration by the World Heritage Committee.

## 4. INTEGRITY

### 4.1 Legal status

The nominated property is the area contained within TNP. As such it will be afforded the same legal status and protection that currently applies to the park. The primary national legislation governing TNP is Law 5/1981 which assigns TNP a special legal regime designed to protect it and limit the rights to use its natural resources. It also delimits a protective buffer zone.

In addition, Decree 153/2002 contains the legal basis for the protection of the natural resources of the park, establishing general management criteria and zoning of the park into Reserved, Restricted Use, Moderate Use and Special Use Zones to govern use. As well as the above general legislation, a range of supporting environmental legislation provides protection to the park and its resources.

Proposals are in development to transfer management responsibility of TNP to the Autonomous Community of the Canary Islands, through the Joint Management Commission of the Canaries National Parks. Measures are in place to ensure coordination and integration between the different levels of government.

The day-to-day management of the park is the responsibility of the National Park Technical Team who report to the Joint Management Commission. Participatory mechanisms such as the 'Patronage Committee' ('Patronato') ensure wide consultation with stakeholders.

The national and regional legislative framework currently in place to protect the integrity of TNP appears to be adequate and it is effectively administered through the various tiers of park management.

### 4.2 Boundaries

The boundary of the nominated property coincides with the existing boundary of TNP which generally follows the upper limit of the tree-line and is thus also defined by an appropriate ecological boundary.

Completely surrounding TNP is the buffer zone defined by the Corona Forestal Natural Park. Construction in the buffer zone is effectively prohibited and measures are in place to support natural resource protection and control introduced species.

### 4.3 Management

The management of TNP is carried out in accordance with a 'Management and Usage Administration Plan' which runs for six years and is due for renewal in 2008. The management plan specifies objectives and measures to protect the park's values and natural resources, raise public awareness through education, and control use and development.

TNP is adequately staffed and resourced with 23 staff directly employed and a further 114 working in the park for other agencies. At present, core funding for the park comes from the State via the budget of the Ministry of the Environment. This is then allocated to the Autonomous Organisation of National Parks that assigns and distributes funds to TNP. The park also receives budget contributions from the Star Programmes of the Autonomous Organisation of National Parks that finance specific park projects. Annual budgets range from 3.7 to 4.8 million euros and are considered adequate.

Impressive scientific research and monitoring programmes are in place on a range of issues such as visitor carrying capacity. In 1989, TNP was awarded the European Diploma for Protected Areas by the Council of Europe. This award is reviewed every 5 years and the park authorities have to submit an annual report. This award signifies a high standard of management.

### 4.4 Threats and human use

High mountain environments are particularly sensitive indicators of climate change. For this reason, TNP, together with other Spanish national parks, are to be included in a global change monitoring network. The Picos del Europa, Sierra Nevada and TNP have also been selected as sites to monitor wider ecological change. Through the Izaña Atmospheric Observatory, the high-altitude area above the temperature inversion is one of

five similar international sites monitoring global atmospheric change and is also part of the international Network for the Detection of Stratospheric Change. In this context, TNP is seen as a valuable early-warning system for environmental change based on long and detailed records of environmental conditions.

Biological threats are monitored through regular 'phytosanitary inspections' that survey indicator species for foliage loss, discolouration and evidence of damage from biological agents. There is some localised evidence of damage by beetles, but generally damage is slight.

Natural disasters including fire and seismic / volcanic activity are covered by contingency planning required by national legislation. This includes coordination of emergency plans with other administrative agencies and the presence in the park of emergency stations at El Portillo and the Cable Car Station, including a fire station. The scrub vegetation of the park is less susceptible to fire than the forest of the buffer zone. Fire prevention and control in this zone is the responsibility of the Insular Government of Tenerife (the Cabildo).

Visitor pressure is generally recognized as a significant potential threat to TNP. With more than 3.5 million visitors per annum, it is inevitable that key sites come under considerable strain at different times of the day and year. Site management based on usage zones is seen as the most appropriate type of management tool for dealing with the large numbers of visitors to TNP. Effective visitor education and use programmes assist in limiting visitor impact in sensitive areas.

Overall visitation to Tenerife is controlled through the imposition of strict numbers of bed spaces on the island. The emphasis within the next management plan will therefore be on the development of an integrated access strategy including the possible establishment of a series of 'service centres' on access routes just beyond the park boundary. These could contain a range of visitor facilities and it is envisaged by the park authorities that they should provide the opportunity for visitors to park their car and use a shuttle bus service to tour the park.

Devolution of management responsibility and the transfer of responsibility for TNP from national to regional government is possibly the greatest area of uncertainty regarding the future management of the park. Concerns relate to the potential erosion of long-term conservation goals and strategies in the face of development and economic pressures. It is important that participatory processes are maintained so that transparent decisions are made which are consistent with management objectives for the protection of the park's values and natural resources.

In summary, the national park status of the nominated property has ensured that sufficient management capacity is in place, as well as experience in managing the site effectively and in close collaboration with the local population. Its status has also resulted in effectively enforced legislative controls and a management strategy that is supported by central government funding.

Overall, IUCN considers that the nominated property meets the conditions of integrity as required under the Operational Guidelines.

## 5. ADDITIONAL COMMENTS

Although the property has not been nominated under criteria (ix) and (x), special mention should be made of the important role played by the biodiversity of TNP. Tenerife is one of the few islands in the world that can support zonal ecosystems above the tree-line, giving rise to two unique ecosystems and one of the best natural environments in the world for primary ecological successions linked to the variety of volcanic deposits and the adversity of the climate. There is an impressive faunal and floral biodiversity with close to 50 species of vascular plants that are exclusive to TNP.

## 6. APPLICATION OF CRITERIA / STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The property has been nominated under criteria (vii) and (viii). IUCN considers that the nominated property meets these criteria and proposes the following Statement of Outstanding Universal Value:

Teide National Park, dominated by the 3,781 m Teide-Pico Viejo stratovolcano, represents a rich and diverse assemblage of volcanic features and landscapes concentrated in a spectacular setting.

**Criterion (vii): Superlative natural phenomena or natural beauty and aesthetic importance**

Mount Teide is a striking volcanic landscape dominated by the jagged Las Cañadas escarpment and a central volcano that makes Tenerife the third tallest volcanic structure in the world. Within this landscape is a superlative suite of landforms that reveal different phases of construction and remodeling of the volcanic complex and highlight its unique geodiversity. The visual impact is emphasized by atmospheric conditions that create constantly changing textures and tones in the landscape and a 'sea of clouds' that forms a visually impressive backdrop to the mountain.

**Criterion (viii): Earth's history, geological and geomorphic features and processes**

Teide National Park is an exceptional example of a relatively old, slow moving, geologically complex and mature volcanic system. It is of global importance in providing diverse evidence of the geological processes that underpin the evolution of oceanic islands, and these values complement those of existing volcanic properties on the World Heritage List, such as the Hawaii Volcanoes National Park. It offers a diverse and accessible assemblage of volcanic features and landscapes in a relatively limited area. The area is a major centre for international research with a long history of influence on geology and geomorphology especially through the work of von Humboldt, von Buch and Lyell which has made Mount Teide a significant site in the history of volcanology.

**Conditions of Integrity, Protection and Management**

The property is well managed and resourced, with a six-year management plan in place which is due for renewal in 2008. The property is afforded the same legal protection as other national parks in Spain and is surrounded by a buffer zone. Key management issues include the management of tourism, the potential impact of climate change, and effective coordination of management responsibility between national and regional levels of government.

## 7. RECOMMENDATIONS

IUCN recommends that the World Heritage Committee **inscribes** the Teide National Park, Spain, on the World Heritage List on the basis of criteria (vii) and (viii).

IUCN recommends that the World Heritage Committee commends the State Party for its continued efforts to conserve this protected area and for establishing impressive educational and awareness raising programmes in the park.

IUCN also recommends that the State Party be requested, as part of the process to review and update the management plan for Teide National Park, to:

a) Strengthen harmonization between strategic tourism planning and development in the Canary Islands and the use of Teide National Park to ensure that use does not adversely impact the outstanding universal value of the property;

b) Strengthen mechanisms to monitor visitor use and develop management approaches that balance the protection of park values with enhanced visitor experience;

c) Encourage improved research and monitoring of the potential impact of global climate change and the need for adaptive management strategies;

d) Strengthen coordination and cooperation between the Spanish State and Autonomous Community of the Canary Islands to share responsibility and to guarantee central funding; and

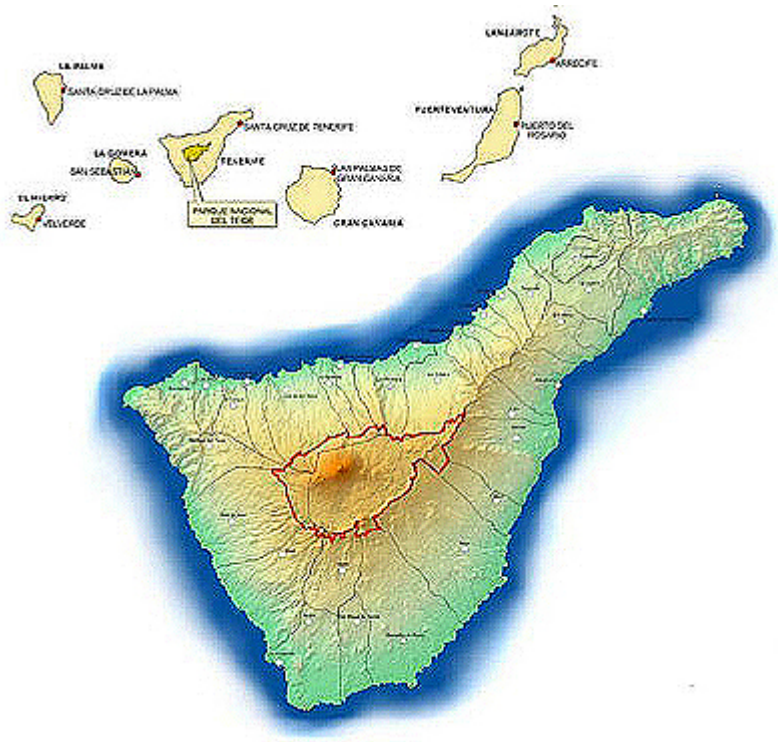
e) Encourage exchange of management experience and joint promotion between the Teide National Park and other World Heritage properties in the Canary Islands (Garajonay National Park and San Cristóbal de La Laguna).

Finally, and in the interests of maintaining the credibility of the World Heritage List, IUCN recommends that the World Heritage Committee notes that volcanic systems are relatively well represented on the World Heritage List and that there is increasingly limited potential for further inscriptions of volcanic sites on the World Heritage List. The Committee may therefore recommend States Parties considering further nominations of volcanic sites to consider the principles suggested in section 5.2 of the IUCN evaluation of Jeju Volcanic Island and Lava Tubes.

**Map 1: Location of nominated property**




**Map 2: Boundaries of nominated property**



EUROPE / AMÉRIQUE DU NORD

# PARC NATIONAL DU TEIDE

ESPAGNE



# CANDIDATURE AU PATRIMOINE MONDIAL – ÉVALUATION TECHNIQUE DE L'UICN

# PARC NATIONAL DU TEIDE (ESPAGNE) – ID No. 1258

## 1. DOCUMENTATION

i) **Date de réception de la proposition par l'UICN :** avril 2006

ii) **Informations complémentaires officiellement demandées puis fournies par l'Etat partie:** l'UICN a demandé des informations complémentaires le 19 septembre 2006, avant d'entamer sa mission d'évaluation. La réponse de l'État partie a été soumise le 21 novembre 2006, et comprenait des réponses à tous les points soulevés par l'UICN.

iii) **Fiches techniques PNUE-WCMC :** 1 référence (proposition)

iv) **Littérature consultée :** Arana, V. and Carracedo, J.C. (1978). **Los Volcanes de las Islas Canarias.** Editorial Rueda, Madrid. Carracedo, J.C. et al. (2002). **Cenozoic volcanism II: the Canary Islands.** In: W. Gibbons and T. Moreno (eds.). The Geology of Spain. Geological Society Special Publication, London: 439-472. Day, S. and Carracedo, J.C. (2002). **Canary Islands (Classic Geology in Europe 4).** Terra, Harpenden. Decker, R. and Decker, B.C. (1997). **Volcanoes.** W.H. Freeman, New York. Editors of Chambers (2005). **Chambers Book of Facts.** Chambers Harrup. Gill, R. and Thirlwall, M. (2003). **Tenerife (Geologists' Association Guide 49).** Geological Society, London. IUCN (2005). **Geological World Heritage: A Global Framework.** IUCN. Ollier, C. (1988). **Volcanoes.** Blackwell, Oxford. Smithsonian National Museum of Natural History (2007). **Global Volcanism Program.** Accessed online: www.volcano.si.edu/index.cfm.

v) **Consultations :** 14 évaluateurs indépendants. De larges consultations ont eu lieu durant la mission d'évaluation avec : des représentants du Ministère de la Culture et de la Direction du Parc national du Teide, la Commission mixte de gestion des parcs nationaux des Canaries (Ministère de l'Environnement et gouvernement des Canaries), le *Patronato* du Parc national du Teide et les Associations des maires et des résidents des zones couvertes par le parc ; les acteurs du tourisme, notamment SPET Assoc. Guías de Turismo, TUI et ASHOTEL ; des spécialistes de la géologie et des paysages ; des représentants d'institutions scientifiques telles que la Universidad de La Laguna, le Consejo Superior de Investigaciones Científicas, l'Instituto de Astrofísica de Canarias, et l'Observatorio Atmosférico de Izaña ; des représentants d'ONG, notamment Amigos de la Tierra, Amigos de la UNESCO, ATAN, CICOP, Greenpeace, Seo Birdlife et le WWF ; et le Conseil scolaire des Canaries.

vi) **Visite du bien proposé :** Bernard Smith, septembre – octobre 2006

vii) **Date d'approbation du rapport par l'UICN :** avril 2007

## 2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

Le bien proposé comprend le Parc national du Teide (PNT) qui se trouve sur l'île de Tenerife dans la Communauté autonome des îles Canaries, en Espagne. Avec une superficie de 18 990 ha, il couvre un gradient altitudinal de 1650 mètres à 3718 mètres au-dessus du niveau de la mer. Une zone tampon (Parc naturel forestier de Corona) de 54 128 ha entoure le bien proposé.

La caractéristique dominante du PNT est le strato-volcan du Teide-Pico Viejo qui, à 3718 mètres d'altitude, est le point culminant de l'Espagne. Le volcan, qui s'élève à environ 7500 mètres au-dessus des fonds océaniques, est considéré comme la troisième plus haute structure volcanique du monde. Vu depuis la mer, le Teide est un repère pour les navigateurs, célèbre depuis des siècles pour sa silhouette particulière qui semble flotter au-dessus des nuages portés par les alizés.

Tenerife se compose d'un complexe de strato-volcans qui chevauchent le Miocène et le quaternaire et qui sont restés actifs jusqu'à il y a juste quelques siècles. Parmi les exemples de volcanisme relativement récent, il y a le volcan Fasnia (1705) et l'éruption des cônes adventifs des 'Narices del Teide' (Narines du Teide, 1798). Le cratère plus ancien et plus complexe du Pico Viejo date du Pléistocène. Le strato-volcan est situé au centre d'une vaste dépression, la caldeira de Las Cañadas, délimitée à l'est, au sud et partiellement à l'ouest par des escarpements abrupts de 650 mètres de haut qui exposent l'histoire géologique de la région sur 25 kilomètres de long.

À l'est, l'escarpement de Las Cañadas comprend des couches alternées de lave et de débris d'explosion, suivies par un arc de dépôt de ponces puis par des dépôts d'écoulement. Le paysage continue d'évoluer par des processus actifs d'érosion et de déposition, comme en témoignent des caractéristiques telles que le torrent de Corbata del Teide et les tabliers d'éboulis de la paroi de Las Cañadas. Au nord et au nord-ouest du strato-volcan,

la paroi de la caldeira est absente, à l'exception d'un escarpement limité à La Forteleza. Beaucoup y voient la preuve de l'effondrement latéral d'un proto-volcan via des effondrements massifs et complexes du type avalanche, en direction d'Icod et de l'Oratava.

Entre la base du strato-volcan et le pied du mur s'étend un vaste champ de lave (y compris d'obsidienne – verre volcanique) et de matériaux pyroclastiques récents. Cette zone contient aussi de nombreuses structures de taille moyenne et de petite taille, notamment des crêtes, des cônes, des cratères, des champs volcaniques, des dômes, des fissures, des blocs, des aiguilles, des tunnels, des canaux, des bad-lands et des lahars. La géologie du PNT représente toute la gamme des séries magmatiques avec une grande quantité et une grande diversité de matériaux volcaniques acides (felsiques/phonolitiques) entièrement différenciés ainsi que de matériaux volcaniques basiques (basaltiques).

Le bien proposé présente donc un assemblage complexe de caractéristiques géologiques et il est remarquable par la diversité des structures présentes et des processus qu'elles représentent dans un espace limité et accessible. En tant que tel, c'est une ressource scientifique importante qui a fourni et continue de fournir aux chercheurs d'excellentes possibilités d'étude et de compréhension de l'évolution des terrains volcaniques en particulier et de l'histoire de la Terre en général.

L'isolement physique de l'île océanique et les hautes montagnes se conjuguent pour produire un environnement biologique complexe présentant un degré élevé de radiation adaptative et d'endémisme. Compte tenu de son altitude élevée, Tenerife est une des rares îles volcaniques à avoir un écosystème stratifié au-dessus de la ligne des arbres. Il s'agit de l'écosystème unique de *retamar* (genêt du Teide) de sommet et de l'écosystème de haute montagne. Avec les pentes plus basses de la montagne, ils fournissent, comme à Hawaï, une succession écologique archétype qui a été décrite par Alexander von Humboldt et qui a joué un rôle insigne dans son énoncé du concept de « géobiologie ». La flore vasculaire du PNT comprend 220 taxons dont 73 sont endémiques des Canaries et 33 de Tenerife ; parmi ces derniers, 16 n'existent que dans le PNT. Les espèces endémiques les plus caractéristiques sont les suivantes : codeso, rosalillo de cumbre, moutarde du Teide, violette du Teide et genêt du Teide. Le PNT abrite aussi trois espèces de reptiles endémiques : un lézard (*Gallotia galloti galloti*), une salamandre (*Tarentola delalandii*) et un scinque (*Chalcides viridanus viridanus*), ainsi que vingt espèces d'oiseaux et cinq de chauves-souris. Dans le PNT, l'endémisme des populations d'invertébrés est également élevé avec 70 espèces confinées au PNT.

## 3. COMPARAISON AVEC D'AUTRES SITES

Le programme mondial sur le volcanisme de la Smithsonian Institution note l'existence d'environ 1546 volcans actifs depuis le début de l'Holocène. Selon la méthode de calcul, il y a actuellement au moins 454 et peut-être 1343 volcans actifs sur la terre dont la majorité se trouvent dans la « Ceinture de feu du Pacifique ».

Les processus géologiques qui ont façonné (et continuent de façonner) le PNT sont le résultat d'un ensemble de facteurs associés au volcanisme intraplaque des îles océaniques et à la longue histoire volcanique de l'île. Compte tenu de ces conditions, des îles Canaries présentent une grande diversité et une variété de produits, caractéristiques, structures et processus éruptifs volcaniques. Les experts en géologie qui ont réalisé l'évaluation ont insisté sur le fait que, parmi les caractéristiques du bien proposé, la longue histoire de l'évolution du PNT, la concentration des dépôts volcaniques et des caractéristiques et structures morphologiques, l'exemple inhabituel des processus de formation de la caldeira avec des glissements de terrain massifs et l'évolution géochimique et magmatique inhabituelle et diverse dans le contexte d'une île océanique sont à la fois importants et distinctifs par rapport à d'autres sites comparables. Bien que d'autres îles de l'archipel des Canaries contiennent d'importantes caractéristiques qui rivalisent, en valeur, avec celles du PNT, c'est à Tenerife, actuellement au sommet de son développement géologique, que ces caractéristiques sont le mieux représentées. Il y a, aux îles Canaries, un autre bien du patrimoine mondial : le Parc national de Garajonay sur l'île de La Gomera. Ce bien est tout à fait différent du PNT ; il est inscrit au titre de sa forêt laurifère unique.

Les systèmes volcaniques sont déjà bien représentés sur la Liste du patrimoine mondial. Environ 13 biens ont été inscrits, essentiellement pour leurs caractéristiques volcaniques, ce qui fait que les systèmes volcaniques sont les mieux représentés de tous les thèmes identifiés dans l'étude thématique de L'UICN sur le patrimoine géologique mondial, terminée en 2005. La gamme des biens volcaniques du patrimoine mondial est diverse. Elle comprend le Parc national des Virunga (République démocratique du Congo), le Parc national de Sangay (Équateur), le Parc national de Tongariro (Nouvelle-Zélande), la Chaussée des géants et sa côte (Royaume-Uni) et le Parc national de Yellowstone (États-Unis). Il convient également de noter que certains biens volcaniques ont été inscrits pour leur valeur esthétique (critère vii) plutôt que pour leur intérêt géologique – c'est particulièrement le cas du Parc national du Kilimandjaro (République-Unie de Tanzanie). Il y a plusieurs biens volcaniques sur la Liste du patrimoine mondial dont l'échelle est supérieure à celle du PNT, en particulier le bien des Volcans du Kamtchatka (Fédération de Russie) qui dépasse, de loin, tous les autres biens volcaniques du point de vue du nombre et de la diversité de ses volcans mais, ce bien et plusieurs autres biens du patrimoine mondial sont situés dans des environnements tectoniques et paysagers totalement différents.

Il est possible d'établir des comparaisons directes avec les huit biens existants du patrimoine mondial qui comprennent des caractéristiques volcaniques dans des systèmes insulaires. Il s'agit des îles Hawaï, des îles Galápagos, des îles Éoliennes, des îles Gough et Inaccessible, des îles Heard et McDonald, du Parc national du Morne Trois Pitons et de la zone de gestion des Pitons. Certaines contiennent des strato-volcans, mais aucune ne rivalise avec le strato-volcan du Teide qui associe taille, complexité, âge, profondeur des études et intérêt actuel pour la science. Il y a d'autres strato-volcans océaniques intraplaques (p.ex., Pico do Pico, aux Açores ; Fogo, aux îles du Cap-Vert) qui ne figurent pas

sur la Liste du patrimoine mondial mais peu d'entre eux sont situés sur la lithosphère stationnaire ou se déplaçant lentement et le PNT les dépasse tous par son échelle. La comparaison directe la plus proche, du point de vue de volcans océaniques intraplaques, peut être établie entre le PNT et le Parc national des volcans d'Hawaï. Ce dernier contient des volcans boucliers qui présentent des éruptions volcaniques impliquant les magmas les moins évolués des séries magmatiques d'îles océaniques intraplaques. Sur un plan purement géologique, il est un argument irréfutable, à savoir que les deux sites représentent, certes, des complexes volcaniques intraplaques mais Hawaï et Teide se trouvent aux deux extrémités du spectre, du point de vue de l'évolution : d'un côté les îles Hawaï, relativement jeunes, se déplaçant rapidement et géologiquement simples et de l'autre le mont Teide, un strato-volcan ancien, se déplaçant lentement, géologiquement complexe et mature.

Le bien proposé se compare favorablement aux autres biens du patrimoine mondial du point de vue de l'échelle et de la diversité de ses caractéristiques géologiques et géomorphologiques et de ses autres valeurs paysagères distinctives. Teide offre un paysage remarquable et frappant que l'on peut attribuer, en partie, à ses pentes dénudées et à ses caractéristiques volcaniques spectaculaires. La plus spectaculaire est la caldeira de Las Cañadas mais des éléments tels que le pilier isolé de Roque Cinchado, lorsqu'ils se profilent sur le mont Teide, sont tout aussi emblématiques pour la plupart des Espagnols et autres touristes. Le grand nombre de visiteurs du parc démontre également l'attrait de ce paysage spectaculaire. En outre, les conditions atmosphériques locales créent très fréquemment une dynamique visuelle unique – le phénomène de la 'mer de nuages' qui se forme au-dessous de la caldeira et qui sert de toile de fond à la montagne, agissant, en d'autres termes, comme un 'portail' par lequel doivent passer les visiteurs pour arriver dans le parc. C'est un phénomène naturel d'une rare beauté. L'inscription est, par ailleurs, justifiée par la longue histoire d'études scientifiques qui ont eu lieu dans ce site et, en particulier, par son importance pour le développement de la géologie et de la volcanologie modernes. Le PNT a attiré des naturalistes et des géologues du monde entier. Dès le début du 19e siècle des chercheurs comme Alexander von Humboldt, Leopold von Buch et Charles Lyell y ont conduit des travaux pionniers et y ont énoncés les concepts fondamentaux de la géologie et de la volcanologie.

En résumé, bien que d'autres sites possèdent des caractéristiques comparables, la diversité des caractéristiques volcaniques du bien proposé et leur échelle impressionnante le placent certainement dans la catégorie des autres biens volcaniques du patrimoine mondial. L'UICN note, toutefois, le potentiel de plus en plus limité de nouvelles inscriptions de sites volcaniques sur la Liste du patrimoine mondial et fait des recommandations à cet effet dans son évaluation de l'île volcanique et tunnels de lave de Jeju (République de Corée) qui est également examinée par le Comité du patrimoine mondial.

## 4. INTÉGRITÉ

### 4.1 Statut juridique

Le bien proposé est contenu dans le PNT. Il se verra donc accorder le même statut juridique et la même protection que le parc. La principale législation nationale gouvernant le PNT est la Loi 5/1981 qui lui assigne un régime juridique spécial conçu pour le protéger et limiter les droits d'utilisation des ressources naturelles. Elle délimite aussi une zone tampon protectrice.

En outre, le décret 153/2002 contient les fondements juridiques de la protection des ressources naturelles du parc, établissant des critères de gestion généraux et la zonation du parc en zones réservée, à usage restreint, à usage modéré et à usage spécial. Tout comme la législation générale mentionnée plus haut, plusieurs lois complémentaires sur l'environnement assurent la protection du parc et de ses ressources.

Des propositions sont à l'étude en vue de transférer la responsabilité du PNT à la Communauté autonome des îles Canaries, par l'intermédiaire de la Commission mixte de gestion des parcs nationaux des Canaries. Des mesures de coordination et d'intégration entre les différents paliers de gouvernement ont été mises en place.

C'est à l'Équipe technique du parc national – qui fait rapport à la Commission mixte de gestion – qu'incombe la gestion quotidienne. Des mécanismes participatifs tels que le Comité de patronage ('Patronato') sont le garant d'une large consultation des différents acteurs.

Le cadre législatif national et régional qui protège actuellement l'intégrité du PNT semble adéquat et il est administré efficacement aux divers paliers de l'administration du parc.

### 4.2 Limites

Les limites du bien proposé coïncident avec celles du PNT qui suivent généralement la limite supérieure de la ligne des arbres et sont donc définies par une limite écologique appropriée.

Une zone tampon, définie par le Parc naturel forestier Corona, entoure totalement le PNT. Dans la zone tampon, la construction est interdite et des mesures sont en place pour soutenir la protection des ressources naturelles et contrôler les espèces introduites.

### 4.3 Gestion

La gestion du PNT relève d'un 'Plan administratif de gestion et d'usage' d'une durée de six ans qui devrait être renouvelé en 2008. Le plan de gestion précise des objectifs et des mesures pour protéger les valeurs et les ressources naturelles du parc, sensibiliser le public par l'éducation et contrôler l'usage et le développement.

Le PNT dispose d'un personnel et de ressources suffisants avec 23 personnes directement employées et 114 autres personnes qui travaillent dans le parc pour d'autres agences. Actuellement, le financement administratif du parc lui vient de l'État via le budget du Ministère de l'Environnement. Ce financement est ensuite attribué à

l'Organisation autonome des parcs nationaux qui assigne et distribue les fonds au PNT. Le parc reçoit aussi des contributions budgétaires des programmes de l'Organisation autonome des parcs nationaux qui financent des projets spécifiques pour les parcs. Les budgets annuels sont de l'ordre de • 3,7 à 4,8 millions et sont considérés suffisants.

Des programmes de recherche scientifique et de suivi impressionnants sont en place qui portent sur différents sujets comme par exemple la capacité de charge pour les visiteurs. En 1989, le PNT a reçu le Diplôme européen pour les aires protégées décerné par le Conseil de l'Europe. Cette distinction est revue tous les cinq ans et les autorités du parc doivent soumettre un rapport annuel; elle récompense une gestion de haut niveau.

### 4.4 Menaces et activités anthropiques

Les milieux de haute montagne sont des indicateurs particulièrement sensibles des changements climatiques. C'est la raison pour laquelle le PNT, avec d'autres parcs nationaux d'Espagne, sera inclus dans un réseau de surveillance des changements climatiques mondiaux. Les Picos de Europa, la Sierra Nevada et le PNT ont également été choisis pour la surveillance des changements écologiques généraux. Par l'intermédiaire de l'Observatoire atmosphérique d'Izaña, la zone de haute altitude, au-dessus de l'inversion de température, est un des cinq sites internationaux semblables où l'on surveille les changements atmosphériques mondiaux et fait partie du Réseau international de détection des changements stratosphériques. Dans ce contexte, le PNT est considéré comme un système d'alerte rapide précieux pour les changements environnementaux, grâce à des enregistrements de longue durée et détaillés des conditions environnementales.

Les menaces biologiques font l'objet d'une surveillance au moyen d'inspections phytosanitaires régulières qui surveillent les espèces indicatrices pour la perte de feuillage, la décoloration et les preuves de dommages causés par des agents biologiques. Il y a des preuves localisées de dommages causés par des coléoptères mais en général, les dommages sont légers.

Les catastrophes naturelles, y compris le feu et les activités sismiques/volcaniques sont couvertes par des plans d'urgence obligatoires au titre de la législation nationale. Cela inclut la coordination des plans d'urgence avec d'autres agences administratives et la présence dans le parc de postes d'urgence à El Portillo et à la station de téléphérique, avec notamment une station de pompiers. La végétation de broussailles du parc est moins sensible aux feux que la forêt de la zone tampon. La responsabilité de la prévention et du contrôle des incendies dans cette zone incombe au gouvernement insulaire de Tenerife (le Cabildo).

Il est généralement reconnu que la pression des visiteurs est une menace potentielle importante pour le PNT. Avec plus de 3, 5 millions de visiteurs par an, il est inévitable que des sites clés subissent des stress considérables à différents moments du jour et de l'année. La gestion du site, basée sur des zones d'utilisation, est considérée comme le type de gestion le plus approprié pour faire face au grand nombre de visiteurs dans le parc. Des programmes efficaces d'éducation des visiteurs contribuent à limiter leur impact dans les zones sensibles.

Globalement, le tourisme à Tenerife est contrôlé par une restriction rigoureuse du nombre de lits disponibles sur l'île. Dans le prochain plan de gestion, l'accent sera mis sur l'élaboration d'une stratégie d'accès intégrée comprenant l'établissement éventuel d'une série de 'centres de services' sur les routes d'accès, juste à l'extérieur des limites du parc. Ces centres pourraient contenir différentes installations pour les visiteurs auxquels les autorités du parc envisagent de proposer de garer leur voiture et d'emprunter un service de navettes pour visiter le parc.

La délégation de la responsabilité en matière de gestion et le transfert de cette responsabilité pour le PNT du gouvernement national au gouvernement régional est peut-être le principal domaine d'incertitude concernant la gestion future du parc. On craint une érosion potentielle des objectifs et stratégie de conservation à long terme devant les pressions du développement et de l'économie. Il est capital que les processus participatifs soient maintenus afin que les décisions puissent être prises dans la transparence et le respect des objectifs de gestion pour garantir la protection des valeurs et des ressources naturelles du parc.

En résumé, le statut de parc national du bien proposé a assuré la mise en place d'une capacité de gestion suffisante ainsi que d'une expérience de gestion efficace en étroite collaboration avec la population locale. Ce statut a également permis l'application efficace des contrôles législatifs et d'une stratégie de gestion soutenue par le financement du gouvernement central.

Dans l'ensemble, l'UICN considère que le bien proposé remplit les conditions d'intégrité requises par les Orientations.

## 5. AUTRES COMMENTAIRES

Le bien n'a pas été proposé au titre des critères (ix) et (x), mais il convient d'accorder une mention spéciale au rôle important joué par la biodiversité du PNT. Tenerife est une des rares îles du monde qui puisse entretenir des écosystèmes stratifiés au-dessus de la ligne des arbres, donnant deux écosystèmes uniques et l'un des meilleurs milieux naturels du monde pour les successions écologiques primaires liées à la variété des dépôts volcaniques et à l'adversité du climat. La biodiversité de la faune et de la flore est impressionnante avec près de 50 espèces de plantes vasculaires inféodées au PNT.

## 6. APPLICATION DES CRITÈRES / ATTESTATION DE VALEUR UNIVERSELLE EXCEPTIONNELLE

Le bien est proposé au titre des critères (vii) et (viii). L'UICN considère que le bien proposé remplit ces critères et propose l'Attestation de valeur universelle exceptionnelle suivante :

Le Parc national du Teide, dominé par les 3781 mètres du strato-volcan Teide-Pico Viejo, représente un assemblage riche et divers de caractéristiques et de

paysages volcaniques concentrés dans un décor spectaculaire.

**Critère (vii) : Phénomène naturel ou beauté et importance esthétique exceptionnels**

Le mont Teide offre un paysage volcanique spectaculaire dominé par l'escarpement déchiqueté de Las Cañadas et par un volcan central qui fait de Tenerife la troisième plus haute structure volcanique du monde. Dans ce paysage, on trouve une série extraordinaire de formations topographiques qui révèlent différentes phases de construction et de remodelage du complexe volcanique et mettent en valeur sa géodiversité unique. L'impact visuel est accentué par les conditions atmosphériques qui donnent au paysage des textures et des tons changeants et par une 'mer de nuages' qui forme un arrière plan impressionnant pour la montagne.

**Critère (viii) : Histoire de la terre, caractéristiques et processus géologiques et géomorphologiques**

Le Parc national du Teide est un exemple exceptionnel d'un système volcanique relativement ancien, géologiquement complexe et mature qui évolue lentement. Il a une importance mondiale en ce qu'il illustre de diverses manières des processus géologiques qui sous-tendent l'évolution des îles océaniques, et ses valeurs complètent celles des biens volcaniques déjà inscrits sur la Liste du patrimoine mondial, comme le Parc national des volcans d'Hawaii. Il offre un assemblage divers et accessible de caractéristiques et de paysages volcaniques dans une zone relativement limitée. Le site est un centre capital pour la recherche internationale et influence, depuis longtemps, la géologie et la géomorphologie, notamment à travers les travaux de von Humboldt, von Buch et Lyell ce qui fait du mont Teide un site important pour l'histoire de la volcanologie.

**Conditions d'intégrité, protection et gestion**

Le bien est bien géré et bien financé, avec un plan d'aménagement d'une durée de six ans en vigueur qui doit être renouvelé en 2008. Il bénéficie de la même protection juridique que les autres parcs nationaux d'Espagne et est entouré par une zone tampon. Les problèmes de gestion clés sont la gestion du tourisme, les impacts potentiels des changements climatiques et la coordination efficace des responsabilités de gestion entre les paliers de gouvernement nationaux et régionaux.

## 7. RECOMMANDATIONS

L'UICN recommande que le Comité du patrimoine mondial **inscrive** le Parc national du Teide, Espagne, sur la Liste du patrimoine mondial au titre des critères (vii) et (viii).

L'UICN recommande que le Comité du patrimoine mondial félicite l'État partie pour les efforts permanents qu'il déploie en vue de conserver cette aire protégée et pour avoir mis en place, dans le parc, un programme impressionnant d'éducation et de sensibilisation du public.

L'UICN recommande aussi de prier l'État partie, dans le cadre du processus de révision et de mise à jour du plan de gestion du Parc national du Teide :

a) de mieux harmoniser la planification et le développement stratégiques du tourisme aux îles Canaries et l'utilisation du Parc national du Teide afin de garantir que cette utilisation n'aura pas d'impact négatif sur la valeur universelle exceptionnelle du bien ;

b) de renforcer les mécanismes de surveillance des visiteurs et de mettre au point des méthodes de gestion qui assurent un équilibre entre la protection des valeurs du parc et l'amélioration de l'expérience pour les visiteurs ;

c) d'encourager l'amélioration de la recherche et du suivi sur les impacts potentiels des changements climatiques mondiaux et sur la nécessité d'adopter des stratégies de gestion adaptatives ;

d) de renforcer la coordination et la coopération entre l'État espagnol et la Communauté autonome des îles Canaries afin de partager la responsabilité et d'assurer un financement central ; et

e) d'encourager l'échange de l'expérience en matière de gestion et la promotion conjointe entre le Parc national du Teide et d'autres biens du patrimoine mondial des îles Canaries (Parc national de Garajonay et San Cristóbal de La Laguna).

Enfin, soucieuse de préserver la crédibilité de la Liste du patrimoine mondial, l'UICN recommande que le Comité du patrimoine mondial note que les systèmes volcaniques sont relativement bien représentés sur la Liste du patrimoine mondial et que le potentiel d'inscription de nouveaux sites volcaniques est de plus en plus limité. Le Comité pourrait donc recommander aux États parties qui envisagent de proposer l'inscription de nouveaux sites volcaniques de tenir compte des principes suggérés dans la section 5.2 de l'évaluation, par L'UICN, de l'Île volcanique et tunnels de lave de Jeju.

**Carte 1:** Localisation du bien proposé




**Carte 2:** Limites du bien proposé

