Doñana National Park

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: Spain
Inscribed in: 1994
Criteria: (vii) (ix) (x)

Doñana National Park in Andalusia occupies the right bank of the Guadalquivir river at its estuary on the Atlantic Ocean. It is notable for the great diversity of its biotopes, especially lagoons, marshlands, fixed and mobile dunes, scrub woodland and maquis. It is home to five threatened bird species. It is one of the largest heronries in the Mediterranean region and is the wintering site for more than 500,000 water fowl each year. © UNESCO

SUMMARY

2020 Conservation Outlook
Finalised on 02 Dec 2020

Doñana National Park is threatened by a significant number of issues, the most serious being the long-term and continuing reduction in water quantity and quality within the site. Although the park managers are doing a good job of managing the World Heritage site itself with excellent public awareness and management activities, plus the decision not to dredge the Guadalquivir River and to develop and implement the “Special Management Plan of the Irrigation Zones located to the North of the Forest Crown of Doñana” has been very positive, there are still other decisions pending that may have an impact on the site. Until external threats such as water management (which also has an effect on alien invasive species and wildfires) can be resolved, and given the demonstrated deterioration in some of the site’s Outstanding Universal Value, the Conservation Outlook for the site remains of Significant Concern.
FULL ASSESSMENT

Description of values

Values

World Heritage values

► Exceptional coastal and marshland ecosystems

Because of its unique composition of sedimentary deposits and ongoing coastal and fluvial processes, the property comprises an exceptionally wide range of well-preserved coastal and freshwater marsh ecosystems (Ramsar, 2007). Marsh ecosystems which support the greatest bird diversity are highly seasonal and typically fall dry in summer. They are characterized by steep salinity gradients with associated shifts in flora and vegetation. Coastal ecosystems are dominated by beach and dunes, the latter partly mobile and sparsely vegetated, and partly immobile and covered in Rhamno-Juniperetum Sophora communities with a notable degree of endemism (UNEP-WCMC, 2011). Doñana holds both permanent and temporary ponds. The system of temporary ponds of Doñana is one of the most important in Europe, due to the abundance and diversity of ponds, and their natural origin. In rainy years, around 3,000 ponds can be flooded in Doñana, with different sizes and hydroperiods, allowing for the conservation of a great number of species of zooplankton, macro-invertebrates, amphibians and aquatic macrophytes (Serrano et al., 2006; Díaz Paniagua et al., 2014; Díaz Paniagua & Aragonés, 2015).

► Extraordinary terrestrial ecosystems

The terrestrial inland part of the property is characterized by extended heathland and open forest ecosystems which are a major habitat of the Iberian Lynx Lynx pardinus. The area belongs to the WWF Global 200 priority ecoregion “Mediterranean Forests, Woodland and Scrub” (WWF, 2012). Since the inclusion of the property in the World Heritage list, the systematic removal of eucalyptus and the naturalisation activities and reforestation of degraded areas or areas occupied by exotic species has lead to a notable improvement and local regeneration of habitats and communities of interest (State Party of Spain, 2016).

► Globally significant bird migration hotspot

Doñana, and particularly its marshes, is of international importance for numerous species of breeding, staging and wintering waterbirds, and is a bottleneck along the Western Europe - West African migratory flyway, with 400,000 wintering and up to 6 million migratory birds during peak migration periods (UNEP-WCMC, 2011). Migratory and wintering groups of particular importance include ducks and geese, storks and raptors, as well as gulls and shorebirds. 20,000 storks and raptors regularly pass over the area. The area overlaps with the Important Bird Area of global importance “Guadalquivir Marshes” (BirdLife International, 2017a), recently identified as IBA in Danger by BirdLife International and SEO/BirdLife (BirdLife International, 2017).

► Diversity of flora

Over 750 species of higher plants have been recorded in the property, including a number of threatened species growing in four main vegetation types: marshlands/aquatic, salt-tolerant, open forest and heath, with healthy populations of species typical to these vegetation types. Noteworthy protected and nationally endemic species include Micropyrosis tuberosa, Linaria tursica, Gaudinia hispanica, and Vulpia fontquerana (UNEP-WCMC, 2011).

► Exceptional diversity of fauna

Doñana has a rich fauna diversity, with 37 species of mammals, 12 of amphibians, 23 of reptiles, and 72 of fishes, plus a large number of invertebrate species (UNEP-WCMC, 2011). More recently, 1,957 species
of animals have been recorded in the property (State Party of Spain, 2016). The most notable element of the property’s fauna is its avifauna, with more than 419 species having been recorded (UNEP-WCMC, 2011), including several globally threatened breeding species such as the Marbled Teal Marmaronetta angustirostris (VU), the White-headed Duck Oxyura leucocephala (EN) and the Spanish Imperial Eagle Aquila adalberti (VU). In addition its huge heronries, with at least eight breeding species of heron and egret, are remarkable. The area overlaps with the Important Bird Area “Guadalquivir Marshes” (BirdLife International, 2017a), but not with any Endemic Bird Area (BirdLife International, 2017b). Another emblematic element of the property’s fauna is the Iberian Lynx Lynx pardinus (EN) with an effective population size around Doñana of about 24 breeding females (Iberlince, 2016). Among the reptiles, particularly notable are the Spur-thighed Tortoise Testudo graeca (VU), and Lataste’s Viper Vipera latastei (VU). Among the fish, the Spanish Toothcarp Aphanius iberus (EN) is noteworthy (UNEP-WCMC, 2011; Crivelli, 2006).

Extraordinary natural beauty

At the time of nomination, the property was noted for its exceptional beauty, solitude and unspoilt nature, particularly its vast flat expanses of wilderness containing diverse habitats (marshes, forests, beaches, dunes, lagoons). Its 38 km long beach is completely pristine, and it possesses spectacular colonies of nesting birds, as well as a unique spectacle of bird migration (IUCN, 1994).

Assessment information

Threats

Current Threats

There is a large number of threats to Doñana National Park, many of which are individually low risk, but the high chance of at least one occurring presents a combined high risk to the World Heritage site. Both, the regular tourist pressure and annual El Rocio pilgrimage present high threats. Alien invasive species and hunting are low threats, but road kills are a high threat. The site has undergone significant change both over the course of the 20th century and more importantly, during the past 20 years. But it is difficult to separate natural hydrological processes from human-induced alterations. Large annual variations in inundated marsh area are largely attributable to variations in rainfall. The abstraction of groundwater has led to significant declines in many underlying aquifers, but this has not been conclusively linked to changes in the marsh ecosystem. Nevertheless, uncertainty in the knowledge of the link means that a threat remains. Management initiatives put in place to reverse the decline in groundwater levels should reduce or remove the threat from aquifer abstraction.

Problematic Native Species

(Wild boars)

Wild boar population has increased greatly within the National Park in recent years. Wild boars pose one of the key threats to the bird species within the National Park (EBD, 2016).

Tourism/ visitors/ recreation

(Tourism infrastructure development)

Some tourism infrastructure developments near Mazagón were documented in 2008, and the general disturbance from a high level of weekend tourism has been highlighted (WWF, 2008). However, the abstraction of water to supply the town and beach resort of Matalascañas, especially in the summer when more than 90,000 tourists arrive, is significant. It takes place from a set of five wells up to 150 m deep, taking water from the aeolian sands sub-unit of the Almonte-Marismas aquifer. As a result, some nearby lagoons located in the Doñana Biological Reserve, such as Brezo or Charco del Toro, have permanently dried-out since 1976 and 2010, respectively (Hollis et al.,1989; Díaz-Paniagua & Aragonés, 2015). The flooded surface and inundation occurrence of other ponds such as Zahillo have also decreased as a direct consequence of groundwater withdrawal in the coastal resort (Dimitriou et al.,
2017, Fernández-Ayuso et al., 2018). By contrast, Santa Olalla permanent pond seems unaffected at the time (Fernandez-Ayuso et al., 2019), as it is located further from the pumping wells than the above-mentioned ponds and at a preferential groundwater discharge area. According to the latest annual report of the Status of Doñana aquifers (Guadalquivir River Basin Authority, 2020) the coastal and ponds areas are considered to be in a pre-alert status. To address environmental concerns, plans have been put forward to close wells nearer the impacted lagoons and to transfer water from other sectors of the province for public supply.

**Hunting and trapping, Fishing / Harvesting Aquatic Resources**

*Inside site, extent of threat not known*

*Outside site*

Illegal egg collection and bird and large herbivore poaching have been documented from the World Heritage site, as well as illegal fishing and persecution (poisoning) of wild animals (WWF, 2008). There reportedly is also illegal fishing of European eel (Anguilla anguilla) which returns to breed in the lower Guadalquivir. The status of the population is so bad that glass eel fishing has been banned since 2011, although illegal fishing remains a problem. However, due to the relatively effective management of the site, in comparison to other threats this threat is significant, but low.

**Roads/ Railroads**

*Inside site, scattered (5-15%)*

*Outside site*

A number of fenced roads both within and around the World Heritage site are contributing to habitat fragmentation. Despite the fences, there is also a high amount of roadkill including the Iberian Lynx. For example, 2,298 vertebrates were killed on roads inside the site in nine months in 2007 (WWF, 2008). A "Special Plan" implementing the Regulations of the Doñana Region Land Plan is meant to "establish a balance between the development of agricultural activity in the vicinity of Doñana and the environmental impact of this activity", noting the decision that the "functional structure of the agricultural area needs to be compatible with the road system and rural routes providing access to the holdings, and the services and equipment linked to agricultural activity and their users" (State Party of Spain, 2016). It was added that "Measures need to be taken to permeate the agricultural area to allow for the movement of wildlife through the creation of an ecological connectivity, and precautionary measures need to be taken to ensure compatibility with the road system and all the rural routes". Once this is put into place so that fragmentation and roadkill is reduced, this threat will also be reduced, but at this point in time it remains high.

**Water Pollution, Household Sewage/ Urban Waste Water, Industrial/ Military Effluents**

*Inside site, throughout (>50%)*

*Outside site*

The 1998 Aznacóllar mine accident led to the poisoning of the Guadiamar River with heavy metals and other toxic materials, which affected the property (UNEP-WCMC, 2011). In 2013, the regional government issued a public bid for reopening the mine, and in 2015 one international bid was received for its exploitation. In 2016, the State Party reported in its state of conservation report that the project has not proceeded to implementation but a research project has been authorized. In 2019, the State Party shared the project’s EIA and indicated that the IUCN World Heritage Advice Note on Environmental Assessment was expected to be incorporated. In response, the World Heritage Committee urged Spain to prepare a clear risk preparedness plan and rapid emergency response capacities and to submit these analyses for review by IUCN, as soon as they become available and before a decision on re-opening the mine is made (State Party of Spain, 2019; UNESCO, 2019).

In addition, several municipalities on tributaries of the wetlands of the World Heritage site such as Almonte, Rociana de Condado and Matalascañas, reportedly have insufficient waste water treatment systems in place. The Spanish government was fined by the European Union in 2016 for the lack of adequate water treatment in Matalascañas (La Nueva España, 2016).

Contamination from industrial water pollution, including on the Guadalquivir River (CSIC et al., 2011) constitutes a threat, as does pollution from agriculture (fertilizers and pesticides). However, imported
water for irrigation comes from the Andevalo-Chanza dams, whose basin is sparsely populated and not intensively cultivated, so its quality is good.

In 2019, the State Party reported the hydrological condition inside the World Heritage site as stable (State Party of Spain, 2019), however the annexed 2016-2017 Guadalquivir Hydrographic Confederation report on the status of the aquifers indicated a stabilization of the aquifer sections inside the site at “pre-alarm” and “alert” levels, whilst four sections partly adjoining the northern boundary of the property are reported to be in an “alarming” state (UNESCO, 2019). Furthermore, infringement proceedings issued by the European Commission regarding the Habitats and Water Framework Directives are currently underway (UNESCO, 2019).

The combined pollution from various sources of water entering the site constitutes a high threat, contributing to the entrance of nutrients and eutrophication.

### Fire/ Fire Suppression

(Internal forest fires)

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<th>Inside site</th>
<th>Low Threat</th>
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<td>Widespread (15-50%)</td>
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In 2008 and 2009, a large number of fires inside and in the vicinity of the property affected 84,000 ha of the site and its surroundings. Fires affect forest areas in particular and appear to be largely caused by humans, with more than 40% started intentionally (WWF, 2010). In 2017, a large fire which occurred outside of the site threatened the site and caused problems with the Iberian Lynx captive breeding facility (El País, 2017). The fire affected about 40 species of flora, including the endemic Linaria tursica, 38 species of mammals and 75 species of birds. In addition, 13 habitats of community interest and 3 of primary community interest have been affected (SEO/BirdLife, 2017a). No fires have been reported to impact the property since, and the current threat appears to be low, however climate change will also influence the number and intensity of wildfires in future (Green et al., 2017).

### Invasive Non-Native/ Alien Species

(Alien plant and animal species)

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Both alien plant (e.g. Eucalyptus, Acacia spp., giant cane Arundo donax, burdock Xanthium strumarium, Nicotiana glauca and alien floating fern Azolla filiculoides) and alien animal species (e.g. American Crayfish Procambarus clarkii in the wetlands, Chinese Mitten Crab Eriocheir sinensis in the Guadalquivir estuary) have been detected inside the property (UNEP-WCMC, 2011; State Party of Spain, 2016; Green et al., 2017). 96% of the fish biomass inside the marshland of the National Park are invasive alien species (Moreno et al., 2013). These alien invasive species are currently classed as low threat although they may in effect be a higher threat to the OUV of the site, particularly with climate change and eutrophication of the water. Three species of fish have disappeared from the site, caused in part by invasive species (WWF, 2017).

### Crops

(Reduced water supply)

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The floodplain marshes of Doñana Park are a flood-pulse system in which their water levels and extent of inundation are determined primarily by high surface flows arriving rapidly after winter rainfall from the Guadiamar River. Groundwater only makes a significant contribution to flows is late summer. Other small tributaries, such as the La Rocina River also provide some freshwater to the marshes and are partially surface and partially groundwater-fed. The southern extreme of the marshes, where the Guadiamar River joins the Guadalquivir estuary, can be inundated by brackish water at high tide, particularly since re-opening of the levee in 2013/15, which previously separated Doñana from the Guadiamar. There is thus a gradient of fresh to brackish marshes from north to south.

The average rain in the area is 540 mm (1970/71-2018/19). The area has suffered two prolonged periods of heavy drought 1979-80 to 1982-83 (305 mm average rain) and 1991-92 to 1994-95 (350 mm) and is experiencing a long mid-dry period since 2011/12, with only 460 mm of average rain. This circumstance must be taken into account when interpreting current piezometry. The Doñana area is underlain by the Almonte-Marismas detritic aquifer composed of deltaic sands. This aquifer outcrops in
the north but inclines to the south, being covered by up to 100 m of clay beneath the Doñana marshes. Water from the aquifer has been abstracted for agriculture, such as strawberries (now covering 6000 ha in the eastern area), fruits, cotton, rice, and orchards. The CHG has recorded water levels in a very dense network of 292 piezometers with some data going back before 1974. In many piezometers, groundwater levels are consistent with rainfall. However the CHG declared that three of the five groundwater bodies that share the aquifer to the north of Doñana National Park are at risk of failing to achieve Good Status as required under the European Union Water Framework Directive (WFD) because of low and declining groundwater levels, even taking into account the low rainfall since 2011. Some aquifer water levels are lower than during the drought of the mid-1990s, though others are higher. This has given rise to fears that the water supply to Doñana is at risk due to abstraction. However, the available evidence is that the detritus aquifer does not contribute significantly to flooding of the marshes and satellite images suggest that the area of marsh has not fluctuated more than would be expected by changes in rainfall. Nevertheless, uncertainty in knowledge of the interaction between aquifers and with rivers, marshes and lagoons means that a risk remains. The State Party report (2016) recognised the need to set limits on the extraction of groundwater resources for irrigation and the associated irrigated area that would protect the ecosystems in the Doñana Natural Area. To implement this, abstraction from the detritic aquifer is being reduced as part of a CHG plan that combines five measures: (1) stopping illegal abstraction (2) reducing the area of groundwater-irrigated land (3) adjusting legal abstraction during dry periods (4) providing surface water from dams (e.g. Agrio in the Guadiamar) and other catchments (such as the Guadiana River) for irrigation to replace groundwater and (5) enhancing control with water agents, telecontrol of water meters and remote sensing of land use. Some 5 hm3 per year have already been provided to offset groundwater abstraction, but 15 hm3 per year are still required, which will necessitate new infrastructure. Closing the first wells involved a 7-year practical, administrative and legal process. However, implementing the CHG’s plan, which includes closure of 544 wells, should return the degraded aquifers to Good Status by 2027. Achievement of Good Status is in the interests of abstractors as it ensures protection of future water resources in the aquifer. Since Good Status equates to near-natural groundwater levels, achieving it should adequately protect any groundwater-dependent ecosystems. Thus, recovery of the detritic aquifers to Good Status should remove any potential hydrological risk to Doñana of abstraction from its underlying aquifers (IUCN Consultation, 2020).

Livestock Farming / Grazing
(Livestock)

The vegetation cover of the marshland of the marsh area of the National Park shows evident signs of strong overgrazing. There is a positive correlation between the breeding success of waterfowl colonies and their location in areas with perimeter fencing of livestock exclusion in certain areas of the marsh, areas where these structures have kept the marsh vegetation in good condition, indicating the negative effects of overgrazing on the conservation of these birds. Overgrazing compromises the state of conservation of aquatic birds in Doñana in the Plan of Recovery and Conservation of Birds of Wetlands of Andalusia (SEO/BirdLife, 2015).

Tourism/ visitors/ recreation
(Tourism pressure from pilgrimage of El Rocío)

No impact studies have been carried out since the admission of the ‘rocieros’. The pilgrimage of El Rocío attracts more than 40,000 people, who cross areas of high ecological value during the breeding season of birds, which undoubtedly generates important and significant impacts on biodiversity that have never been quantified (SEO/BirdLife, 2017a). Domestic waste, including plastic bags and bottles, left by pilgrims is a significant, though temporary, issue.

Habitat Shifting/ Alteration, Droughts
(Climate Change)

The European Environment Agency has stated that countries of the Mediterranean have experienced
decreased precipitation and increased temperature over past decades. This trend is projected to worsen with reductions in river flows (Estrela et al., 2012) and recharge to aquifers (Molano-Leno et al., 2018; Naranjo-Fernández et al., 2020) possibly diminishing groundwater inputs to the property (Guardiola-Albert & Jackson, 2011). The size of permanent and semi-permanent lagoons is strongly correlated with annual rainfall (Díaz-Paniagua & Aragonés, 2015). Recent research suggests that a decline in species, such as zooplankton (Florencio et al., 2020), has been related to long-term reduction of wet period length of temporary freshwater ponds within the Park. Species of shrews, mice and rats have been declining with increasing temperatures and lighter rainfall (Santoro et al. 2017). Diving birds and vegetation gleaners are likely to decline in future climate scenarios, while many small wading birds will benefit from changing conditions. Resident species and those that breed in this wetland may be more negatively impacted than those using this area for wintering or stopover (Ramírez et al, 2018). Climate change will also influence the number and intensity of wildfires as well as affect a wide range of additional potential threats including an increase in alien floating plants and cyanobacterial blooms (Green et al., 2017) which need to be studied in more detail. A study (Scheffer et al., 2015) alerts a number of actions carried out in Doñana, leaving it vulnerable to climate change.

The national programme to monitor closely global change in the Spanish National Parks does not yet include Doñana (IUCN Consultation, 2020), but its incorporation could provide indicators for its particular types of wetland ecosystems that are not covered by other coastal National Parks participating in the programme. Also, it might be helpful to include Doñana as a particularly helpful case to illustrate concrete adaptation and mitigation measures for the regional climate change strategy of the government of Andalucía.

### Potential Threats

**Low Threat**

Potential threats include the re-opening of the Aznalcóllar mine that caused a major pollution incident in 1998, as well as the potential future expansion of a dam. Projected future reductions in rainfall and greater variability due to climate change pose a major threat. Climate change may also increase threats from fire and invasive species. Potential threats may also arise from future refinery/shipping accidents.

**Water Pollution**

*(Potential impacts of refinery/port and tanker traffic accidents and pollution)*

The site is highly exposed to potential impacts of refinery/port or tanker traffic accidents and pollution in the access of the extended La Rábida oil refinery at Huelva, and there have been minor oil spills already, such as in 2009 (UNESCO/IUCN/Ramsar, 2011). Because of the proximity (ca. 35 km) and size of the facility, this is a high potential threat. Navigation in the Guadalquivir also poses a threat, with boats being stranded almost every year.

**Shipping Lanes**

*(Further dredging of lower Guadalquivir River)*

A project to dredge the Guadalquivir river to a depth of 8m to improve access to the Port of Seville would have wide-ranging consequences for the dynamic, morphology and biodiversity of the river and the World Heritage site. The government has confirmed that regarding the deepening dredging, "the project has been neither authorised nor implemented and that, in view of the conclusions of the Scientific Committee, the grounds of the judgment of the Supreme Court, the stance of the World Heritage Committee and the assessment of the Property's management and participation bodies, the project will not be allowed to go ahead" (State Party of Spain, 2016). In 2019, it was confirmed that deep dredging will be removed from the new Guadalquivir Basin Hydrological Plan (2021-2027) (State Party of Spain, 2019). This potential threat can therefore be viewed as very low, although if the decision were to be changed the threat would be very high.
IUCN World Heritage Outlook: https://worldheritageoutlook.iucn.org/
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Dams/ Water Management or Use
*(Increased irrigation for rice paddies and dam construction on the Guadiamar River)*

In 2014, a project to increase water use of rice paddies upstream of the World Heritage site and dam construction on the Guadiamar River were reported (IUCN, 2015), which would likely have a negative impact on the property and which the Committee expressed its utmost concern about (UNESCO, 2014). In 2016, the government reported that a detailed study/draft plan analysing the possibilities of the enlargement of the Agrio reservoir and the environmental feasibility of the works will be undertaken (State Party of Spain, 2016), and in 2017 the Committee acknowledged that the proposed dam expansion was still at a conceptual stage and requested the government to ensure that impacts including cumulative impacts on the OUV of the site should be assessed (UNESCO, 2017). In 2019, the government then confirmed that the situation remained unchanged since 2017 (State Party of Spain, 2019), so this currently remains a low potential threat.

Oil/ Gas exploration/development
*(Gas exploitation and storage projects in the vicinity of the property)*

The impact of several mining and gas exploitation and storage projects in the vicinity of the World Heritage site could have a potentially cumulative effect on it. Four gas extraction and storage projects located 3 to 25km from the site are undergoing approval processes: Marismas Occidental, Marismas Oriental, Aznalcázar, and Saladillo. Of these four projects, two have been subject to an Environmental Impact Statement and implementation has started for one of those (Marismas Occidental). For the other two which are partially located in the Natural Park, for Marismas Oriental authorization has been requested and denied because of overlap with the Natural Park, while for Saladillo no request has been made yet.

Overall assessment of threats

The current threats to the World Heritage site, in particular the annual and decadal variations in rainfall, and long-term and continuing reduction in water quantity and quality in aquifers and rivers, are likely to get worse under climate change. These may combine in the future with an increased threat of wildfires, pollution and invasive species to present an overall high level of threat. There is a large number of threats to the Doñana Park, many of which are individually low risk, but the high chance of at least one occurring presents a combined high risk to the property. Both, the regular tourist pressure and annual El Rocio pilgrimage present high threats. Alien invasive species and hunting are low threats, but road kills are a high threat. The site has undergone significant change both over the course of the 20th century and more importantly, during the past 20 years. But it is difficult to separate natural hydrological processes from human-induced alterations. Large annual variations in inundated marsh area are largely attributable to variations in rainfall. The abstraction of groundwater has led to significant declines in many underlying aquifers, but this has not been conclusively linked to changes in the marsh ecosystem. Nevertheless, uncertainty in the knowledge of the link means that a threat remains. Management initiatives put in place to reverse the decline in groundwater levels should reduce or remove the threat from aquifer abstraction.

Protection and management

Assessing Protection and Management

Management system

Management of the World Heritage site (both the National Park and the Nature Park) is under the
Doñana National Park holds the European Diploma of Protected Areas since 1985 that was renewed for 2010-2020, with an annual progress report requested (CoE, 2010; CoE, 2017, State Party of Spain, 2016). This diploma indicates good overall management effectiveness. The park was added to the pilot phase of the IUCN Green List (IUCN, 2015) and is undergoing renewal in 2019 (IUCN Consultation, 2020). Overall management effectiveness is good, apart from the inability to manage and control key external threats.

Boundaries

The boundaries were generally considered adequate upon inscription (IUCN, 1994), and improved after extension in 2005 so that the World Heritage site and the National Park had the same boundaries (World Heritage Committee, 2005). There is no buffer zone but the surrounding Natural Park largely fulfills this function. It has been suggested to add a marine coastal area to the property to increase the biodiversity values conserved within it (Oceania, 2010; UNESCO/IUCN/Ramsar, 2011).

Integration into regional and national planning systems

A regional and national planning system, including the Doñana Territorial Management Plan (2003), a Plan for the Sustainable Development of Doñana, and a Special Management Plan of the Irrigation Zones Located to the North of the Forest Crown of Doñana (2014) is in place. However, concerns have been raised over the past decade that these and other planning documents have not resulted in reversing the trend towards reduced water quantity and quality in the property to date, and have not halted illegal water abstraction (Carmona et al., 2012; WWF, 2016). The Guadalquivir Hydrographic Confederation has started to implement a plan to reduce abstraction from the aquifer underlying Doñana that has led to parts of the aquifer failing to meet Good Status under the Water Framework Directive. The plan combines five measures: (1) stopping illegal abstraction (2) reducing the area of groundwater-irrigated land (3) adjusting legal abstraction during dry periods (4) providing surface water from dams (e.g. Agrio in the Guadiamar) and other catchments (such as the Guadiana River) for irrigation to replace groundwater and (5) enhancing control with water agents, telecontrol of water meters and remote sensing of land use. Some 5 hm3 per year have already been provided to offset groundwater abstraction, but 15 hm3 per year are still required, which will necessitate new infrastructure. Closing the first wells involved a 7-year practical, administrative and legal process. However, the various authorities involved are confident that by implementing the CHG’s plan, which includes closure of 544 wells, the degraded aquifers will be improved to Good Status by 2027. Achievement of Good Status is in the interests of abstractors as it ensures protection of future water resources in the aquifer. The WFD also requires that aquifer levels are sufficient to maintain surface waters and ecosystems dependent on groundwater. Since Good Status equates to near-natural groundwater levels, achieving it should adequately protect any groundwater-dependent ecosystems. Thus, recovery of the detritic aquifers to Good Status should remove any possible hydrological risk to Doñana of abstraction from its underlying aquifers (IUCN Consultation, 2020).

Relationships with local people

The Participation Council of Doñana, a consultative body including representatives of 60 bodies, institutions or social agents linked to the Doñana Natural Area, meets annually to approve reports on activities and outcomes of the protected area, as well as the annual Work and Investment Plan (State Party of Spain, 2016). However, some concerns have been expressed that this council is composed of too many institutional stakeholders without a direct relevance to the site’s management, and that conservation NGOs and technical experts are not sufficiently represented. There is still a lot of room for
improvement, creating real multi-sectoral working groups (that include people not represented in the Council), where consensus is reached on the best solutions for the challenges of Doñana.

▶ Legal framework
Mostly Effective
The site’s legal framework consists of the Law 91/1978 of 28 December 1978 which established the National Park; the Special Plan of 1986, the Plan Director Territorial de Coordinacion 204/1984 of 17 July 1984 as well as the Plan de Ordenacion del Territorio del Ambito de Doñana 341/2003 of 3 December 2003, which protects and enhances spaces of environmental value and contributes to economic values (UNESCO/IUCN/Ramsar, 2011). It is further supported by a number of general national laws, such as on coastal protection, biodiversity and nature protection. In 2016 protection has been reinforced: by Royal Decree 389/2016 the State has adopted a new and more demanding Master Plan for the National Park Network in accordance with the new Law on National Parks of 2014. By Decree 142/2016, the Junta de Andalucía has approved new planning documents for the Natural Site (National Park and Natural Park) and the expansion by almost 14,500-hectare of the Natural Park (State Party of Spain, 2016). The framework is effective overall, although concerns persist regarding implementation, particularly regarding illegal wells and irrigated horticulture in the Corona Forestal (WWF, 2009; WWF, 2016).

▶ Law enforcement
Mostly Effective
WWF (2016) notes that there are 1,000 illegal wells and 3,000 hectares of illegal farming fields in the area surrounding the World Heritage site which they feared has had a great impact on water flows and quality within the site. Closing of illegal wells has taken a long time with the first involving a 7-year practical, administrative and legal process. However, implementation of a major plan, which includes closure of 544 wells, is well underway and aims to return the aquifers to Good Status by 2027. Since Good Status equates to near-natural groundwater levels, achieving it should adequately protect any groundwater-dependent ecosystems. Thus, recovery of the detritic aquifers to Good Status should remove any possible hydrological risk to Doñana of abstraction from its underlying aquifers (IUCN Consultation, 2020).

▶ Implementation of Committee decisions and recommendations
Some Concern
The State Party has addressed some of the recent Committee decisions and recommendations (State Party of Spain, 2019). It is positive that the State Party has stated that the “Special Management Plan of the Irrigation Zones located to the North of the Forest Crown of Doñana” is being implemented and that the Guadalquivir will not be dredged. It is less clear how some of the other recommendations (UNESCO, 2015; IUCN, 2015) are being implemented, although they appear to require further studies.

▶ Sustainable use
Mostly Effective
There is only limited natural resource use but significant tourism use (UNEP-WCMC, 2011). Natural resource use consists of planned sustainable use of shellfish, bees, pine cones and forestry around and also inside the property (UNESCO/IUCN/Ramsar, 2011). These do not appear to influence the values of the site, and their management is considered mostly effective. However, agricultural water use outside the property is clearly unsustainable (Carmona et al., 2012). The Sustainable Agriculture Initiative has made a “Doñana Strawberry and Sustainable Water Management Group Position statement” (SAI, 2016). Although no scientific data have been collected, there appears to some pressure inside the property from overgrazing, indicated by soil compaction, nest destruction, phosphorous mobilization that could be contributing to eutrophication, tuberculosis propagation etc. (IUCN Consultation, 2017).

▶ Sustainable finance
Mostly Effective
The periodic report (State Party of Spain, 2014) notes that 80% and 20% of funding for the World Heritage site comes from the regional and national governments respectively, and that existing sources of funding are secure in the medium-term and planning is underway to secure funding in the long-term. No annual budget information is provided, although it is noted that the available budget is inadequate for basic management needs and presents a serious constraint to the capacity to manage. A number of
projects are funded from EU funds or other sources (State Party of Spain, 2016).

**Staff capacity, training, and development**

Highly Effective

In 2016 a total of 251 park staff were reported: 138 including administrators, guards, technicians, educators plus 113 staff funded through projects (State Party of Spain, 2016). This compares with 178 staff reported in 1995 (World Heritage Committee, 2006). A capacity development plan or programme is in place and partially implemented; some technical skills are being transferred to those managing the site locally but most of the technical work is carried out by external staff (World Heritage Committee, 2014).

**Education and interpretation programs**

Highly Effective

There is a planned and effective education and awareness programme that contributes to the protection of the World Heritage site (World Heritage Committee, 2014).

**Tourism and visitation management**

Mostly Effective

The World Heritage site and the surrounding natural space receive about 400,000 visitors annually. The overall Doñana Natural Space which includes the site and beyond has 8 excellent visitor centres with walking and bicycle trails, observatories and recreational areas among other infrastructure. Guided visits are restricted to specific areas of the park and outsourced to a company with special vehicles, and numbers of visitors and timing are strictly regulated. However, weekend and summer tourism are intense and increasing tourism has an effect on water supplies. The pressure from increased number of tourists associated with the pilgrimage is significant and needs to be managed.

**Monitoring**

Mostly Effective

There are many monitoring projects on biodiversity undertaken by the Doñana Biological Station on a wide range of flora and fauna as well as on climate change impact (State Party of Spain, 2016; CSIC, 2017). WWF has conducted regular forest fire monitoring during the early 2000s (WWF, 2009). Increased monitoring on water flows and quality is required (WWF, 2016). The Doñana Biological Station (EBD) is working on a new set of indicators, which could be further improved to become real meaningful tools to improve and adjust management. The Confederacion Hidrográífica del Guadalquivir collect monthly data in a very dense network of 292 piezometers, 174 of them with 25 or more years of data, and some records going back before 1974, and twice a year also monitors the irrigated area using remote sensing (IUCN Consultation, 2020).

**Research**

Highly Effective

Research at the site is led by the Doñana Biological Station, under the authority of the Spanish Council for Scientific Research (CSIC). There is high-level research into species ecology and evolution, ecosystem conservation, invasive species, global change impacts and other areas (CSIC, 2017).

**Overall assessment of protection and management**

Some Concern

In general protection and management of the World Heritage site is effective or even highly effective. The Park has strong collaboration with authorities that address threats originating from outside the property, including conflict over water use with the agricultural sector, but it is not within their control, and therefore requires greater regional and national collaboration to address this issue. Other aspects of park management including replanting of previously degraded areas, tourist management, education and research, are highly effective.

**Assessment of the effectiveness of protection and management in addressing threats outside the site**

Some Concern

A major issue has been how to manage water use and quality outside of Doñana National Park, as it was feared that groundwater use for irrigation in particular was having a serious detrimental impact on the OUV of the World Heritage site. Although it is prudent to be precautionary, there is a lack of
strong evidence that groundwater plays a major role in determining the hydrology of the Park, but scientific uncertainty means a threat remains. The plan produced by the Guadalquivir Hydrographic Confederation is now being implemented and many illegal groundwater wells are being closed. So any threat may be removed over the next few years.

State and trend of values

Assessing the current state and trend of values

World Heritage values

► Exceptional coastal and marshland ecosystems

Given the dramatic variations in the extent of coastal and particularly marshland ecosystems from 150,000 ha to 30,000 ha since the middle of the 20th century (WWF, 2009), the long-term state and trend of the values of the World Heritage site are of great concern (UNESCO/IUCN/Ramsar, 2011). The extent of inundation of the marshes is determined largely by rainfall, which is highly variable from year to year and likely to become even more so in the future. Projected higher future temperatures are likely to mean greater evaporation and lower recharge of aquifers. Currently several major aquifers underlying Doñana are failing to meet Good Status due to abstraction for irrigated agriculture. Whilst this may have some impact on the Doñana National Park, there is little evidence that this has contributed significantly to past ecological change and abstraction is now being significantly reduced with the aim of returning the aquifers to Good Status. Variations in rainfall have also caused fluctuations to the aeolian sands aquifer that supports coastal lagoons and some of which are drying-out more quickly and more often than previously, resulting in ecological change. This is likely to increase in the future. Abstraction of water for public supply to coastal resorts has contributed to such change in some lagoons, so water supply wells are being re-located to reduce ecological impact (IUCN Consultation, 2020).

► Extraordinary terrestrial ecosystems

Although the site is affected by fire and other anthropogenic threats (WWF, 2008; 2010), it appears that the conservation status of the terrestrial ecosystems of the site is stable as long as fire control and other management activities are maintained.

► Globally significant bird migration hotspot

The site continues to be a bird migration hotspot (e.g. BirdLife International, 2012a), but this function clearly depends on the hydrological integrity of the area and is therefore of high concern. Populations of some species such as egrets have remained positive but ducks and coots are declining.

► Diversity of flora

The hydrological shifts within the World Heritage site have had a clear effect on the integrity of its vegetation and flora. For example, some plant species requiring more water have had their surface area reduced by more than 60%, and in some cases have been reduced to 80% between 1990 and 2004 (WWF, 2009).

► Exceptional diversity of fauna

The last census of the Iberian lynx shows decreasing population and Imperial eagle as stable. Some other species have been very rare, for example 7 out of 10 species of dragon- and damsel flies have
disappeared from the site, as well as 3 species of fish. In addition the Marbled Teal, once a common breeding duck in Doñana, is now rarely seen (WWF, 2016). Other bird species that used to breed in Doñana are also deteriorating. Rabbit population has crashed in recent years, dropping 90% since 2012.

**Extraordinary natural beauty**

The site continues to possess extraordinary natural beauty, and has not changed significantly visually, since inscription, though the coastal ponds in the dune area can almost be considered critical. This value could rapidly deteriorate if the hydrological state of the marshes and their associated biodiversity deteriorates.

**Summary of the Values**

**Assessment of the current state and trend of World Heritage values**

Major variation in the hydrological regime of the World Heritage site (both in water quantity and quality) affects all the other values of the site. Hydrological variability is projected to increase under future climate change, with possibly less rainfall and greater evaporation resulting in greater extremes of marsh and lagoon extent. Although some species have been shown to be stable or are even increasing, others are decreasing, particularly those associated with water. Therefore, the overall conservation status of the site is assessed as of high concern and deteriorating.

**Benefits**

**Direct employment**

The site provides ca. 178 jobs for its management alone (UNEP-WCMC, 2011). In addition, a significant number of jobs (hundreds to thousands of jobs in tourism) indirectly benefit from the attractiveness of the OUV and biodiversity of the site.

**Outdoor recreation and tourism**

400,000 people visit the Doñana Natural Space annually (UNESCO/IUCN/Ramsar, 2011). If managed sustainably, the site will continue to offer a unique opportunity to experience an extraordinary coastal and marshland landscape with its associated biodiversity. This contributes significantly to income generation and the socio-economic development in the site’s vicinity.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - Moderate
- Pollution: Impact level - Moderate
- Invasive species: Impact level - Moderate
- Habitat change: Impact level - Moderate

If the marshes dry up, or the water becomes increasingly polluted with aquatic vegetation or toxic cyanobacterial blooms clogging up the water, or if the temperature gets hotter, tourism will decline with a reduction in benefit to the local and regional population.

**Importance for research**

Research in and around the property has significantly contributed to scientific understanding of many topics, including bird migration, conservation biology, climate change and hydrology, and knowledge
IUCN World Heritage Outlook: https://worldheritageoutlook.iucn.org/
Doñana National Park - 2020 Conservation Outlook Assessment

continues to be generated through extensive scientific research and publications (CSIC, 2017).

► Contribution to education

Based on the site’s significant importance for knowledge generation and its excellent visitor and educational programmes and facilities, the Doñana Natural Space also functions as a living museum, giving people a direct experience of the natural coastal Atlantic landscape as well as memorable encounters with large numbers of birds and other wildlife (UNEP-WCMC, 2011).

► Collection of wild plants and mushrooms,
Fishing areas and conservation of fish stocks

The site also supports livelihoods based on the sustainable harvest of natural resources such as fish, molluscs, honey and wild plants collected in the areas surrounding the site as well as apparently to a certain extent within the National Park (Rössler et al., 2011).

► Direct employment,
Tourism-related income,
Provision of jobs

The park employs over 200 people plus concessions to companies managing tourist visits.

Summary of benefits

The greatest benefit of the World Heritage site is its iconic wilderness qualities and extraordinary biodiversity and ecological values, which attracts increasing nature tourism and contributes to the local and regional economy. The park also employs a significant number of people. Sustainable natural resource use is also dependent on the park that provides an important breeding area for fish populations, and the site has and continues to make a large contribution to knowledge generation and education.

Projects

Compilation of active conservation projects

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<tr>
<th>№</th>
<th>Organization</th>
<th>Brief description of Active Projects</th>
<th>Website</th>
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<tr>
<td>1</td>
<td>Doñana Biological Station (CSIC)</td>
<td>Research and monitoring of biota and ecosystems inside the site and beyond, including genetics, evolution, ecology and ecosystem ecology.</td>
<td><a href="http://www.ebd.csic.es/proyectos-en-donana">http://www.ebd.csic.es/proyectos-en-donana</a></td>
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<td>2</td>
<td>OCEANA</td>
<td>Several research projects and campaigns in relation to threats to the marine/coastal part of the site (particularly refineries and tanker traffic) and its extension to include high value coastal marine areas.</td>
<td><a href="http://eu.oceana.org/en/our-work/donana/overview">http://eu.oceana.org/en/our-work/donana/overview</a></td>
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<td>3</td>
<td>WWF Spain</td>
<td>Several projects on hydrological and fire monitoring and research as well as campaigning, policy advice and support, and campaigns in relation to illegal groundwater abstraction around the park.</td>
<td><a href="http://www.wwf.es/que_hacemos/donana/">http://www.wwf.es/que_hacemos/donana/</a></td>
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<td>4</td>
<td>Nature Tourism Association “Puerta Doñana”</td>
<td>Several projects in support of sustainable nature based tourism in and around the site.</td>
<td><a href="http://www.puertadonana.es/">http://www.puertadonana.es/</a></td>
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<td>5</td>
<td>Confederacion Hidrografica del Guadalquivir (CHG)</td>
<td>Agreements with Instituto Geologico y Minero de España (IGME) and Universidad Pablo de Olavide (UPO) for researching in numerical modeling of Doñana aquifers (IGME) and in relationships lagoon-aquifer (UPO)</td>
<td><a href="https://www.chgualquivir.es/estudios-technicos">https://www.chgualquivir.es/estudios-technicos</a></td>
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# REFERENCES

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<td>La Nueva Española (2016) España afronta una multa de 46,5 milliones por incomplie el saneamiento de Gijón y otras ciudades. 18 November 2016.</td>
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<td>SEO/BirdLife (2017a) El impacto de la romería de El Rocío sobre el espacio protegido de Doñana sigue sin evaluarse por la inacción de la Junta de Andalucia.</td>
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