Everglades National Park

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: United States of America (USA)
Inscribed in: 1979
Criteria: (viii) (ix) (x)

This site at the southern tip of Florida has been called ‘a river of grass flowing imperceptibly from the hinterland into the sea’. The exceptional variety of its water habitats has made it a sanctuary for a large number of birds and reptiles, as well as for threatened species such as the manatee. © UNESCO

SUMMARY

2020 Conservation Outlook  Finalised on 02 Dec 2020

CRITICAL

The conservation outlook for Everglades National Park remains critical. Unless more restoration projects are enacted outside the site (e.g., Decompartmentalisation, Tamiami Trail Next Steps, water storage and treatment south of Lake Okeechobee, etc.) that deliver more clean water to the site as correctly-timed sheetflow and the expected benefits of these projects are not compromised, the essential qualities and habitat of the site will continue to be lost. Measures to detect and control non-native invasive plant and animal species will continue to be an ongoing management issue. The Everglades Restoration program, so critically linked with maintenance and improvement of site values, must be re-assessed to take into account the effects of sea level rise and climate change on overall program goals, and thus the expected effects on site values in line with the findings of the 2018 National Academy report. Combined, these threats will lead to further reductions in populations of wading birds, which are key indicators of the health of the ecosystem, perhaps along with other threatened and endangered species within the site.
FULL ASSESSMENT

Description of values

Values

World Heritage values

► Large, flat, low-lying landscape

The Everglades is a vast, nearly flat, seabed that was submerged at the end of the last Ice Age supporting a vast continuum of shallow marine, estuarine, freshwater and terrestrial landscapes (seagrass, mangrove, wetland and terrestrial vegetation) (World Heritage Committee, 2006).

► One of the most active areas of modern carbonate sedimentation

The limestone substrate of the site is one of the most active areas of modern carbonate sedimentation (World Heritage Committee, 2019).

► Diverse array of habitats

The Everglades contains vast subtropical wetlands and coastal/marine ecosystems including freshwater marshes, tropical hardwood hammocks, pine rocklands, saltwater marshes and seagrass ecosystems important to commercial and recreational fisheries. It contains the largest mangrove ecosystem in the Western Hemisphere. Such a mixture of subtropical and temperate wildlife species is found nowhere else in the United States (World Heritage Committee, 2019).

► Oligotrophic ecosystem

Extremely low nutrient, P-limited throughout much of the park and N-limited at marine end-member—giving rise to plant and algal species that form the basis of the food web and are very sensitive to changes in water quality.

► Biodiversity sustained through trophic interactions

Complex biological processes range from basic algal associations through progressively higher species and ultimately to primary predators such as the alligator, crocodile and Florida panther; the food chain is superbly evident and unbroken (ENP, 2015). A periphyton-based food web supports a diverse assemblage of fish and invertebrates in addition to a suite of large predators including panther, alligator, crocodile, etc. and a large wading bird community.

► A uniquely diverse combination of species from different biogeographic realms

The diversity of habitats described above supports a uniquely diverse combination of species from different biogeographic realms (Carolinian, Louisianan and West Indian) and lies at the nexus of two major migratory bird routes: the Atlantic and Mississippi flyways (World Heritage Committee, 2006).

► Threatened, endangered and endemic species

The site provides habitat for approx. 30 threatened or endangered species including the Florida panther, green sea turtle, American crocodile, small-toothed sawfish, wood stork, West Indian manatee, snail kite, and Cape Sable seaside sparrow (World Heritage Committee, 2006). Everglades National Park provides habitat for many rare and regionally endemic species of plants and animals including: numerous orchid species, tree snails, pine rockland herb and shrub species, Schaus swallowtail butterfly
and Everglades mink (Lodge, 2010).

**Essential wading bird habitat**

The exceptional variety of its water habitats has made it a sanctuary for a large number of birds. It provides important foraging and breeding habitat for more than 400 species of birds and is a major corridor for migration (World Heritage Committee, 2006). It is the most significant breeding ground for wading birds in North America including: roseate spoonbill, great egret, snowy egret, great blue heron (and white morph), reddish egret, wood stork, little blue heron, and tricolored heron.

**Assessment information**

**Threats**

**Current Threats**

Current threats related to reduced water flows, water pollution and shifting habitat are affecting the health of the site and the amount and quality of habitat. Whilst many threats and their underlying drivers are larger scale unmanaged changes in conditions, they may not be actionable threats at the site level. However, restoration projects intended to address these threats have been implemented but are not delivering the originally expected benefits at this time. Some habitat losses cannot be restored, as habitat features such as peat soils have taken decades to centuries to develop. Invasive species are an increasing threat to site values.

**Fire/ Fire Suppression**

 *(Devastating fires (peat, tree island) from lack of water, water management impact)*

Fire is a natural part of the Everglades landscape. Due to proximity to large urban/suburban population centres, fire suppression has potentially altered natural habitats especially near the park boundaries. More importantly, fire frequency and intensity is unnaturally high due to water management for flood control that creates a drier ecosystem than historically. This has led to habitat change and loss of organic soils over large areas, as well as loss of significant archaeological sites (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010). While a return to historical fire frequencies and recovery of soil lost is very unlikely, recent improvements in management of prescribed fire within the site and progress on Everglades Restoration projects may lead to slight relaxations in this threat over the next 10 years (Everglades National Park 2015b; IUCN Consultation, 2020).

**Housing/ Urban Areas**

*(Urbanization in the greater Everglades watershed)*

Urbanisation has reduced the greater Everglades footprint, impacting water supply and water quality, and affecting the way water is managed in the ecosystem (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010), including the lower 20% of this vast system that forms the Everglades National Park World Heritage site. The current extent of urbanization from a spatial context is somewhat fixed, even recognizing that it can be changed based on periodic changes in land use permits. Any expansion in urbanisation would increase needs for flood protection, complicating the options for additional water deliveries to the site. The urban system surrounding the site is also a source of invasive species (Krysko et al. 2011) and light and noise pollution.

**Roads/ Railroads**

*(Road kills and road noise)*

Wildlife mortality by roadkill occurs inside and outside the site. Seasonal wildlife movements and nesting can affect the intensity of this threat, but site management actions such as seasonal decreases in vehicular speed limits and signage along the main park road have been implemented to address it.
Vehicle collisions are a significant species-level impact on the endangered Florida Panther, but most of this mortality occurs outside the World Heritage site (FWC, 2019).

**Habitat Shifting/ Alteration**

*Sea level rise*

Sea levels have been rising in the region causing shifts in plant communities, changes in wading bird feeding locations and saltwater intrusion into formerly freshwater locations (Park et al. 2017; Wilson et al. 2018). Projections for sea level rise in south Florida are beginning to be included in the design of Everglades Restoration Projects but a formal and systematic re-appraisal of the Comprehensive Everglades Restoration Plan and related programs to include sea level rise and assess effects on restoration goals has not yet been conducted. The most recent National Academy report on Everglades Restoration (2018) emphasizes this point.

**Agricultural effluents**

*Pollution from agricultural sources*

Nutrient pollution from upstream agricultural sources has been a major concern regarding water quality at the site (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010). Nutrient pollution modifies marsh algal communities and shifts the natural patchwork of marsh habitats toward a monospecific community of cattail which drastically reduces the diversity and abundance of wildlife (Surratt et al. 2011). Over 23,000 ha (57,000 acres; National Academies of Sciences, Engineering, and Medicine, 2018) of constructed stormwater treatment areas located upstream are now in place and beginning to improve the quality of water arriving at the site. The State of Florida’s Restoration Strategies water quality plan, including additional water quality treatment projects and improvements in agricultural best management practices, is expected to be complete in 2025 (SFWMD 2019). Significant re-assessment of the nutrient pollution threat should take place after completion of the Restoration Strategies Plan. Full restoration of the hydrology of the Park relies on diverting more water from Lake Okeechobee to the park, but that goal is highly threatened by continued phosphorus over-enrichment of Lake water. The 2019 Basin Management Action Plan for Lake Okeechobee (Florida Department of Environmental Protection 2019), declared they do not project meeting the Lake’s phosphorus goals by the year 2034. Mercury is an issue due to legacy depositions in soils that continue to be mobilized, made biologically available through interaction with certain agricultural additives (primarily sulfates) upstream of the park and carried to the park through the canal system (Orem et al. 2019). This issue requires a regional response and has not yet been systematically addressed.

However, this threat has been substantially reduced by the various State of Florida projects (see *Projects). Water Quality in the Everglades including inflows to Everglades National Park, is a concern that has received heightened attention over the last 20-years, and improvements to lower nutrients (particularly phosphorus) have been a major success (IUCN Consultation, 2020). Additional water quality treatment efforts will be needed, as we send additional water flows southward into the Everglades.

**Dams/ Water Management or Use**

*Flood control and water supply*

The Central & South Florida Project and subsequent flood control features altered the flow of water through the ecosystem, including the inflows to the property—resulting in loss of landscape pattern and changes in habitat (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010). Specific effects of this threat on the OUV of the site are numerous, but include The threat of increased fire incidence and intensity, soil drying and oxidation as well as persistent drought periods, that are extended in time, space, and level of intensity by water management practices. The Everglades Restoration program is a long-term, USD 10.5 billion+ effort to modify the water management system and remedy this threat (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010).
The insufficiency of freshwater inputs to the World Heritage site has uncertainty, since it is not clear when sufficient water will be supplied, especially when accounting for the uncertainty due to climate change uncertainty, which is likely to compound the negative effects of this threat to the site's OUV but as yet not fully understood or planned for.

**Invasive Non-Native/ Alien Species**

Invasive species include Burmese python (Dorcas et al., 2012), Brazilian pepper, Old World climbing fern (Lycodinium microphyllum), melaleuca, birds (e.g., starling), non-native apple snails, Cuban tree frog, Argentine black and white tegu and several fish species (Everglades CISMA 2019). Of the nearly 1000 plant species found at the site, about 220 are non-native; 6 species have been deemed sufficiently invasive to warrant direct action (Everglades National Park 2019e). Non-native invasive species threaten habitat quality and biodiversity throughout the Everglades (State Party of the United States of America, 2017). The South Florida Ecosystem Restoration Task Force developed a coordinated strategy and specific actions to address the problem in 2014 (SFERTF 2019b), and Everglades National Park has recently begun to shift restoration research funds toward exotic species research and control (IUCN Consultation, 2020); however, these advances are woefully inadequate to address the level of the threat. In 2019, the federal government de-activated a 20-year advisory committee dedicated to high-level interagency coordination on invasive species at the national level, a significant step backwards that affects options for progress at the site (DOI, 2019).

**Water Pollution**

Everglades National Park undertook the "Contaminants Assessment and Risk Evaluation Project" from 2005 through 2012. Assays were conducted for a large number of potential contaminants: only a few compounds were of immediate potential risk, and these were limited to borders of the park adjacent to contamination sources (Castro et al. 2016).

**Flight Paths**

The site lies near a major airport (Miami International Airport) and immediately adjacent to smaller regional airports which contribute to noise pollution at times (McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010).

**Tourism/ visitors/ recreation**

Isolated to relatively small areas of the site, there is still visible impact by visitors and tourism in the site. This is most often evident as airboat trails (in the freshwater marsh) or propeller scars (in the shallow marine areas). Management policies implemented as part of the General Management Plan are intended to address these issues: periodic monitoring is ongoing (Everglades National Park 2015a and 2019c; State Party of the United States of America, 2017).

**Utility / Service Lines**

Increasing light levels are altering circadian rhythms in organisms, and can alter nocturnal migratory/movement cues, attract prey and predators, and interfere with nocturnal behaviour (Longcore & Rich, 2004). The urban areas on both the east and west coasts of the park produce light pollution. The park designs its own lighting projects to maximize efficiency and minimize wildlife impacts and light pollution (Everglades National Park 2019d).
Potential Threats

Potential threats, including climate change with predicted decreasing rainfall, increased hurricane frequency, and ocean acidification, constitute a high threat overall and are perhaps being realised already.

- **Ocean acidification**
  - (Decreasing pH affecting epibionts and macroalgae in western FL Bay affecting sediment production)
  - High Threat
  - Inside site, widespread (15-50%)
  - Outside site

Ocean acidification poses a potentially high threat as it affects biogeochemical processes related to carbonate precipitation, particularly along the southwestern boundary between Florida Bay and the Gulf of Mexico (Robbins and Lisle 2018).

- **Fishing / Harvesting Aquatic Resources**
  - (Commercial and recreational fishing)
  - Low Threat
  - Inside site, scattered (5-15%)
  - Outside site

Limited to Florida Bay, intense fishing pressure has led to declines of some species in some areas. However, other species such as lobster, sponges and stone crabs are protected. Commercial fishing is no longer allowed within the site (McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010). Close coordination with the Florida Fish and Wildlife Conservation Commission and long-term monitoring of the estuarine fishery in the park are activities that help to reduce this threat (Everglades National Park 2015a).

- **Storms/Flooding**
  - (Changes in frequency and severity of hurricanes)
  - High Threat
  - Inside site, throughout (>50%)
  - Outside site

Changes in hurricane intensity and frequency beyond what the ecosystem has co-evolved with may lead to significant threats to values (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010). Whilst these general trends due to climate change are predicted at a broad scale, there is a lack of evidence to suggest that this will be the case in the Everglades, and therefore some caution is noted. However, should such an increase in the frequency and intensity of hurricanes occur in the future, many of the site's values may be impacted with more disturbance and less recovery time between extreme weather events.

- **Utility / Service Lines**
  - (Utility lines and radio towers)
  - Low Threat
  - Inside site, localised (<5%)

Everglades National Park finalized a land exchange with Florida Power and Light Company in 2016, a project which placed the company’s corridor of private lands outside the northeast boundary of the park and allows for re-hydration of the park through the Everglades Restoration process. While planning and licensing is completed for the utility project, construction has not begun. If implemented the utility project will create potential impacts to the viewshed (Everglades National Park 2017; World Nuclear News 2018). No other transportation corridor issues are currently known to exist. Land acquisition in East Everglades Expansion Area has set us up to remove radio towers and commes in/around this area by 2026. An application has been made to put four 315-foot tall (100 meters) radio towers with 15 guy wires each, in the Bird Drive CERP component. These would affect the viewshed and pose a threat to birds and bats, and especially threatening neotropical migrants due to their nocturnal take off and landings during ocean crossings.

- **Droughts**
  - (Droughts)
  - High Threat
  - Inside site, throughout (>50%)
  - Outside site

Climate change projections predict reduced annual rainfall and perhaps more intense and frequent droughts, which will contribute to further threats related to lack of water (State Party of the United States of America, 2017; McVoy et al., 2011; Lodge, 2010).
Oil/ Gas exploration/development

(Oil exploration and exploitation)

At present there is no hydraulic fracturing (‘fracking’) or other form of oil and gas developments inside the property. However, in 2013, a company operating in the Everglades ecosystem upstream of the property used an ‘acidisation process’, which involved the injection of 700,000 gallons of acidic water into the ground. This was stopped and the company fined by the Florida Department of Environmental Protection. On January 15, 2020 the State of Florida purchased the 20,000 acre property to prevent any future oil exploration at that location (Fleshler, 2020).

Overall assessment of threats

Very High Threat

Current threats related to reduced water flows, water pollution and shifting habitat are affecting the health of the site and the amount and quality of habitat. Some of these losses cannot be restored, as habitat features have taken decades to centuries to develop. Invasive species are an increasing threat to site values. Potential threats to the site, including hurricanes, climate change and ocean acidification, constitute a high threat overall and are potentially being realised already. Current very high threats combined with potential threats that are of high concern result in a very high rating for overall threats.

Protection and management

Assessing Protection and Management

Management system

Serious Concern

Internal park management has shown consistent improvement over the past 5 years as the General Management Plan has begun to be implemented. Internal management at the site has direct effect on threats such as unnaturally intense or frequent fires, roadkill frequency, and tourism and fishing impacts. Nevertheless, regional management of water quality and quantity (controlled by the State and to some extent the Federal government) is not focused on the park, which is the World Heritage site. The park is at the downstream end of the greater Everglades ecosystem, and decisions made regarding management upstream of the site have not always been compatible with protecting the health of the bottom end (State Party of the United States of America, 2017; McVoy et al., 2011; Lodge, 2010). While site participation in Everglades Restoration project planning and coordination through the South Florida Ecosystem Task Force is ongoing, the technical complexities, timeline and diverse objectives of this program remain a challenge for the park (IUCN Consultation, 2020).

Management of non-native invasive species is a high priority for the site, actions are being taken, and local and state level coordinating mechanisms are operational (Everglades CISMA 2019; Everglades National Park 2019e; SFERTF 2019b). However, funding is inadequate to address the burgeoning issue, and the federal government at the national level has moved backwards with respect to addressing this problem (DOI 2019).

Effectiveness of management system

Some Concern

Regional management does not allow for effective protection of World Heritage values. While park staff and management participation in Everglades Restoration project planning and coordination through the South Florida Ecosystem Task Force is ongoing, the technical complexities, timeline and diverse objectives of this program remain a challenge for the park (State Party of the United States of America, 2017; IUCN Consultation, 2020). Regional invasive species coordination programs are well-organized and functional, but do not have the funding or manpower needed to address this threat.
Boundaries

Mostly Effective

Boundaries of the National Park are well established and guidelines for protection within boundaries are understood. This aspect is highly effective. However, the watershed boundaries extend well beyond (i.e. upstream) the boundaries of the World Heritage site, which exacerbates water quantity and quality problems (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010).

Integration into regional and national planning systems

Mostly Effective

Integrative planning is effective; however, implementation has not achieved the same level of success.

Relationships with local people

Some Concern

The site faces challenges due to the variety and number of stakeholders, and their differing expectations. Improvements have been made to interactions with internal park stakeholders (the tourism and fishing communities) as a result of finalization of the General Management Plan and additional efforts made on the part of the park to communicate frequently.

The Everglades Restoration stakeholder community is extremely diverse and complex. Increased local demand for water supply and flood control benefits reduce the expected ecological benefits from restoration projects. Also, some stakeholder groups such as the hunting community and bass fishers want to protect their recreational interests in the greater Everglades outside the park. In some instances these interests conflict with the goals of restoration that involve filling-in of canals used by bass fishermen and re-hydration of lands that are currently traversed by hunters on foot (McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010). Because the Everglades Restoration Program affects so many different interests, this topic is likely to continue to be a concern and require significant effort from the park for some time.

Legal framework

Some Concern

The greater Everglades ecosystem is highly compartmentalised with varying jurisdiction and management strategies for each compartment. For example, water in the Water Conservation Areas is managed by the State of Florida (South Florida Water Management District), water quality is a State of Florida responsibility, and Florida also has an important regulatory role in the management of fisheries and wildlife resources. In turn, the U.S. Army Corps of Engineers is charged with management of important aspects of the engineered system, with the primary goal of flood protection. Endangered species are managed at the State and Federal levels and enforcement of the Endangered Species Act is viewed by some as an impediment to restoration of the greater ecosystem. Some areas that used to be wet historically are kept dry for management of wildlife that were not abundant in those areas in the pre-impact state. At the downstream end of this water management system, the Everglades National Park World Heritage site is managed by the National Park Service but inflows are managed by the State. There are also tribal interests involved at many levels (State Party of the United States of America, 2017; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010).

Law enforcement

Mostly Effective

Enforcement within the Everglades National Park/World Heritage site is strong; upstream of the park enforcement varies, sometimes with results that conflict with strong resource protection downstream in the World Heritage site.

Implementation of Committee decisions and recommendations

Some Concern

For reasons described above, only partial success has been seen in the implementation of Committee decisions and recommendations, and as such the site is retained on the List of World heritage in Danger (World Heritage Committee, 2019a) and therefore of some concern. The most recent decision from the World Heritage Committee makes a number of requests of the State Party, in response to the SOC report submitted in 2019 (State Party of the USA, 2019), including to ensure a continued, long-term allocation of resources to control the existing IAS inside the site; submit the General Management Plan
to the UNESCO World Heritage Centre and IUCN; ensure a detailed Environmental Impact Assessment (EIA) of any prospective hydrocarbon drilling activities that assesses the possible impacts on the Outstanding Universal Value (OUV) of the property noting the prospect of exploratory drilling within the Water Conservation Areas located upstream of the property and ‘to inform the World Heritage Centre about the potential for hydraulic fracturing projects in proximity of the property and the proposal of a utility transmission line along its eastern border’ (UNESCO, 2019; World Heritage Committee, 2019b). Additionally, in 2019 a retrospective statement of outstanding universal value (OUV) was adopted (World Heritage Committee, 2019c). The World Heritage Committee is yet to consider the State Party of the USA, 2020 State of Conservation report.

### Sustainable use

Within the boundaries, most of the site has Federal Wilderness-protected status with a very low developed footprint. Fishing guide businesses generally support sustainable use of the coastal/marine areas (Everglades National Park 2015a). Use outside of boundaries is not sustainable for all resources, thereby contributing to some impacts within the site (McVoy et al., 2011; Lodge, 2010).

### Sustainable finance

Internal financing for the site itself has remained steady, and implementation of in-house projects in line with the General Management Plan and national level policy has created opportunities for the park to acquire funding through increases to entrance fees and concessions management (Everglades National Park 2019b).

In terms of funding for Everglades Restoration projects, which are critical to the long-term ecological health of the site, the current trend in low levels of in year-to-year financing creates obstacles for implementation of projects. According to the National Academy of Sciences (2018) recent levels of funding mean that currently authorized Everglades Restoration projects would not be complete for another 65 years. Funding for invasive species detection and control is insufficient.

### Staff capacity, training, and development

NPS Staff at the Everglades National Park undertake a high degree of mandatory training (IUCN Consultation, 2020).

### Education and interpretation programs

Efforts at conveying natural aspects and values – and the threats thereto – are perhaps unparalleled. The NPS has partnered with teachers 'to provide curriculum-based, hands-on education experiences in the park' since 1971 (Everglades National Park, 2020a). Recent interpretation programs have improved access to cultural resources (IUCN Consultation, 2020).

### Tourism and visitation management

Recent changes to concessions management (Everglades National Park 2018) and associated quality control programs have increased the consistency of interpretation experiences for park visitors. Fishing guide businesses, while small in numbers, have a large economic impact and provide quality interpretation of resources.

### Monitoring

Continued monitoring will be essential in tracking changes due to climate change, sea level rise and ecosystem restoration. Some key parameters are being monitored by agencies other than the National Park Service; these efforts are coordinated through the Everglades Restoration framework (State Party of the United States of America, 2017; SFERTF, 2019). Budgets for this activity have been declining. In addition, recent information from the National Academy of Sciences (2018) indicates that monitoring programs may not be adequate to detect changes in the ecosystem due to restoration projects.

### Research

Research has been and will continue to be vital to managing the World Heritage values of the site.
Everglades National Park’s South Florida Natural Resources Center has 70 scientists and technicians that monitor and conduct research. Much fundamental research is largely supported by agencies other than the National Park Service; formal coordination of this research occurs through the Everglades Restoration framework (State Party of the United States of America, 2017). Because of the need to understand the impacts of new threats such as invasive species and climate change, budgets for this activity are insufficient.

Overall assessment of protection and management

Recent changes in internal policies and projects at the site, including implementation of resource protection measures included the General Management Plan, improvements to prescribed fire activities, increases in financing opportunities for internal park projects, and improving consistency in the management of park visitor activities indicate significantly improved internal management at the site.

However, the park faces major difficulties in addressing the many threats originating outside the site, such as reduced water flow, nutrient pollution, invasive species and sea level rise. The Everglades ecosystem is highly compartmentalised with varying jurisdiction and management strategies for each compartment. Regional management of water quality and quantity (controlled by the State and to some extent the Federal government) is not focused on the park, which is the World Heritage site. The park is at the downstream end of the ecosystem, and decisions made regarding upstream water management have not always been compatible with protecting the health of the bottom end. While the site itself is increasing work to deal with invasive species, support at the federal level is not commensurate with the size of the problem.

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

The park continues to face difficulties in addressing the many threats originating outside the site, such as reduced water flow, nutrient pollution, invasive species and sea level rise. Recent advances in implementation of Everglades Restoration projects to improve flow across the Tamiami Trail, diminish the loss of water across the eastern boundary of the park, and improve water quality are encouraging; however, the timeline for implementation of projects that would bring significant improvements to the ecological health of the park are far into the future (ENP, 2016; National Academies of Sciences, Engineering and Medicine, 2018). While the site participates in well-organized local and state coordinating mechanisms that are attempting to address the invasive species problem, the federal government has stepped back, and current levels of funding and other support are inadequate.

Best practice examples

Implementation of the General Management Plan, including changes to boating rules and zoning along with significant interaction with local stakeholders (South Florida National Parks Trust 2017; Everglades National Park 2019c).

Site participation in the Everglades Cooperative Invasive Species Management Area (2019).

Coordination of monitoring and research, staff training and education and visitor interpretation. The park’s South Florida Resource Center provides research, monitoring and synthesis and integration of old and new information supporting park operations and the USD 10.5 billion Everglades restoration effort.

State and trend of values

Assessing the current state and trend of values
### World Heritage values

<table>
<thead>
<tr>
<th>Category</th>
<th>High Concern</th>
<th>Data Deficient</th>
<th>Critical</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large, flat, low-lying landscape</td>
<td>High Concern</td>
<td>Data Deficient</td>
<td>Critical</td>
<td>Trend: Deteriorating</td>
</tr>
<tr>
<td>Changes in soil elevation that affect the flow of water, the patterning of the landscape and concentration of wading bird prey (State Party of the United States of America, 2017; Everglades National Park 2015a; McVoy et al., 2011; Davis &amp; Ogden, 1994; Lodge, 2010).</td>
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<tr>
<td>One of the most active areas of modern carbonate sedimentation</td>
<td>Data Deficient</td>
<td>Trend: Data Deficient</td>
<td>Critical</td>
<td>Trend: Deteriorating</td>
</tr>
<tr>
<td>Sea-level rise, reduced freshwater flow and changes in ocean alkalinity will alter the location of active peat accumulation and carbonate precipitation in the coastal Everglades or threaten carbonate precipitation over longer periods of time (State Party of the United States of America, , 2017; McVoy et al., 2011; Lodge, 2010; Robbins and Lisle 2018).</td>
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<tr>
<td>Diverse array of habitats</td>
<td>Critical</td>
<td>Trend: Deteriorating</td>
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<td>The diversity of habitats is being threatened by loss of ridge and slough patterning, loss of tree islands, collapse of peat soils along the saltwater/freshwater interface and invasive/exotic plants and animals (State Party of the United States of America, 2017; Everglades National Park 2015a; McVoy et al., 2011; Davis &amp; Ogden, 1994; Lodge, 2010; Wilson et al. 2018).</td>
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<tr>
<td>Oligotrophic ecosystem</td>
<td>Critical</td>
<td>Trend: Deteriorating</td>
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<td></td>
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<tr>
<td>With the addition of phosphorus from agricultural and urban runoff, the northern Everglades has become gradually enriched, making the ecosystem less oligotrophic. Further, with reduced flows to the southern and coastal Everglades, we have seen a gradual loss of oligotrophy with relatively more enriched waters infiltrating from the Gulf of Mexico. Changes in water depth from sea-level rise and water management and increased nutrient loading can affect patterns of production, biomass allocation and the ultimate accumulation of organic matter in Everglades’ soils and sediments (State Party of the United States of America, 2017; Everglades National Park 2015a; McVoy et al., 2011; Davis &amp; Ogden, 1994; Lodge, 2010).</td>
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<td>Biodiversity sustained through trophic interactions</td>
<td>Critical</td>
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<td>The periphyton-based food web of the Everglades is threatened by nutrient (mainly phosphorus) loading (State Party of the United States of America, 2017; Everglades National Park 2015a; McVoy et al., 2011; Davis &amp; Ogden, 1994; Lodge, 2010). Over 23,000 ha (57,000 acres; National Academies of Sciences, Engineering and Medicine, 2016) of stormwater treatment areas are beginning to meet water quality goals for phosphorus removal and periphyton protection. Additional water quality constructed features are expected to be finalized in 2025 (SFWMD 2019). The place of invasive species and their effects on biodiversity and trophic interactions needs to be also considered. Abundance of mammals has been severely impacted by the presence of invasive Burmese pythons at the site, and the marsh rabbit has been locally extirpated and is unable to persist in the park (Dorcas et al. 2012; McCleery et al. 2015). More recent reptilian invasions bordering the site, particularly Argentine tegu, have the potential to alter the trophic structure and native biodiversity at the site. Invasive plants such as Old-World climbing fern present at the site are altering habitat structure at the local level. Primarily because of the current and future impacts of invasive species, this value should be considered critical.</td>
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<tr>
<td>A uniquely diverse combination of species from different biogeographic realms</td>
<td>High Concern</td>
<td>Trend: Deteriorating</td>
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<tr>
<td>Loss of habitat will affect species diversity. A few species in particular are at risk due to decreased...</td>
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IUCN World Heritage Outlook: https://worldheritageoutlook.iucn.org/  
Everglades National Park - 2020 Conservation Outlook Assessment

habitat quality (e.g. Everglades snail kite).

**Threatened, endangered and endemic species**

High Concern
Trend: Deteriorating

Approximately 30 Federally listed species are at-risk of being lost from the ecosystem. Endemic species may be at risk of going extinct (State Party of the United States of America, 2017; Everglades National Park 2015a; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010).

**Essential wading bird habitat**

High Concern
Trend: Deteriorating

The Everglades is still an essential wading bird habitat in south Florida. However, continued impacts from water management and loss of habitat may lead to mass defection and abandonment of habitat in favour of other areas (e.g. roseate spoonbills in Florida Bay) (Everglades National Park 2015a; McVoy et al., 2011; Davis & Ogden, 1994; Lodge, 2010; Lorenz 2013).

**Summary of the Values**

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

Critical
Trend: Deteriorating

Major issues with water quantity, quality, distribution and timing, invasive species and climate change continue to create over-riding impacts to the system, and the continued deteriorating trend of so many values put the park’s World Heritage values in a critical situation. Although some major Everglades Restoration projects have been completed and the park is able to accept additional water flows when available, critical water operational plans are still not complete. Furthermore, modifications to pre-CERP components resulted in a reduction in the originally estimated hydrologic and ecological benefits of these projects. Current hydrologic and water quality restoration projects estimated to be complete in about 2027 are intended to address this “benefit setback”, but challenges remain with financing of these projects in a timely fashion (IUCN Consultation, 2020). Future sea-level rise impacts have yet to be taken into account sufficiently in the Everglades Restoration program. Non-native invasive species have increasing impacts on the site's values.

**Additional information**

**Benefits**

**Understanding Benefits**

**Water provision (importance for water quantity and quality)**

The site provides essential freshwater storage and aquifer recharge services for the greater South Florida urban, commercial and agricultural communities. Despite these threats, the system maintains its ability to recharge regional aquifers used for municipal water supplies.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - High, Trend - Continuing
- Overexploitation: Impact level - High, Trend - Continuing
- Invasive species: Impact level - High, Trend - Continuing
- Habitat change: Impact level - High, Trend - Continuing

Urban development and consequent increasing water demands continue in spite of projected declines in rainfall due to climate change.
Coastal protection

The mangrove coastal expanse, several miles wide in places, provides critical buffering against storm surge and wind for inland communities.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - High, Trend - Continuing
- Invasive species: Impact level - High, Trend - Continuing
- Habitat change: Impact level - High, Trend - Continuing

Increases in catastrophic hurricane frequency may decrease resiliency of native plant communities by invasive species; mangroves are already advancing inland with reduced freshwater flows into the park and rising sea levels.

Outdoor recreation and tourism

Nearly 1 million visitors pass through the entrance stations of the site each year (this does not include the visitors using the site’s marine resources). These visitors have a significant economic impact on the surrounding communities of Florida City, Homestead, Miami, the Florida Keys and Everglades City. During the spring months, a high percentage of visitors to the site are international.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - Low, Trend - Continuing
- Pollution: Impact level - Low, Trend - Continuing
- Overexploitation: Impact level - Low, Trend - Continuing
- Invasive species: Impact level - Low, Trend - Continuing
- Habitat change: Impact level - Low, Trend - Continuing

While the new General Management Plan (2015) enhances visitor access and opportunities, the gradual decline of fauna and flora to systemic impacts will affect the visitor experience.

Carbon sequestration

With ongoing restoration of water flows to the site there is significant opportunity to sequester carbon by accretion of peat soils in freshwater marshes, tree islands and mangrove swamps.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - Moderate, Trend - Decreasing
- Overexploitation: Impact level - Moderate, Trend - Decreasing
- Habitat change: Impact level - Moderate, Trend - Decreasing

The Comprehensive Everglades Restoration Plan (CERP; USD 10.5 billion +) funding and implementation are critical to recover system functions and must continue. Early CERP projects are providing improvements to water quality, timing, distribution and quantity.

Fishing areas and conservation of fish stocks

Florida Bay and the mangrove coast support the economically important recreational fishery (red drum, sea trout and others). In addition, the mangrove ecosystem provides critical spawning ground for important commercial species and the aquatic food chain.

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - Moderate, Trend - Continuing
- Overexploitation: Impact level - Moderate, Trend - Continuing
- Invasive species: Impact level - Moderate, Trend - Continuing
- Habitat change: Impact level - Moderate, Trend - Continuing

Science-based management/monitoring must underpin management decisions to protect this important resource from intense recreational fishing pressures.

Direct employment, Tourism-related income

Tourism generated USD 146.6 million in economic benefits locally, providing 2,408 jobs (NPS 2014).
Due to the importance of the site (especially Florida Bay) as a nursery for recreationally and commercially important fish species, as well as an area of direct recreational saltwater fishing, the contribution to the local economy is likely much higher than the 2014 figure. Although difficult to estimate the exact contribution of the site itself, in 2006 recreational fishing in the larger Everglades ecosystem generated an estimated $1.2 billion in economic activity, including $378 million in wages and 12,391 full time jobs. Saltwater recreational fishing makes up the majority of this contribution (Redwine and Mitchell 2016).

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - High, Trend - Continuing
- Pollution: Impact level - High, Trend - Continuing
- Overexploitation: Impact level - Moderate, Trend - Continuing
- Habitat change: Impact level - High, Trend - Continuing

Factors associated with nutrient inputs, lack of freshwater, higher temperatures and the effect of hurricanes lead to damaging algal blooms in Florida Bay (SFNRC 2016). Depending on extent and longevity, these blooms can have either localised or more severe effects on fishery resources in the Bay.

History and tradition,
Wilderness and iconic features,
Sacred natural sites or landscapes,
Sacred or symbolic plants or animals,
Cultural identity and sense of belonging

The site is the most highly protected part of the larger Everglades ecosystem, which is important culturally and spiritually to the Seminole and Miccosukkee tribes as well as to the history and traditions of early Florida settlers of European origin (Redwine and Mitchell 2016). The site contains and has recently begun to interpret the Nike Missile Base, a cultural resource of military importance during the Cold War. Local interest in the Nike Missile Base exceeded expectations, and the park has recently expanded available tours (Everglades National Park, 2019b).

Factors negatively affecting provision of this benefit:
- Climate change: Impact level - High, Trend - Decreasing
- Invasive species: Impact level - High, Trend - Decreasing

Water management over the last century has modified habitats and modified the availability of access to areas of importance to the Miccosukkee tribe. The impact of climate change, sea level rise and invasive species on the site's cultural and spiritual values is largely unknown but impacts are expected as habitats and species availability change as a result.

Summary of benefits

The natural resources protected by Everglades National Park provide key ecosystem services to the regional human population. These services include water storage and recharge of the aquifer, buffering against the impacts of tropical storms and hurricanes, as well as economic benefits associated with tourism, including recreational fishing and the commercial fishing industry. In 2011, Everglades National Park-related tourism generated USD 146.8 million in economic benefit locally, providing 2,408 jobs (NPS, 2014). Benefits to the wider, world community include those associated with the protection and preservation of unique habitats and species, as well as climate modification benefits from carbon sequestration within the mangrove forests and sea grasses of Florida Bay.

Projects

Compilation of active conservation projects

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<thead>
<tr>
<th>№</th>
<th>Organization</th>
<th>Brief description of Active Projects</th>
<th>Website</th>
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<tr>
<th></th>
<th>Organization(s)</th>
<th>Description</th>
<th>Website</th>
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<tr>
<td>1</td>
<td>National Park Service (NPS)</td>
<td>GENERAL MANAGEMENT PLAN (GMP): The Everglades National Park General Management Plan was completed in 2015. New elements include pilot boating zones within the park (called pole and troll zones); and intensive work to re-establish freshwater flow through infrastructure barriers on NPS lands (culvert projects on Old Ingraham Hwy and Research Road). In addition, the GMP contemplates adaptation of park infrastructure and resource management in the face of climate change. Projects and policies from the GMP are being implemented.</td>
<td><a href="http://www.nps.gov/ever/parkmgmt/ever-general-management-plan.htm">http://www.nps.gov/ever/parkmgmt/ever-general-management-plan.htm</a></td>
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<td>2</td>
<td>NPS and the South Florida National Parks Trust</td>
<td>FLORIDA BAY: SEAGRASS RESTORATION PROJECTS: Work to restore areas of seagrass habitat damaged by boaters. This work is ongoing; the intent of zoning through the GMP is to reduce the pressure on seagrass habitat and allow substantial restoration of this resource.</td>
<td><a href="http://www.nps.gov/ever/poleandtroll.htm">http://www.nps.gov/ever/poleandtroll.htm</a></td>
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<td>3</td>
<td>US Army Corps of Engineers, US National Park Service</td>
<td>MODIFIED WATER DELIVERIES TO EVERGLADES NATIONAL PARK PROJECT AND THE TAMIA MI TRAIL NEXT STEPS PROJECT – Restoration of water flows to the northeastern portion of ENP that was cut-off from natural marsh flow in the 1960s. Constructed features of this project are finalized. The Combined Operational Plan is still in development.</td>
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<td>4</td>
<td>South Florida Water Management District, US National Park Service</td>
<td>EVERGLADES CONSTRUCTION PROJECT AND THE RESTORATION STRATEGIES PROJECT – Construction/expansion of man-made wetlands (stormwater treatment areas) and shallow reservoirs (flow equalisation basins) to reduce nutrient loadings and improve water flows into the Everglades.</td>
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<td>6</td>
<td>US Army Corps of Engineers, South Florida Water Management District</td>
<td>CENTRAL EVERGLADES PLANNING PROJECT – Long-term planning to restore more natural water flows from Lake Okeechobee into the central and southern Everglades, as part of the USD 10.5 billion + Restoration Plan (CERP).</td>
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<td>7</td>
<td>NPS Everglades National Park and NPS Southeast Regional Office</td>
<td>EXOTIC PLANT MANAGEMENT: work to remove exotic plant species from Everglades National Park lands, throughout all habitats. Funding principally from NPS. Additional work is ongoing with outside funding (see website).</td>
<td><a href="http://www.nps.gov/ever/naturescience/invasiveplantprogram.htm">http://www.nps.gov/ever/naturescience/invasiveplantprogram.htm</a></td>
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<td>8</td>
<td>NPS Everglades National Park, in conjunction with the U.S. Army Corps of Engineers as the permitting entity</td>
<td>HOLE IN THE DONUT PROJECT: in-lieu-fee programme oriented toward restoration of approximately 6,000 acres of abandoned agricultural land within Everglades National Park. Funding from the in-lieu-fee programme, which works in a manner similar to a ‘mitigation bank’.</td>
<td><a href="http://www.nps.gov/ever/naturescience/hidprogram.htm">http://www.nps.gov/ever/naturescience/hidprogram.htm</a></td>
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<td>9</td>
<td>Everglades National Park in coordination with the Florida Fish and Wildlife Conservation Commission</td>
<td>EXOTIC ANIMAL MANAGEMENT: work to understand and eventually control/manage the impact of exotic animal species on Everglades National Park resources. Additional work is needed (see below).</td>
<td><a href="http://www.nps.gov/ever/naturescience/nonnativespecies.htm">http://www.nps.gov/ever/naturescience/nonnativespecies.htm</a></td>
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NPS. Work completed from 2008 – 2011 plugged 2 major canals, using seed money from the USFWS Coastal Program, and major funding from the American Recovery and Reinvestment Act; work to monitor the ecological effects is ongoing.

CAPE SABLE CANALS DAM RESTORATION PROJECT: Work to plug man-made canals and ditches in the Cape Sable region of Everglades National Park. This work is oriented toward reducing the negative impact of the canals, toward restoring a more natural hydrology and salinity regime in the area, and toward restoring habitats for American crocodile. All planning work is complete as is most of the implementation. Only one canal (Raulerson) still remains to be implemented (Everglades National Park 2019b).
## REFERENCES

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<td>22</td>
<td>IUCN Consultation. (2020). IUCN Confidential Consultation: Everglades National Park, USA</td>
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