

## World Heritage Sites

### Protected Areas and World Heritage



## LAURISILVA OF MADEIRA PORTUGAL

*The Laurisilva of Madeira is the largest surviving relict of a virtually extinct laurel forest type once widespread in Europe. It is still 90% primary forest and is a centre of plant diversity, containing a unique suite of rare and relict plants and animals, especially endemic bryophytes, ferns, vascular plants, animals such as the Madeiran long-toed pigeon and a very rich invertebrate fauna.*

### COUNTRY

Portugal

### NAME

Laurisilva of Madeira

### NATURAL WORLD HERITAGE SITE

1999: Inscribed on the World Heritage List under Natural Criteria ix and x.

### STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The UNESCO World Heritage Committee adopted the following Statement of Outstanding Universal Value at the time of inscription:

#### Brief Synthesis

The Laurisilva of Madeira, within the Parque Natural da Madeira (Madeira Natural Park) conserves the largest surviving area of primary laurel forest or "laurisilva", a vegetation type that is now confined to the Azores, Madeira and the Canary Islands. These forests display a wealth of ecological niches, intact ecosystem processes, and play a predominant role in maintaining the hydrological balance on the Island of Madeira. The property has great importance for biodiversity conservation with at least 76 vascular plant species endemic to Madeira occurring in the property, together with a high number of endemic invertebrates and two endemic birds including the emblematic Madeiran Laurel Pigeon.

**Criterion (ix):** The Laurisilva of Madeira is an outstanding relict of a previously widespread laurel forest type, which covered much of Southern Europe 15-40 million years ago. The forest of the property completely covers a series of very steep, V-shaped valleys leading from the plateau and east-west ridge in the centre of the island to the north coast. The forests of the property and their associated biological and ecological process are largely undisturbed, and play a predominant role in the island's hydrological balance. The forest is mainly comprised of evergreen trees and bushes, with flat, dark green leaves. The property provides a wealth of ecological niches, complex food webs and examples of co-evolution of species. A range of climax vegetation communities such as the "Til Laurisilva", the "Barbusano Laurisilva" and the "Vinhático Laurisilva", have been identified within the property. Ancient trees in the valley bottoms, waterfalls and cliffs add to the experience of the values of the property.

**Criterion (x):** The Laurisilva of Madeira is a place of importance for its biological diversity. A large proportion of its plants and animals are unique to the laurel forest, and it is larger than and with significant differences to other laurel forest areas. Endemic trees belonging to the Lauraceae family such as the Barbusano Apollonias barbujana ssp. Barbujana, the Laurel Laurus novocanariensis, the Til Ocotea foetens and the Vinhático Persea indica are dominant. Other endemic plants include plants such as Pride of Madeira Echium candicans, Honey Spurge Euphorbia mellifera, Madeira Foxglove Isoplexis spectrum and Musschia wollastonii. Ferns abound in the shadowy valleys and bryophytes cover large areas of the soil, banks, rocks and tree trunks. Around 13 liverwort species and 20 moss species are noted as threatened at a European scale, while abundant lichens are indicative of high environmental quality and the absence of pollution. Vertebrate species include a limited number of species with high endemism, including two rare species of bats, the Madeira Pipistrelle Pipistrellus maderensis and the Leisler's Bat Nyctalus leisleri verrucosus and several birds, such as the Madeira Laurel Pigeon Columba trocaz, the Madeiran Firecrest Regulus madeirensis and the Madeiran Chaffinch Fingilla

coelebs madeirensis. In the Laurisilva there are more than 500 endemic species of invertebrates, including insects, arachnids and mollusks.

### **Integrity**

The property includes the areas of primary laurisilva remaining on Madeira. Its boundaries were defined after an exhaustive field study to identify the most significant areas of remaining vegetation. Most of the property is believed to have never been felled and includes some massive old trees, possibly over 800 years old, which have been growing since before the island was settled. Goats and sheep, which caused some damage in the past, have now been eradicated from the area.

The property also contains an important testimony of human use. The settlers of Madeira constructed water channels, known as levadas, which run through the forest following the contours of the landscape, and clinging to the cliffs and steep-sided valleys. Typically 80-150 cm wide and constructed of stone or more recently concrete, they carry water from the forest to hydropower stations and to the towns of the south, where they provide essential drinking water and irrigation supplies. Along the levadas there are paths typically 1-2m wide, which allow access to the otherwise almost impenetrable forest. The impact of these features on the property is limited, and also has some benefit for conservation, since they allow access to the forest on relatively flat paths and cover only an infinitesimal area of land. None has been built for 70 years, but the present ones are carefully maintained. Apart from the levadas, and the occasional tiny hut used by those that maintain them, human development within the property is very limited and there is no habitation, no buildings, except the occasional tiny hut for those who maintain the levadas, and no cultivated land. There are limited impacts from two roads, with plans to replace one by a tunnel.

The integrity of the property is further enhanced by buffer zones that are not part of the inscribed property but protect it from threats originating from outside its boundaries. Possibly threats arising from these areas include invasive species and species introductions from both agriculture and forestry.

### **Protection and Management Requirements**

The property comprises approximately 15,000ha of land within the 27,000ha of Parque Natural da Madeira (Madeira Natural Park). It has strong and effective legal protection under regional, national and European Law. These multiple layers of protection include status as a special area of conservation under the Habitats Directive of the European Union, which obliges the State Party to protect the area so that both "Madeiran laurel forest" and 39 species of rare and threatened plants and animals remain at, or are restored to, "favourable conservation status". The property is also a Biogenetic Reserve of the Council of Europe, and a Special Protection Area under the European Union Birds Directive. The property is gazetted under Madeiran law, with around half of the area as a Strict Reserve ("Reserva Integral") and the remainder as a Partial Reserve ("Reserva Parcial").

Effective conservation management is also in place. Conservation functions are devolved to regional government in the form of the Governo da Região Autónoma da Madeira (Autonomous Regional Government of Madeira). A management plan (Plano de Ordenamento e Gestão da Floresta Laurisilva) is in place and has been approved by the Regional Government. This is a powerful legal instrument which defines strategies and objectives for the protection and enhancement of the property, drawing the main guidelines for its management, conservation and protection.

Adequate staff and resources are in place and need to be maintained in the long term. There are a number of issues requiring effective long-term management. These include monitoring the potential threat to the property from invasive species including species from former agricultural land at the lower edge of the property. A small number of permits is issued to local people for limited collection common tree heather in the higher zones. Although declining, this use needs to be monitored and kept within levels that do no harm to the forest. Management of the areas adjacent to the property needs to fully consider its Outstanding Universal Value, particularly in relation to the potential for introduction of alien invasive species. Facilities for visitors to the laurel forest are few and visitor management will need to be prioritized as tourism trends change. With sheer cliffs beside narrow levadas, great care is needed to both to protect the forest and to provide for safe visitor access, especially in relation to possible increases in visitor pressure. Strong policies are needed to ensure there is no temptation to build inappropriate facilities for visitors. Effective visitor interpretation and education programmes would also be highly beneficial to the communication of the Outstanding Universal Value of the property.

### **IUCN MANAGEMENT CATEGORY**

Laurisilva of Madeira (half):	Ia Strict Nature Reserve
Laurisilva of Madeira (half):	II Partial Nature Reserve
Madeira Nature Park:	V Protected Landscape/Seascape

### **BIOGEOGRAPHICAL PROVINCE**

Macaronesian Islands (2.40.13)

## **GEOGRAPHICAL LOCATION**

Located along 35 km of the northern slopes of the island of Madeira in the Atlantic Ocean, 970 km southwest of Portugal and 540 km west of Morocco, centred on 32°46'N and 17°03'W.

## **DATES AND HISTORY OF ESTABLISHMENT**

- 1982: Created as part of Madeira Nature Park by Decrees Nos 12/82/M and later, 13/93/M; these provided for the administration and management of the Park;
- 1989: The Regional Direction of Forests charged with the protection and surveillance of the Park by Decree No.21/89/M;
- 1992: Declared a Council of Europe Biogenetic Reserve, a Special Conservation Zone within the EU Bird Habitats Directive and a Site of Community Interest within the EU Habitats Directive.

## **LAND TENURE**

The land is 10% owned by the regional Government and 90% local authority land administered by the regional Government through the Regional Directorate of Forests under the Regional Secretariat for Agriculture, Forests and Fish.

## **AREA**

15,000 ha, entirely within the 27,000 ha Madeira Nature Park. Its buffer zone of 12,000 ha is also within the Nature Park.

## **ALTITUDE**

Sea level to 1,400m.

## **PHYSICAL FEATURES**

The Madeira archipelago is composed of four main islands of which Madeira, at 77,900 ha and some 55 km long, is by far the largest, with a high 30 km long east-west backbone ridge of mountains capped by high plateaus. The highest point is 1,862m. The islands are of volcanic origin about 6 million years old, evident in the many crags, dykes and basalt columns. The rugged northern slopes are deeply dissected by a series of very steep valleys leading from the plateau and central ridge of the island to the nearly vertical cliffs of the north coast. They are completely covered up to 1,300m with laurel forest (*laurisilva*), a type of mountain cloud forest, which occupies some 20% of the island, crossed by many streams in deep v-shaped valleys and spattered with waterfalls. The volcanic ash soils are fertile and the more gradual lower southern slopes have long been cleared and cultivated, irrigated by water channels from the mountains, the lines of which score the precipitous slopes.

## **CLIMATE**

The climate is oceanic but notable for sharp altitudinal and north-south climatic gradients. On the north side of the island the climate is moderated by the surrounding ocean and the prevailing northeasterly winds. It is mild, with a relative humidity of 85% and often cloudy, preserving the conditions in which the *Laurisilva* once dominated Tertiary southern Europe. This forest needs over 1,700mm of rain a year and the average annual precipitation for the island is between 250 and 750mm. However, 3,000mm has been recorded on the north coast and measured rainfall on the foggy north slopes is probably doubled by condensation. Frost and snow occur above the treeline. The south has a humid subtropical regime. The average annual temperature for the island ranges between 15°C and 20°C.

## **VEGETATION**

Most of Madeira was forested when it was discovered, but the warm southern slopes were early cleared for sugar cane and for fuelling the refineries. Forests are now found between 300 and 1,300m on the cool wet north slopes and from 700-1600m on south-facing slopes. The north slope forest is a relict: a 90% intact laurel forest, of moist montane evergreen hardwoods with a dense understorey of shrubs and ferns. This humid subtropical late Tertiary vegetation type dating from 40-15 million years ago once covered much of southern Europe but is now virtually extinct. Its disappearance was due first to glacial advance and later to the dessication of the Mediterranean basin where it grew until 10,000 years ago. It survives in the Macaronesian archipelagos which retain the constant mild temperatures and high humidity that it requires. *Laurisilva* once covered much of Madeira, the Azores and the western Canary Islands but the forests were reduced by logging, clearance for crops, overgrazing, and invasion by alien species. The forest on Madeira is the largest

to survive, although there are still 6,000 ha on Tenerife and 2,000 ha at Garjonay on La Gomera. Elsewhere only small often degraded patches persist in Macaronesia, southern Spain, Portugal and northern Morocco. There are very ancient trees 40m tall, and perhaps 800 years old with huge ferns in the valley bottoms. The precipitous slopes and the luxuriant vegetational structure are more like an East African montane forest than Europe. The *laurisilva* is all primary forest except for two portions in the east (10% of the whole) which were cut 40-50 years ago but are now recovering (IUCN, 1999).

150 plant species are found in the forest, 66 being endemic to Madeira, representing some 15% and 9% of the endemic species of Madeira and Macaronesia respectively. Madeiran *Laurisilva* (the *Clethra-Laurion* association of Sjögren, 1975) is composed of four main trees: Canary laurel *Apollonias barbujana*, Azores laurel *Laurus azorica*, foetid laurel *Ocotea foetens* and Madeira mahogany *Persica indica*, a valuable hardwood. The first two, with *Picconia excelsa* and strawberry tree *Visnea mocanera* are found in the dry *laurissilva* on south-facing slopes; *Laurus azorica*, *Ocotea foetens* and *Persica indica* grow on moist north-facing slopes and gorges. The beautiful small endemic lily-of-the-valley tree *Clethra arborea* is common throughout. Other important trees include beefwood *Heberdenia excelsa*, *Picconia excelsa* bay laurel *Laurus nobilis*, Madeira cheesewood *Pittosporum coriaceum*, buckthorn *Rhamnus glandulosa* and the large shrubs Madeira holly *Ilex perado* and Canary Island holly *I. canariensis*.

The trees are covered with the bryophytes, dripping mosses and lichens characteristic of unpolluted humid ecosystems and support a huge and diverse understorey of shrubs, ferns, mosses (20 rare spp.) and liverworts (13 rare spp.). The understorey also includes shrubby sow thistle *Sonchus fruticosus*, the rare Madeira storkbill *Geranium maderense*, the endemic Madeira orchids *Dactylorhiza foliosa* and Madeira goodyera *Goodyera macrophylla* and the Madeira squill *Scilla maderensis*. In the ravines of the coast, there is an arboreal community dominated by the endemic wild olive *Olea maderensis* and a shrub *Chamaemeles coriacea* of an endemic genus. Above the laurel forest is an endemic highland community dominated by tree heath *Erica arborea* and besom heath *Erica platycodon* ssp. *maderincola*, shrubby Madeira juniper *Juniperus cedrus* and heathers *Erica* spp.

## FAUNA

The fauna is relatively poor, but most species are of conservation concern, being endemic to the island. Mammals and reptiles in the forest are represented by only two mammals, the lesser noctule bat *Nyctalus leisleri verrucosus* and the Madeira pipistrelle *Pipistrellus maderensis* (EN) and one reptile, the Madeira wall lizard *Lacerta dugesii*. The wolf spider *Lycosa blackwalli* is endemic to the forest and there are 500 species of invertebrates and many species of butterflies and molluscs.

The Madeira Archipelago has 43 breeding species of birds and the forest contains four of Madeira's eleven Important Bird Areas. The outstanding endemic forest birds are the Madeira laurel-pigeon *Columba trocaz* and Madeira firecrest *Regullus madeirensis*. The forested cliffs may see two other endemics, Zino's petrel *Pterodroma madeira* (EN) and Madeira storm petrel *Oceanodroma castro*. There are also some interesting sub-species such as the Madeira chaffinch *Fringilla coelebs madeirensis*, a race of Berthelot's pipit *Anthus bertheloti madeirensis*, Madeira rock sparrow *Petronia petronia madeirensis* and the dark barn owl *Tyto alba schmitzi*. There are also Eurasian sparrowhawk *Accipiter nisus granti*, and plain swift *Apus unicolor* and common canary *Serinus canaria canaria*. Madeira has Fea's petrel *Pterodroma feae*, and 13 marine sub-species, including little shearwater *Puffinus assimilis baroli*, white-faced storm petrel *Pelagodroma marina hypoleuca*, kestrel *Falco tinnunculus canariensis*, and yellow-legged gulls *Larus cachinans atlantis*. There are also regular visitants like little and cattle egrets *Egretta garzetta* and *Bubulcus ibis*, whimbrel *Numenius phaeopus*, dunlin *Calidris alpina*, turnstone *Arenaria interpres* and occasional vagrants like laughing gull *Leucophaeus atricilla*, and Eurasian spoonbill *Platalea leucorodea* (Madeira Wind Birds, 2005).

## CONSERVATION VALUE

The *Laurisilva*, still 90% primary growth, is the largest such forest in the Macronesian Islands. Its level of endemism in plants and animals is very high and it is essential to protect the island's micro-climate and water supplies. The Park lies within a Conservation International-designated Conservation Hotspot, a WWF Global 200 Eco-region, a WWF/IUCN Centre of Plant Diversity and a BirdLife-designated Endemic Bird Area.

## **CULTURAL HERITAGE**

Madeira was discovered in 1419 by the Portuguese navigator Joao Gonçaves Zarco. In the 16th and 17th centuries the southern half was developed for the production of cane sugar. To irrigate this crop, an impressive system of 80-150cm-wide water channels (*levadas*) with narrow paths alongside were cut in and some tunnelled through the steep mountainsides.

## **LOCAL HUMAN POPULATION**

The site is uninhabited and uncultivated but approximately 500 people live in the buffer zone. This pressure is decreasing as the hardships of traditional terrace farming are abandoned for employment in the heavily populated south where tourism prospers. Some small-scale cutting of tree heather is permitted to local people.

## **VISITORS AND VISITOR FACILITIES**

Thousands of tourists visit Madeira and visitors are permitted in parts of the Park but access is not easy: the widespread but narrow maintenance paths along the water channels are often too dangerous to allow their use by the public. In 1999 visitors had to take a guide and travel in groups of 20 on prescribed paths. But a report from the state party in 2008 mentions climbing and canoeing as well. Only two roads cross the range, one now in a tunnel. However, a projected cable car to the mountain has one station in the property which will allow access to about 500 visitors per day during the summer half of the year or some 90,000 annually. The existing visitors' centre is to be enlarged to include an auditorium, library, shop, improved sanitary installations, car park and emergency services (UNESCO, 2009).

## **SCIENTIFIC RESEARCH AND FACILITIES**

Scientific research has been mainly conducted by Madeira Botanical Garden on indigenous and endemic plant species and their re-introduction into the natural habitat. From 1992 to 1995, staff now of the Madeira Nature Park conducted an exhaustive ecological survey of the forest using transects and 1155 study sites. The results were published in *Laurisilva da Madeira* in 1996 and in the *Atlas do Ambiente* by the Directorate General of the Environment in 1997.

## **MANAGEMENT**

The Park is managed by the Regional Directorate of Forests under the Regional Secretariat for Agriculture, Forests and Fish and is well supported by the regional government. The zoning and management plan defined by Regional decrees 19/82/M and 12/95/M provides for the territorial organisation of the region. This is a land use plan for the whole island which is also the management plan for the *Laurisilva*, including general guidelines on planning and development, land tenure and protection of the natural heritage. Within this strategic frame the Nature Park is guided by annual operational plans. In 1980, a program to remove all alien species led to the recovery of a large area of primary forest. Goats have been a serious threat to the forest since colonial times but following eradication campaigns stray goats are now only occasionally seen. Encroachment by alien species such as Norway maple *Acer sycamorus* and Kahili ginger *Hedygium gardnerianum* could crowd out recovering forest on abandoned terraces and there are programs to eradicate these.

## **MANAGEMENT CONSTRAINTS**

Extension of the road network and the subsequent pressure from tourism are the main potential problem. A cable car to the mountain with one station in the property opened in 2000. Invasive species such as the tree-climbing black rat *Rattus rattus* and the invasive Kahili ginger have become threats.

## **STAFF**

In 1999 there was a total of 43 staff under the Director: 2 heads of division, 4 senior technicians, 3 assistant technicians, 6 administration assistants and 25 forest rangers from the Regional Direction of Forests. The team also manages the nature reserves of the Selvagens and Desertas Islands.

## **BUDGET**

The 1999 budget was €1,58 million (US\$1,740,000) from the European Commission LIFE fund for scientific projects and from the Regional Government of Madeira.

## **LOCAL ADDRESSES**

Parque Natural da Madeira, Quinta do Bom Sucesso, Caminho do Meio, 9050 Funchal, Madeira.

Direcção Regional des Florestas, Estrada Comandante Camacho de Freitas, No.308, Jamboto S. Antonio 9000, Funchal, Madeira

Secretariat Regional de Agricultura, Florestas e Pescas, Palacio do Governo, Avenida Zarco 9000, Funchal, Madeira

## REFERENCES

The principal source for the above information was the original nomination for World Heritage status.

Centre for Macaronesian Studies (2003). *II Symposium of Island Ecosystems*. Funchal, Madeira Island, Portugal.

Costa-Neves, H. *et al.* (1996). *Laurisilva da Madeira: Caracterização Quantitativa e Qualitativa*. Secretariat Regional de Agricultura, Florestas e Pescas. Parque Natural da Madeira, Funchal.

Directorate General of the Environment (1997). *Atlas do Ambiente*. Funchal.

Gandulla, J. (1991). *Estudio Ecologico de la Laurisilva Canaria*. Ministerio de Agricultura, Florestas e Pescas. Lisbon.

Gouvernement Régional de Madère (1996). *Laurisilva da Madeira. Proposition pour son Inscription sur la Liste du Patrimoine Mondial de l'UNESCO comme Bien Naturel*. Funchal.

Hilton-Taylor, C. (compiler) (2008). *IUCN Red List of Threatened Species*. IUCN, Cambridge, U.K.

IUCN (1999). *World Heritage Nomination - IUCN Technical Evaluation. The Laurisilva of Madeira (Portugal)*. IUCN, Gland, Switzerland.

Madeira Wind Birds (2005). *Madeira Laurel Forest*.

Quintal, R.(1989). *Laurisilva da Madeira*. Clube de Ecoogia Barbosano, Funchal.

Santos-Guerra A. (1990). *Evergreen Forests in the Macaronesian Region*. Steering Committee for the Conservation & Management of the Environment & Natural Habitats, Council of Europe, Strasbourg.

Sjogren, E. (1972). Vascular plant communities of Madeira. *Bol.Mus.Mun.Fun.* 26:46-122. Funchal.

UNESCO World Heritage Committee (2009). *Report of the 33<sup>rd</sup> Session of the Committee*. Paris.

## DATE

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