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DOÑANA NATIONAL PARK SPAIN

The Coto de Doñana in Andalucía is Europe's largest sanctuary for migrating birds. It is a vast coastal marshland, productive, well preserved and inaccessible, where the River Guadalquivir meets the Atlantic Ocean. It is notable for the great diversity of its biotopes - beaches, marshes, lagoons, fixed and moving dunes, pine and cork oak woodland and heath. The ponds, streams and marshes harbour three threatened bird species, one of the largest heronries in the Mediterranean, more than 500,000 wintering waterfowl and millions of migrant birds.

Threats to the site: Over-extraction and agricultural contamination of water, land reclamation, invasion by cattle, the continuing impacts of the Aznalcollar mine spill and of the annual pilgrimage to El Rocío and the expansion of an oil refinery to the west. It is the habitat of diminishing and threatened populations of the Iberian lynx and Spanish imperial eagle.

COUNTRY

Spain

NAME

Doñana National Park

NATURAL WORLD HERITAGE SERIAL SITE

1994: Inscribed on the World Heritage List under Natural Criteria vii, ix and x.

2005: Extended under the same criteria to coincide with the extended boundaries of the National Park.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

INTERNATIONAL DESIGNATIONS

1980: Designated a Biosphere Reserve under the UNESCO Man & Biosphere Programme (77,260 ha)

1982: Designated a Wetland of International Importance under the Ramsar Convention (50,720 ha)

IUCN MANAGEMENT CATEGORY

II National Park

BIOGEOGRAPHICAL PROVINCE

Mediterranean Sclerophyll (2.17.7)

GEOGRAPHICAL LOCATION

On the southern Atlantic coast of Spain in Andalucía, 50 kilometers southwest of Seville, between the coastal towns of Huelva and Sanlúcar de Barrameda and the right bank of the Guadalquivir River. It lies between 36° 48' to 37° 08'N, and 6° 16' to 6° 34'W.

DATES AND HISTORY OF ESTABLISHMENT

1963: The World Wildlife Fund and the Council of Scientific Research bought land and set up a research station;

1965: Doñana received legal protection as a Biological Reserve;

1969: Gazetted as a National Park by Decree 2.412 (34,625 ha); Guadiamar Reserve created;

- 1973: Declared a Zone of Complete Refuge by Decree 3.101;
- 1978: The Park reclassified and increased in area by Law 91 (50,720 ha);
- 1980: Designated a UNESCO Biosphere Reserve and a Ramsar Wetland Site;
- 1988: Designated a Special Bird Protection Area by the EEC under Directive 79/409;
- 1990: Added to Montreux Record of wetlands in danger;
- 2005: Three small extensions (3,531.7 ha) added to the National Park and World Heritage site by Resolution 3371 (PND, 2005).

LAND TENURE

State, in the provinces of Huelva and Sevilla: an area of 27,937 ha (55.08%) at the time of designation, plus 3,214 ha owned by WWF but ceded to the state. Remaining ownership: municipal, 8,622 ha (17.0%); private, to be compulsarily purchased by the state, 9,124 ha (18%); private, in process of purchase, 4,994 ha (9.8%); private, 43 ha (0.08%). The buffer zone is all private property. Administered since 2006 by the Autonomous Region of Andalucia and the Park Directors of Doñana and the Sierra Nevada.

AREA

World Heritage & Special Bird Protection Areas 54,251.7 ha; buffer zone of 26,540 ha is outside the WH site.

ALTITUDE

Sea-level to 40m (dunes).

PHYSICAL FEATURES

Coto Doñaña is a vast undeveloped coastal marshland on the right bank of the Guadalquivir estuary, cut off from the Atlantic by extensive dunes and subject to seasonal variations in water level and salinity. During the summer it is a dry plain which becomes a wide shallow lake in winter. It overlies quaternary deposits mainly of sand sheets. It comprises three main areas: marsh with watercourses and ponds, dunes, coastal and inland, and heath of scrub or woodland. Over half the Reserve area (~27,000 ha) was originally *marismas* - freshwater marshes on accumulated clayey silt - where the Guadalquivir river delta has been deflected and ponded by a coastal sand spit. These have been reduced by more than 80% over the past century. More than half the water used to come from the Guadiamar river which runs through the centre of the marshes, but the chief present source is rainfall. The water-table is perched near the surface, creating the great biological richness of the Park. Low-lying areas are filled with deep organic matter and the clay is rich in calcium and magnesium. The marshes are fed by the Arroyo de la Madre de las Marismas del Rocio which flows parallel with the coastal dunes, and by the Guadiamar river. There are also flowing interfluves (*caños*) carved by natural drainage, depressions which hold wet season lagoons (*lucios*) and hollows with upwelling groundwater (*ojos*), which form a mosaic of microhabitats: pools, streams, mudflats, reedbeds, banks and islands.

The coastal dunes, each about 2 km long by 200m across and up to 40m high, parallel the coast for 25 kilometers in four rows 3-5 kilometers wide. The seaward dunes are mobile, moving from four and six meters a year before the southwesterly winds, burying pine woods as they go. Their area is about 7,000 ha. The inland dunes (*cotos* or *matorral*) are stabilised by scrub vegetation and in the hollows between them (*corrales*) are lagoons and marshes. The heathland banks (*vera*) are a series of low ridges and hollows which form a narrow ecotone between the dunes and the marsh and also cover the land furthest from the Guadalquivir. This is the most stable and biologically rich area of the Park. The National Park is adjoined by areas of Natural Park (56,250 ha) and Natural Landscape (1,336 ha) on private or municipal land. These are located along the west coast, two in the north and two on the banks of the Guadalquivir.

CLIMATE

The climate is Mediterranean moderated by the ocean, with warm dry summers and cool wet winters. The mean annual temperature is 17°C; July and August average 23.5°C, December and January average 9.3°C. The mean annual precipitation is 525mm, most falling in winter, peaking at 90-110mm in December (Llamas, 1988).

VEGETATION

The great variety of sedimentary deposits has created a great variety of habitats and ecotones. There are four main types of vegetation: marshland/aquatic, salt-tolerant, open forest and heathland. The marsh vegetation depends on the degree of soil salinity and the duration of flooding (Moore *et al.*, 1982). The higher zones support halophytes such as glasswort *Salicornia ramossissima* with seablight *Suaeda* sp. and *Arthrocnemum perenne*. The seasonally flooded hollows are covered with sea clubrush *Scirpus maritimus*, bulrush *Schoenoplectus lacustris*, rushes *Juncus* sp. and crowfoot *Ranunculus baudotii*. Freshwater communities are similar to *Phragmitea*, *Littorelletea* and *Potametea* of Atlantic-European type. Brackish water swamps have communities similar to *Spartinetea*, *Arthrocnemetea* and *Ruppietea* of an arid North African type.

Plant communities on the dunes also have Atlantic-North African affinities and a notable degree of endemism. The mobile outer dunes are sparsely vegetated with marram grass *Ammophila arenaria*, and camarina *Corema album*, with buckthorn-juniper *Rhamno-Juniperetum macrocarpas* communities. The dry dunes inland have *Rhamno-Juniperetum Sophora* communities. On humid pseudo-glei sands the vegetation includes plantations of cork oak *Quercus suber*, which carry large heronries, with olive *Olea europea*, poplars *Populus* spp., fig with ash *Ficario-Fraxinetum angustifoliae* and vine with willow *Viti-Salicetum atrocinaerae* communities.

The heathland vegetation varies with the availability of water. In the damp hollows and interdunal valleys (*monte negro*) tree heather *Erica scoparia* and heath *E. ciliaris* grow, succeeding cork oak *Quercus suber* and strawberry trees *Arbutus unedo*. On the drier ridges (*monte blanco*), *Halimium commutatum* and *H. halimifolium*, rosemary *Rosmarinus officinalis*, lavender *Lavandula stoechas*, rockrose *Cistus* sp. and thyme *Thymus tomentosa* grow with introduced stone pine *Pinus pinea* and *Eucalyptus* spp. Some 750 species of plants have been identified, including two species new to science and at least 45 new to Europe. Four strictly protected species occur, all national endemics: *Micropyropsis tuberosa* (EN), *Linaria tursica*, *Gaudinia hispanica*, and *Vulpia fontquerana* (Gil, 1993).

FAUNA

The fauna of Doñana is mostly Mediterranean with a few north African and northern European species. The *marismas* flood to 30cm for six months, creating the most important wintering area for waterfowl in the peninsula, and ideal conditions for large flocks of migrating birds; the dune scrub (*matorral* or *cotos*) edging the marshes is rich in mammals. The site is identified as an Important Bird Area by BirdLife International. The prevalence of mosquitoes is a major reason for its lack of settlement in the past.

Doñana has a very rich and diverse avifauna, with 419 species of resident and migratory birds (Usher, 2005). The marsh lies on the main western Europe to west Africa migratory flyway and forms a bottleneck through which some 6,000,000 birds pass each year. It is also essential winter habitat for over 500,000 overwintering ducks and waterbirds such as teal *Anas crecca* (200,000), shoveller *Anas clypeata* (150,000), greylag goose *Anser anser* (70,000), most of Spain's herons, white stork *Ciconia ciconia*, stone-curlew *Burhinus oedicephalus* and slender-billed gull *Larus genei*. Important breeding wetland species include marbled teal *Marmaronetta angustirostris* (VU, 400 individuals), white-headed duck *Oxyura leucocephala* (EN, 70), which nest mainly in artificial ponds in surrounding areas, white-eyed pochard *Aythya nyroca*, purple gallinule *Porphyrio porphyrio* and crested coot *Fulica cristata*. It is also a spring nesting area for Mediterranean and African birds including spoonbill *Platalea leucorodia* (600). The shallow lagoons become a feeding place for thousands of greater flamingo *Phoenicopterus ruber* (20,000) which during wet spells also nest in the area. The great bittern *Botaurus stellaris* returned in 2004.

Raptors amongst the stabilised sands include 7 breeding pairs (about a twentieth of the world's population) of the Spanish imperial eagle *Aquila adalberti* (VU), near-threatened black vulture *Aegypius monachus*, short-toed snake eagle *Circaetus gallicus*, booted eagle *Hieraetus pennatus*, buzzard *Buteo buteo*, black kite *Milvus migrans*, black-shouldered kite *Elanus caeruleus*, red kite *M. milvus*, and hobby *Falco subbuteo*. Occasionally seen are glossy ibis *Plegadis falcinellis*, rednecked nightjar *Caprimulgus ruficollis*, little butontail *Turnix sylvatica*, and azure-winged magpie *Cyanopico cyanus* (Heath & Evans, 2000; Gil, 1993; Grimmett & Jones, 1989).

The scrubland (*cotos*) and heathland ecotone (*vera*) are the richest habitats for most animals apart from waterbirds. Identified vertebrates include 37 mammals, 12 amphibians, 23 reptiles and 72 fishes (Usher, 2005). The Park contains a diminishing population of approximately 40-50 of the threatened Iberian lynx *Lynx pardinus* (CR) (Johnson *et al.*, 2003) which is some third to a half of the total wild population: it is

the most endangered of the world's 36 species of cats, being dependent, as the Spanish imperial eagle also is, largely on rabbits which are widely dying off. The commonest mammals are Mediterranean horseshoe bat *Rhinolophis euryale*, lesser horseshoe bat *Rhinolophis hipposideros*, hare *Lepus capensis*, rabbit *Oryctolagus cuniculus*, red fox *Vulpes vulpes*, polecat *Putorius putorius*, weasel *Mustela nivalis*, badger *Meles meles*, Eurasian otter *Lutra lutra*, Egyptian mongoose *Herpestes ichneumon*, small-spotted genet *Genetta genetta*, wild cat *Felis silvestris*, wild boar *Sus scrofa*, fallow deer *Dama dama* (1,500) and red deer *Cervus elaphus* (1,300; PND, 2005). Reptiles, which are found especially in the dunes, include spur-thighed tortoise *Testudo graeca* (VU), the local form of Lataste's viper *Vipera latastei gaditana* (VU), and spiny-footed lizard *Acanthodactylus erythrurus*. Amphibians include the very uncommon Iberian midwife toad *Alytes cisternasii*. Common fish are carp *Cyprinus carpio* and eel *Anguilla anguilla*; a threatened species is the Spanish toothcarp *Aphanius iberus* (EN).

CONSERVATION VALUE

The site is the most important wetland in Spain and one of the largest and best-known wetlands in Europe, because of its wide range of habitats which are productive, inaccessible, well preserved and highly diverse. It is in good condition and is particularly remarkable for its large breeding colonies, the millions of wintering waterbirds, and for harbouring threatened species such as imperial eagle and purple gallinule. It is the last tract of relatively undisturbed marsh in the Guadalquivir delta. It includes a long stretch of undeveloped coastline and protects one of the few mobile dune systems found on the Iberian peninsula. The Park is in a Conservation International-designated Conservation Hotspot, a WWF Global 200 Marine Eco-region, a WWF/IUCN Centre of Plant Diversity and overlaps a Ramsar wetland and a UNESCO Biosphere Reserve.

CULTURAL HERITAGE

A Roman settlement has been uncovered at Cerro del Trigo. But Doñana since 1262 has been the favourite hunting reserve of the Spanish kings Alfonso X, Ferdinand II, Charles V, Philip II, Philip IV, Philip V and Alfonso XIII. It was granted to the Dukes of Medina Sidonia in 1300 who preserved it as a hunting park for 500 years. One duchess, Doña Ana, who lived there, is supposed to have given the area her name. El Palacio de Doñana was once owned by the Duchess of Alba where she was painted by Goya. From 1737, stone pines were planted widely, but the clearance of coastal junipers later in the century destabilised the sand dunes which became mobile.

LOCAL HUMAN POPULATION

Wood gathering, charcoal production, cattle- and horse-grazing, beekeeping and fish farming occur within the Park, and twenty-five families, mostly park staff, live there. Irrigated rice farming and market gardening in the surrounding area are a constant problem, as are adjacent tourist developments at Matalascañas which was founded in 1967, and now attracts 30-40,000 visitors each summer. There is also a religious festival at El Rocio, which brings large crowds of 3-5,000 pilgrims every spring. It is increasingly under the control of the Park administration to safeguard the protected area.

VISITORS AND VISITOR FACILITIES

Entrance is free, but requires a permit and a professional guide. In 2005 visitors to the site numbered 143,000 (PND, 2005). There are two well equipped visitors' centres at El Rocio and El Acebuche which receive 250,000 visitors a year, and an ethnological museum in the Palacio Acebron. There are four other visitors' centres: one on the north edge (Valverde) and another in Sanlucar (the Ice Factory). There is a well-developed system of guided tours, observation points, bird hides and marked trails both short and long. Services are provided by a local cooperative. Education materials include student and teachers' guides, displays, and trained teachers for visiting school parties (Grunfeld, 1988). Two excursions in 4WD vehicles (238 people per trip), and one boat tour are allowed each day. Birdwatching is rewarding anywhere in the area, but the dense undergrowth can hamper viewings of mammals. Entry to the adjoining Natural Park is not restricted.

SCIENTIFIC RESEARCH AND FACILITIES

Research in the Park is of international scientific importance. Ornithological research has been done since the 1950s and studies have since been carried out on vertebrate zoology, botany, ecology, plant ecology, entomology, limnology, geography, ethology, pesticides and diseases. Current research is concerned with endangered species, ecological interactions and population dynamics, on contamination of the water draining into the park, studies of the regeneration of the park's water system and continual monitoring of animals and conditions. The scientific research is coordinated by the director of the Doñana Biological Station where there is accommodation for 12 scientists and many facilities. The station is dependent on the Council of Scientific Research (*Consejo Superior de Investigaciones*

Científicas, CSIC). headquartered in Seville. A complete list is available of the wide range of researches carried out and proposals presented from 1988 on are given in the annual reports of the CSIC.

MANAGEMENT

The National Park is in good condition. It is managed with the assistance of a committee of 32 stakeholders (*Patronato de Doñana*) which includes local landowners, farmers and conservationists. It is also subject to a wide range of organisations and interest groups. It is protected by law from hunting, drainage, forestry plantation and excessive tourist exploitation. Zoning was laid down in the 1991 management plan. This includes Special Use zones with buildings, Park facilities, hamlets etc (173 ha); Recreation and Interpretative zone with visitors centres and traditional trails (382 ha); Intermediate Restricted zone surrounding visitors' centres where tourists may move around freely (100 ha); Managed Nature Reserves and closed Scientific Zone, with access restricted to Park managers and staff, researchers, private owners, their staff, and authorized people only (53,596.7 ha).

Management plans exist for the declining populations of the Iberian lynx and the Spanish imperial eagle. Dispersing young male lynx are vulnerable to road kills: four lynx were killed in March 2002 alone. WWF Spain/ADENA has urged closure of new roads, the restoration of rabbit populations and potential habitats for the imperial eagle, lynx-friendly management on local estates, monitoring and captive breeding. In March 2002 the state launched an €8 million initiative to save the lynx and in 2005 five young were born in captivity in the Park. Plantations of exotic species are gradually being converted to indigenous habitats (Gil, 1993). However, a regional approach is needed for successful recovery plans. Another regional issue is water management for which a plan was approved in 1994. In 1998 the €83.5 million landscape and hydrological *Doñana 2005* regeneration project was launched to restore the marshland channels, recover filled marshlands, treat the wastewater of El Rocio, restore the permeability of the marsh with the Guadalquivir estuary and, in the Green Corridor program, to create a green corridor between Doñana and the Sierra Morena, from which the Guadiamar river flows. This is a basin-wide plan unlike previous more limited schemes, already half completed in 2002 (Jardin *et al.*, 2001) and is slowly progressing. A new Management Plan for the Park was approved in 2003. In 2005 the *Doñana 2005* Restoration Project Scientific Board approved recovery of 1,600 ha of marshland which had been converted to poor farmland, and the pulling down of 40 km of anti-flood walls (Anon, 2005). By 2010, five of eight initial wetland and marsh restoration projects had been completed (UNESCO, 2010)

MANAGEMENT CONSTRAINTS

A WWF report in 2009 *Environmental Flows in the Marshland of Doñana National Park* showed that freshwater inflow into the site's marshlands had been reduced by 80%, reducing the plant life by almost as much and the wading birds dependant on it (UNESCO, 2010). The seasonal wet and dry crop cycle is vulnerable to the failure of winter rains which can severely affect the ecosystem. There were bad droughts in 1980-1 and at the beginning of the 1990s. However, such dry periods are natural and have occurred many times during the last two centuries. More serious is contamination by agricultural runoff upstream from cattle waste, nitrogenous fertilisers and the uncontrolled use of pesticides used to rid ricefields of the introduced American crayfish *Procambarus clarkii*. A die-off of some 30,000 birds in 1986 attributed to this cause may have been due to botulism caused by stagnant water (Grunfeld, 1986). More seriously, continued land reclamation for ricefields, strawberry farms, orchards, salt works and fish farms, and water extraction for agricultural development and irrigation schemes north of and even within the Park's borders (some 1,000 illegal boreholes exist) have modified the hydraulic regime of the marshes and polluted their waters (Llomas, 1988; Hollis *et al.*, 1988). This has diverted natural canals that used to bring water to the Doñana marshes which may therefore eventually dry up, and will create a build-up of salt in the soil unless the over-exploited aquifers are replenished (Luke, 1992). A project to build a canal which would partially restore the former hydrological system has been considered. Illegal upstream water extraction and pollution from a proposed expansion of the port of Seville may also effect conservation in the area.

Increased tourist development near the Park, poaching, illegal fishing, particularly for crayfish and crabs, which disturbs breeding birds, and over-grazing by domestic livestock are also management problems (Gil, 1993), as are the threats to the populations of Iberian lynx and imperial eagle. Measures have been taken to preserve the local population of lynx which is probably too small to obviate inbreeding. There is much interest from NGOs but little funding from the EU for its conservation compared with the support given to industrial agriculture. The increasingly busy traffic threatens its habitat and causes many roadkills: some 27 out of a total of 54 over the past decade, and underpasses for fauna have been built. Only a series of conservation measures will arrest the decline of its habitat

and sources of food (Ward, 2004; UNESCO, 2002). It was such concerns that led to the inclusion in 1990 of the Doñana National Park in the Montreux Record of Ramsar sites requiring priority attention because of the potential for change in their ecological character. In the same year the Ramsar Convention Conference recommended actions that the Spanish Government and regional authorities could take. In the late 1980s and early 1990s the Park was to be the setting for a proposed 32,000-bed holiday resort, *Costa Doñana*, on its borders north of Matalascañas. The development was successfully stopped by environmentalists (Egger, 1991), but this deeply antagonised some local people because of the loss of tourist revenue. The impacts of the annual pilgrimage to El Rocio and of cattle invading from the north are also considerable as are the potential impacts of the port of Seville upstream.

In April 1998 the Park was drastically threatened by the worst single ecological disaster Europe had suffered up till then. 6 million tonnes of heavy metal contaminated muds from an impoundment at Aznalcollar iron pyrites mine, 40 kilometers north of the Park, broke through the dam and entered the Guadiamar River. Urgent measures diverted the flow from the Park into the Guadalquivir, but the Guadiamar valley farmland and some coastal shrimp and fish farms were poisoned and restoration is slow and expensive. The cost of this is still being sought by the state government. The valley is recovering but acid water still escapes and the river's fish have not yet reappeared. The Park is managed by ICONA and the Council of Scientific Research, but with too few staff to prevent the extensive poaching. The surrounding areas are managed by the *Instituto Andaluz de Reforma Agraria* and the *Agencia del Medio Ambiente de la Junta de Andalucía*. There is little cooperation between these bodies (ADENA WWF, n.d.). A need to integrate land use planning for the irrigation and construction projects in the surrounding area to minimise their impacts was noted in the UNESCO 2002 WHC Report: coastal windfarms exist near the reserve, and more are planned which may affect the area's imperial eagle population. A new threat likely to intensify sea traffic and oil spill contamination of the coast of the property is the expansion of the La Rabida refinery to the west with the construction of a pipeline to the Bilbao refinery in Estramadura which might cross part of the site (UNESCO, 2010).

STAFF

In 1995 there were 178 staff, under a Director-Conservador. Of these, 79 were permanent employees and the rest seasonal workers. In 1995 staff were deployed in five departments: conservation (11), works (42), public services such as interpretation, education and visitor management (33), guards (77), and administration. In addition, there is an EU advisor. In 2004 two training initiatives, were set up, on the Park's heritage and on its interpretation (PND, 2005).

BUDGET

The average annual budget for the period 1990-1995 was 1,400 million pesetas (US\$11,000,000). But between 1998 and 2005, €83.5 million was spent on the Doñana 2005 redevelopment projects. The present budget is very sufficient

LOCAL ADDRESSES

The Director, National Parks Department, Direccion Generale de Conservacion de la Naturaleza, Ministerio de Medio Ambiente, Gran Via de San Francisco 428005 Madrid, Spain.

The Director-Conservador, Parque Nationale de Doñana, Centro Administrativo El Acebuche, 21760 Matalascañas, Huelva, Spain.

Doñana Biological Station of C.S.I.C., Avda. María Luisa, s/n. Pabellón de Perú, 41071 Sevilla.

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DATE

1982, 7-1986, 7-1994, 7-1995, 4-1998, 12-2002, 7-2005, 8-2010, May 2011.