

Grand Canyon National Park

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: United States of America (USA)

Inscribed in: 1979

Criteria: (vii) (viii) (ix) (x)



Carved out by the Colorado River, the Grand Canyon (nearly 1,500 m deep) is the most spectacular gorge in the world. Located in the state of Arizona, it cuts across the Grand Canyon National Park. Its horizontal strata retrace the geological history of the past 2 billion years. There are also prehistoric traces of human adaptation to a particularly harsh environment. © UNESCO

SUMMARY

2020 Conservation Outlook

Finalised on 02 Jul 2021

GOOD WITH SOME CONCERNS

The conservation outlook for the Grand Canyon National Park is good with some concerns, on the basis of the low concern towards the World Heritage values of the site which are robust and well-protected through legal instruments and regional planning systems. However, concerns exist in the high threats to which the site is subject to. These include increased visitation and uncertain plans to contend with tourism and proposed development; non-native and invasive species, such as bison and multiple fish species, which are impacting on native species and habitats; aircraft overflights; reservoir equalization flows between Lake Powell and Lake Mead, increased fire threat in the upper watersheds and the potential threat of uranium mining. However, opportunities exist for correction of all of these threats. Actions to reduce the bison population have been initiated. The Grand Canyon Escalade project, a proposed development at the Little Colorado River and at Quartermaster Canyon, was rejected by Navajo Nation voters. The populations trends of some species are in decline, however, humpback chub have expanded their range and established a new subpopulation, through sustained management action. Steps have been taken to address internal management issues which have previously set back management activities.

FULL ASSESSMENT

Description of values

Values

World Heritage values

► **One of the world's most visually powerful landscapes**

Criterion:(vii)

The Grand Canyon, at 1.5 km deep and 445 km long, is considered one of the world's most visually powerful landscapes. Located in the state of Arizona, it cuts across the Kaibab Plateau and has been preserved in part by the 493,000 ha Grand Canyon National Park. It is celebrated for its plunging depths; temple-like buttes; and vast, multihued, labyrinthine topography. Scenic wonders within park boundaries include high plateaus, plains, deserts, forests, cinder cones, lava flows, streams and waterfalls (World Heritage Committee, 2019).

► **Superlative scenic beauty of the Colorado River**

Criterion:(vii)

The Colorado River is one of America's great whitewater rivers (World Heritage Committee, 2019). It established its course through Grand Canyon within the last six million years, and likely evolved from pre-existing drainages to its current course. The Colorado River in Grand Canyon provides a unique combination of thrilling whitewater adventure and magnificent vistas of a remarkable landscape. A river trip through Grand Canyon is one of the most sought-after wilderness experiences in the world, offering a 277-mile mix of placid smooth water and turbulent whitewater.

► **Geologic features and processes, and record of the earth's geologic history**

Criterion:(viii)

Grand Canyon National Park preserves an iconic geologic landscape 1.8 billion to 270 million years old, including diverse paleontological resources; unconsolidated surface deposits; a complex tectonic and erosion history; and Pliocene to Holocene volcanic deposits. Nowhere else on earth is there the clearly exposed geology in such a magnificent landscape. Within park boundaries, the geologic record spans all four eras of the earth's evolutionary history, from the Precambrian to the Cenozoic. The Precambrian and Paleozoic portions of this record are particularly well exposed in canyon walls and include a rich fossil assemblage. Numerous caves shelter fossils and animal remains that extend the paleontological record into the Pleistocene (World Heritage Committee, 2019). Geologic processes, including erosional processes on hill slopes and in tributaries, and active tectonism continue to shape the canyon today.

► **An exceptional example of biological environments at different elevations**

Criterion:(ix)

Grand Canyon is an exceptional example of biological environments at different elevations that evolved as the river cut deeper portraying five of North America's seven life zones within canyon walls. Flora and fauna species overlap in many of the zones and are found throughout the canyon (World Heritage Committee, 2019). The park's great biological diversity includes three of North America's four deserts, and five of Merriam's seven life zones: from rim to river one encounters the Lower Sonoran, Upper Sonoran, Transition, Canadian and Hudsonian zones, the ecological equivalent of traveling from Mexico to Canada. Extreme elevation and topography contribute to a wide range of habitats. The connectivity of species between the park and areas around the park is an important ecological concept and an important function of Grand Canyon National Park. With the perils of climate change looming, Grand Canyon has the attribute to support significant linkages between protected areas.

► **Ecological refuge and biological diversity**

Criterion:(x)

Grand Canyon National Park is an ecological refuge, with relatively undisturbed remnants of dwindling ecosystems (such as boreal forest and desert riparian communities), and numerous endemic, rare or endangered plant and animal species (World Heritage Committee, 2019). The park is known to host 1,750 vascular plant species, 64 moss species, 195 lichen species, 167 fungi species, 377 bird species, 91 mammal species, 58 reptile and amphibian species, 22 fish species, more than 10,000 invertebrate species, and a number of federally listed species.

► Diverse ecosystems

Criterion:(x)

Grand Canyon National Park contains a superlative array of natural resources. Much of this diversity can be attributed to the park's dramatic topographic spectrum. This stratigraphic variety provides microhabitats for natural processes supporting rare and endemic plant and wildlife species. These diverse habitats serve as a living laboratory for scientific research in numerous fields that contribute greatly to our understanding of the relationship between biotic communities and abiotic environments. The five life zones within the canyon are represented in a remarkably small geographic area (World Heritage Committee, 2019). The National Biological Survey released a report designating the old growth, southwestern ponderosa pine forest best represented in GRCA, as an endangered ecosystem type.

► Threatened animal species

Criterion:(x)

Threatened Animals (IUCN Red List of Threatened Species category): California condor (*Gymnogyps californianus*, CR), humpback chub (*Gila cypha*, EN), willow flycatcher (*Empidonax traillii*, LC), spotted owl (*Strix occidentalis*, NT), Kanab ambersnail (*Oxyloma haydeni kanabense*, CR), and Mojave desert tortoise (*Gopherus agassizii*, VU). There are over 35 species of special concern and former USFWS Category 2 species. The Park supports populations of numerous endemic faunal taxa, including 1 dragonfly, 4 butterflies, 1 tiger beetle, 3 ground beetles, 1 robberfly, and several other species new to science.

► Rare plant species

Criterion:(x)

Threatened plants: There are no known threatened plant species in the Park, but the sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*) is rare and is federally listed as endangered. Nine species of special concern (formerly category two species) are known, and 25 additional vascular plants are of management concern due to their limited distribution (World Heritage Committee, 2006). Regionally, old-growth ponderosa pine has suffered an estimated 85-98 percent area loss due to destruction, conversion to other uses, and significant degradation in structure, function, and composition.

Other important biodiversity values

► Extirpated species

Extirpated species include grizzly bear, black-footed ferret, gray wolf, jaguar, Bear Valley sandwort, Colorado pikeminnow, bonytail and roundtail chub, northern leopard frog, and southwestern river otter. The razorback sucker may be extirpated within park boundaries.

Assessment information

Threats

Current Threats

High Threat

Grand Canyon National Park is subject to a high level of current threats, including non-native species in both aquatic and terrestrial habitats which are affecting native species such as humpback chub and impacting important habitats; ongoing issues with the management of the Colorado river, and it's catchment, with regards to the operation of Glen Canyon dam; air and noise pollution associated with expanded development; and increased drought and fires due to climate change, which are compounded by groundwater withdrawal from development outside the park boundaries and a legacy of fire suppression, which has led to increased fuel in the upper reaches of the site.

► **Commercial & Industrial Areas**

Low Threat

(Aircraft over flights and noise pollution)

Inside site, throughout(>50%)

Outside site

Over flights for tourism continue to degrade the natural quiet of the park, affecting backcountry visitors and wildlife behavior. More than 400,000 visitors experienced Grand Canyon via air tours in 2011. In 2012, a reasonable solution to this problem - managing this use, allowing it to continue and reducing impacts - was put on hold by congress and the number of flights has increased since.

► **Invasive Non-Native/ Alien Species**

High Threat

(Non-native species)

Inside site, throughout(>50%)

Outside site

Other invasive species names

rainbow trout (*Oncorhynchus mykiss*); fathead minnow

(*Pimephales promelas*); common carp (*Cyprinus carpio*);

brown trout (*Salmo trutta*); American bison (*Bison bison*)

The introduction of 19 non-native fish into the Colorado River poses major, long-lasting impacts on native fish populations. Salmonids, striped bass, catfish, and other taxa consume larval and juvenile native fish, while carp and several other exotic cyprinid species may outcompete native minnows and suckers. The most cost-effective approach to achieving target adult humpback chub abundance may be a high level of rainbow trout control; humpback chub abundance goals may be achieved at relatively low rainbow trout abundance but control measures may not be cost-effective at relatively high rainbow trout abundance (Bair et al, 2018). Native species continue to decline and the introduction of non-native species into the river below Glen Canyon Dam places pressure on the existing native species, although surveys in 2016 and 2017 suggest that the humpback chub has expanded its range (Rogowski et al, 2018) in Grand Canyon and established a new subpopulation. The US National Park Service (NPS) completed a management plan for the additional tools needed to address non-native aquatic species; the final plan was completed in September 2019 (IUCN Consultation, 2020).

In addition to losses of endangered native fish, more than 10 other rare or listed vertebrate species have been extirpated from the Colorado River corridor (e.g. zebra-tailed lizard, southwestern willow flycatcher, Sonoran river otter, and badger).

Non-native bison also continue to present a threat. State of Arizona bison management policies resulted in an estimated 600 bison residing within Grand Canyon National Park. These are non-native bison, descended from an agricultural experiment that crossed imported bison with cattle. Herd size is thought to be increasing. Heavy impacts to rare and ecologically important springs, ponds, and wetlands have been recorded at numerous sites and appear to be increasing, along with the size of the bison population. After determining that bison impacts threaten multiple natural values on the North Rim, the National Park Service completed an environmental assessment for bison reduction (NPS, 2017). Herd reductions efforts began in 2019 (IUCN Consultation, 2020), however, reduction in herd size has been modest. The effectiveness of herd management within the national park will be unknown for several years. Meanwhile, adverse impacts to natural and cultural resources are apt to continue.

► **Dams & Water Management/Use**

High Threat

(Management of the Colorado River)

Inside site, throughout(>50%)

Outside site

Ecological research conducted in the 1970s-1980s showed significant damage to Grand Canyon National Park resources from construction and operation of Glen Canyon Dam. This includes beaches, archeological sites, fisheries, and riparian ecosystem impacts. Prior the completion of Glen Canyon Dam in 1963 (i.e. before inscription of the property in 1979), 8 native fish species were native to the Colorado River in Grand Canyon; since completion of the dam, 3 species have been extirpated, 2 are now listed as threatened and endangered, and 3 species are maintaining adequate populations. Passage of the 1992 Grand Canyon Protection Act (GCPA) was intended to improve resource conditions of the National Park through implementation of an adaptive management program. Over \$150 million of research conducted since 1997 has shown the need for changes to dam operations to improve resource conditions as required by the GCPA. Lack of implementation of the GCPA has resulted in many park resources

continuing to deteriorate downstream resources in the National Park. NPS recognizes the need for restorative flows for improving resources within the Park. In December 2016, the Glen Canyon Dam Long-Term Experimental and Management Plan Final Environmental Impact Statement were released (U.S. Department of the Interior, 2016); the goals of which include, but are not limited to restoration of ecological patterns and processes, including meeting humpback chub (*Gila cypha*) recovery goals, maintaining self-sustaining native fish species populations and their habitats; increasing and retaining fine sediment volume, area, and distribution in the Glen, Marble, and Grand Canyon reaches; minimizing or reducing the presence and expansion of aquatic non native invasive species and maintaining native vegetation and wildlife habitat.

The extent to which these goals have been met is not fully known, and as such the threat remains high.

► **Other Ecosystem Modifications**

High Threat

(Air pollution)

Outside site

Average visibility is well below the natural conditions target set by the Clean Air Act. Ozone concentrations and exposure indices are surprisingly high for such a remote area. Concentrations have not yet reached the EPA-established level to protect human health, but have come very close. Long-term monitoring revealed a steady rise in ozone concentrations through the 1990s. This trend leveled out well above natural levels in the early 2000s and has not declined. Wet deposition of nitrates, ammonium, and sulfates has risen; the increase is not statistically significant. Between the 1999 and 2001 growing seasons, a six percent increase in ultraviolet radiation was measured in the park. Navajo and Four-Corners generating stations have closed, eliminating pollutants (IUCN Consultation, 2020) from these sources, both of which were coal fired power plants. Air quality could improve at the Park over the next few years. However, dust and smoke related to hotter and drier conditions due to a changing climate are continuing to reduce visibility.

► **Recreation & Tourism Areas**

High Threat

(Expansion of development in the vicinity of the Grand Canyon)

Inside site, localised(<5%)

Outside site

The Hualapai Tribe on the southwestern corner of Grand Canyon operates a rim development and large helicopter tourism service in lower Grand Canyon, over 200 miles west of Grand Canyon Village (the center of NPS operations). Visitation by air and boat in this reach has increased use intensity and decreased the wilderness values that the Park Service has tried to maintain. At present the development and use are confined to that area of the river/canyon (IUCN Consultation, 2020) but noise from helicopter traffic has the potential to increase and adversely affect natural quiet along the river corridor and into adjacent lands administered by the National Park Service. Impacts could degrade World Heritage site values if use expands from this area. This development is important to the tribal economy so some impacts to the park may be acceptable provided the current level does not significantly increase.

► **Dams & Water Management/Use**

High Threat

(Groundwater withdrawal)

Inside site, scattered(5-15%)

Outside site

Groundwater is a critical resource, as it feeds seeps and springs that support rare and biodiverse habitats upon which much of the Grand Canyon's plant and animal life depend. Increasing groundwater withdrawals to support development on the canyon rims is expected to depress groundwater discharge and slow natural recharge, reducing spring flow and ultimately cutting off supply to some surface waters. Subsurface groundwater flows are poorly known, however, as climate warms and precipitation decrease, as projected by regional climate models, aquifer recharge rates are expected to decline. Major stressors to groundwater and springs in the park come from development outside the park boundaries, thus mitigating risk to this key resource requires coordination with surrounding communities and landowners (Stortz et al. 1998).

► **Droughts**

High Threat

(Drought, and the re-establishment of fire)

Inside site, extent of threat not known

Outside site

Fire, as a natural process, was eliminated for most of the 20th Century. This has led to the increase in fuels, especially in high elevation forests in the upper watershed of side canyons and tributaries. High

severity fires created hydrophobic soils and increase erosion, leading to flooding and deposition in downstream reaches that threaten aquatic and riparian ecosystems (Stortz et al. 2018). Use of low-intensity fire as a management tool is allowed in some park areas under restricted conditions, and in accordance with the 2010 Fire Management Plan, but continued drought, the potential for warming and other regional conditions the restoration of fire pose major challenges. High severity fire occurrences have altered plant community structure, resulting in areas of lower canopy cover, changes in vertical fuel distribution, and higher surface roughness (Hoff et al., 2019). Invasion of non-native *Bromus* grasses along the Colorado River have greatly increased fire threats there. Fire was not a prominent process along the pre-dam river, but has become a critical danger in wide reaches.

Potential Threats

Low Threat

Potential threats to the site include most notably the potential for uranium mining, and its associated impacts. Uranium mining remains a potential threat to the values of the site, so long as the exemptions to the mining ban are in place and the possibility for overturning the decision is present. Should uranium mining occur within the Grand Canyon watershed in the future, this would constitute a high threat due to the significant direct and cumulative downstream impacts on the site. Other potential threats include the further establishment of non-native and potentially invasive species, such as elk, and unsustainable infrastructure development, such as for tourism in eastern Grand Canyon.

► Problematic Native Species

Low Threat

(Introduced Rocky Mountain elk)

Inside site, localised(<5%)

Other invasive species names

Outside site

Rocky Mountain Elk (*Cervus canadensis nelsoni*)

Introduced Rocky Mountain elk are abundant on the South Rim, and exert strong grazing impacts on forest and woodland vegetation, as well as personal and traffic hazards on tourists. This species represents a potential threat should the species become further established throughout the site.

► Mining & Quarrying

High Threat

(Uranium mining)

Outside site

In 2012, a 20-year uranium mining withdrawal was put in place on 400,000 hectares of Federal lands in the area surrounding the World Heritage site in order to undertake scientific studies to identify the environmental impacts of mining on the Grand Canyon watershed, which will be used to inform future mining activities (UNESCO, 2016). However, the withdrawal does not cover all lands around the site, and one uranium lease application to the south of it is located on land that is not included in the withdrawal. There were also 11 uranium mining proposals that were exempt from the withdrawal for the reason that these proposals have valid existing rights under federal law. These raise significant concerns as such mining activities have the potential for considerable direct and cumulative downstream impacts on the World Heritage site.

► Recreational Activities, Other Human Disturbances

Very Low Threat

(Tramway and infrastructure development for tourism in eastern Grand Canyon)

Inside site, localised(<5%)

Outside site

On 31 October 2017, the 23rd Navajo Nation Council voted 16-2 against the proposal to develop the Grand Canyon Escalade project (Navajo Times, 2017). The project proposed to develop a hotel, and related infrastructure, including tramway that would descend into the heart of the canyon, at the confluence of the Little Colorado River, a location of cultural and religious significance to multiple Native American Tribes (UNESCO, 2016). With this Council defeat, this project now poses a very low threat, provided that the proposal is not introduced in another forum.

There is also the potential for new/expanded development in Tusayan, at the park's South Entrance, but at present there is no formal proposal; if one moves forward, there is the potential for impacts upon to night sky, water sources, and other values, but these will be addressed working with the USFS (IUCN Consultation, 2020).

Overall assessment of threats

High Threat

Overall, threats to the World Heritage values of Grand Canyon National Park are high. Current threats include non-native species in both aquatic and terrestrial habitats which are affecting native species such as humpback chub and impacting important habitats; ongoing issues with the management of the Colorado river, and its catchment, with regards to the operation of Glen Canyon dam as ecological research shows significant impacts on the park which require ongoing management; air and noise pollution associated with expanded development; and increased drought and fires due to climate change, which are compounded by groundwater withdrawal from development outside the park boundaries and a legacy of fire suppression, which has led to increased fuel in the upper reaches of the site. The park is taking steps to address climate and drought related concerns but resolution and costs are uncertain. Uranium mining remains a potential threat to the values of the site, so long as the exemptions to the mining ban are in place and the possibility for overturning the decision is present. Should uranium mining occur within the Grand Canyon watershed in the future, this would constitute a high threat due to the significant direct and cumulative downstream impacts on the site. Other potential threats include the further establishment of non-native and potentially invasive species, such as elk, and unsustainable infrastructure development, such as for tourism in eastern Grand Canyon, despite the cancellation of the Escalade project, and the potential for new/expanded development in Tusayan, at the park's South Entrance. The ability to meet and overcome all of these threats is uncertain.

Protection and management

Assessing Protection and Management



Mostly Effective

The park has a General Management Plan, numerous operational plans, is updating a backcountry management plan, has developed a non-native bison management and reduction plan, and has a business management plan. The park completed a foundation document in 2010 and a foundation document overview in 2017 to update and reaffirm park management strategies and initiatives. The park has a good planning and environmental compliance division that is staffed by professionals and addresses planning and management strategy as needed. Funding and future capacity are potential issues.



Some Concern

Some areas of controversy like aircraft over flights, management of increasing visitation, bison management, changes in uranium development policy have potential to affect the site's values, but these concerns are at the effectiveness of decision making at the political level (IUCN Consultation, 2020).



Some Concern

The boundaries of the World Heritage site are well defined. However, threats of adjacent development, such as mining, commercial tourist and urban development and water withdrawal (Centre for Biological Diversity, 2020), may degrade native plant communities, destroy wildlife habitat, interrupt migration corridors, and disturb wildlife breeding activities (IUCN Consultation, 2020).



Mostly Effective

The planning program for the park is effective and integrated into the regional and national planning programs. The current proposed project at Tusayan, which seeks to develop hundreds of homes, along with malls and other associated infrastructure just a mile from the boundary of the site, and carries the

potential to impacts water availability, wildlife and drastically increase light pollution in the skies at night (Centre for Biological Diversity, 2020), is of some concern in this regard. Whether the proposals are accepted will be a test of the integration of the site's values, and how these are prioritized, within the regional and national planning systems.



Some Concern

Eleven American Indian tribes retain significant connections to the canyon, with some considering it to be their original homeland and place of origin (Stortz et al., 2018). While the Park has some very effective individuals working with Native American tribes on a host of issues, relationships are fraught on many issues that affect management. Addressing Tribal concerns over land and water management constitute a set of significant challenges that will have a great impact on park resources (IUCN Consultation, 2020). The Park has begun an initiative working with tribal communities to increase educational opportunities and outreach, and envisioning Desert View as the inter-tribal cultural heritage site (NPS, 2019).



Mostly Effective

The legal framework of parks within the National System is very strong, especially for threats within the boundaries of the parks. The NPS Act of 1916 and enabling legislation for the park are strong, as are the regulations found in the Code of Federal Regulations particularly in title 36. Mostly very well managed, key issues are boundaries, implementation of the Grand Canyon Protection Act, abilities to manage aircraft over flights and key external threats.



Some Concern

Lack of staffing in some areas and political pressures sometimes prevent enforcement of park policies and could diminish values over time.



Mostly Effective

The World Heritage Committee examined this site in 2016 and requested an updated state of conservation report. On February 9, 2018, the National Park Service submitted its report, providing a status on several issues, including uranium mining proposals outside of the park and a project proposal that the Navajo Nation disapproved/disallowed (for its lands). The Committee welcomed the decision by the Navajo Nation. The Committee requested that the NPS monitor and mitigate any potential uranium mining impacts and keep the Committee informed of any monitoring results (World Heritage Committee, 2018).



Mostly Effective

The park has made advancements in sustainability in the last 8 years with good plans and assessments in place.



Serious Concern

Sustainable finance is a concern in terms of funding for both staffing and infrastructure. The park has an ONPS (Operation of the National Park System) budget of approximately \$21 million in fiscal year 2020, of which \$4.7 is for facilities (IUCN Consultation, 2020). Previously, the NPS quantified an annual Operation and Maintenance requirement of \$35 million per year for the facility management operations. The park is only able to fund approximately 30% of this need through ONPS, reimbursement agreements and project funding, which left an annual shortfall of approximately \$25 million for FY13; the situation is little changed. This shortfall is in addition to the \$386 million identified in backlogged deferred maintenance. This lack of funding could threaten historic structures, conservation programs, visitor services and archeological sites in coming years.



Some Concern

Staffing levels are high as GRCA has about 500 employees in an array of conservation and protection fields. Training programs exist at all levels from entry level to management including in law enforcement, interpretation, natural resource management, cultural resource management, business

management and park program management. The park has a reasonable budget for supplies, materials and operations, however continued budget cuts and backlog of facility maintenance could become a concern in future years (IUCN Consultation, 2020). Leadership voids and personnel issues have presented management challenges that continue to the present time. Although, with the recent installation of the new Superintendent of the National Park (National Park Service, 2020d), steps are being made to address this despite past issues in resolving these matters.

► **Highly Effective**

The park has recent quality programs for a variety of opportunities for a spectrum of visitors. Programmes range from Ranger-led field trips to curricula for school children on the geological, ecological values of the site (National Park Service, 2020c) as well as free state-of-the-art distance learning programs for classrooms, senior centers and adult learning institutions (National Park Service, 2020b).

► **Highly Effective**

Much improvement has taken place in this area over the past several years. An initiative specific to educational opportunities and outreach with inter-tribal communities has begun, with Desert View envisioned as the Inter-tribal cultural heritage site for the park (NPS, 2019).

► **Some Concern**

The science and resource division is relatively well managed in some aspects of monitoring. The park is part of a network made up of Colorado Plateau national park system units that cooperate on systematic inventory and monitoring activities, including natural resource vital signs monitoring (IUCN Consultation, 2020). The National Park Service is also a cooperating agency on the Colorado River Adaptive Management Program and it's supporting research and monitoring effort. However, there is some concern noted in the Greater Grand Canyon Landscape Assessment (Stortz et al., 2018) regarding monitoring programs undertaken in the park, specifically in linking the robust research program to management priorities, so that science can better inform management.

► **Mostly Effective**

A robust research program exists, through park staff, other bureau offices, and university and organizational partners (IUCN Consultation, 2020), and is also supported by the U.S. Geological Survey, Southwest Biological Science Center, Grand Canyon Monitoring and Research Center.

Overall assessment of protection and management

Some Concern

The site has a strong management system, which is supported by national law and well integrated into regional planning systems through the Grand Canyon Protection Act and other relevant policies and documents. The staff are also dedicated to protecting Grand Canyon, however, persistent internal management issues have limited the capacity of staff to proactively address emerging threats to natural and cultural resources. This has posed particular challenges in working outside the park, where significant external threats are numerous, and the ability to meet and overcome them is further challenged by the current political and financial environment. Steps have been taken to address these issues however, most notably through the recent installment of a new Superintendent following a high turnover of previous staff in this position. Key areas of concern in the immediate future lie in managing threats like the operation of Glen Canyon Dam, potential uranium-mining development, and proposed developments affecting park resources.

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

A number of key external threats including over flights, uranium mining, bison management, and concerns with management of Glen Canyon Dam as well as problems of water management if drought occurs or water extraction due to development increases could be difficult to manage. The

park has articulated concerns and is addressing all of these issues but support will be needed to overcome threats in future years.

State and trend of values

Assessing the current state and trend of values

World Heritage values

► **One of the world's most visually powerful landscapes**

Low Concern
Trend:Stable

While some concerns exist over development, air quality and other activities, the key resources of the geological landscape are currently protected.

► **Superlative scenic beauty of the Colorado River**

Good
Trend:Stable

Superlative scenic beauty and unique natural process are generally intact as they were at the time of World Heritage designation.

► **Geologic features and processes, and record of the earth's geologic history**

High Concern
Trend:Stable

Alteration of the Colorado River and lack of Implementation of significant conservation measures have seen some deterioration of resources since establishment as a World Heritage site but overall these processes remain largely intact. The installation of Glen Canyon Dam outside of the park dramatically altered the Colorado River. Sediment flow as primary geologic and ecological force was reduced severely, changing beaches, and changing the entire riparian system. The temperature of the river was also dramatically altered, extirpating and threatening native fish and leading to a great abundance of exotic fish in its place. Lack of periodic flooding has altered the riparian vegetation. From the geological perspective however, the area affected inside the property is approximately 10,000 acres, and the trend of its condition is relatively stable.

► **An exceptional example of biological environments at different elevations**

High Concern
Trend:Deteriorating

Some concerns exist for: vegetation in the face of climate change; deterioration of habitat for some species like humpback chub [although chub range expansion has occurred (Rogowski et al., 2018)] and other native fish; and, the need to reduce and manage the numbers of Bison on the north rim [a reduction plan was completed (NPS, 2017) and first reductions occurred in 2019 (IUCN Consultation, 2020)]. Of concern is the increased threat of high severity wildfire due to climate change and the need for restoration through prescribed fire and other treatments; high severity fires have occurred (Hoff et al., 2019). The status of more than 85 taxa in the Colorado River corridor has been questioned, with at least 14 vertebrate species extirpated there, as well as several other large wide-ranging vertebrates (including wolves, jaguar, and grizzly bear) from the middle and upper elevations of the Park. The park will have to have the resources to manage and intervene on key threats to ensure the protection of the park into the future.

► **Ecological refuge and biological diversity**

High Concern
Trend:Stable

The status of life cycle processes varies among sensitive species. For example, whilst there has been a range expansion of humpback chub in the site due to active management efforts, the recent loss of breeding endangered southwestern willow flycatchers from the National Park (IUCN Consultation, 2020) reflects the fact there is high concern for this value. Life zone distribution and responses to climate

change require more active monitoring. Many relict and unique assemblages occur within the large altitudinal gradient of the Park, and many are not adequately monitored (IUCN Consultation, 2020).

► **Diverse ecosystems**

Low Concern
Trend: Stable

The park retains its great biological diversity, which includes three of North America's four deserts, and five of Merriam's seven life zones: from rim to river one encounters the Lower Sonoran, Upper Sonoran, Transition, Canadian and Hudsonian zones, the ecological equivalent of traveling from Mexico to Canada (NPS, 2010). Extreme elevation and topography contribute to a wide range of habitats, and this range will likely remain, despite local disturbances and site changes/effects, because of the size and extent of the park and its connection to other significant natural areas including national monuments, recreation areas, wilderness areas, national forests, and Bureau of Land Management areas. There is concern that climate change has the potential to result in long-term effects, including loss or alteration of elements. High severity fire has the potential to cause landscape-scale changes, and has been shown to not only impact forest structure but also bring heterogeneity to vegetation types along the elevation gradient on the Kaibab plateau (Hoff et al., 2019). With respect to climate change and water sources, monitoring is limited and the data sets are not robust enough to predict long-term change; the park is working to address this issue, with a view to managing potential effects on the values of the site (IUCN Consultation, 2020).

► **Threatened animal species**

High Concern
Trend: Stable

Park resource management priorities have included humpback chub recovery; surveys in 2016 and 2017 showed range expansion and the likelihood of a downriver subpopulation (Rogowski et al., 2019), encouraging trends that have contributed to the possibility that the species will be downlisted from endangered to threatened. Other studies have suggested a potential for success in controlling non-native fish on the Colorado River (Bair et al., 2018). California condor have become established in Grand Canyon, with an experimental but non-essential population. Other threatened species are being monitored, to the extent that their populations are known. Kanab Ambersnail (*Oxyloma haydeni kanabensis*) is being considered for delisting, as it is not considered a distinct species (IUCN consultation, 2020). Overall, threatened and endangered species receive the management attention and priority needed to make some progress toward recoveries and prevent major losses of the values of the site.

► **Rare plant species**

Low Concern
Trend: Stable

The park has one endangered plant, the sentry milk-vetch, which is monitored and is the focus of an active recovery program (NPS, 2020). In the event that special status plants are threatened with potential disturbance, the park actively salvages and transplants at risk specimens. The park controls some non-native plant species, some with targeted actions, (NPS, 2020). One threat to at-risk riparian plant communities along the Colorado River and tributaries is tamarisk (*Tamarix* spp.), which has been targeted by a biocontrol agent, the tamarisk beetle (*Diorhabda carinulata*), released in 2001 (Bedford et al, 2018); the park has an active program to revegetate select locations with native plant species (IUCN consultation, 2020).

Summary of the Values

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

Low Concern
Trend: Stable

While there are a number of potentially significant threats to some values of Grand Canyon National Park, the overall status as it relates to the time of inscription on the World Heritage list shows general stability. Some significant resources along the Colorado River have continued to decline, but these values were heavily impacted at the time the park was inscribed as a World Heritage Site. Some of the key areas of concern include potential uranium mining; impacts of bison on habitats

and ecological processes; threats related to development in the vicinity of the site (eg. proposed Tusayan project), or within the watershed, such as increases in overflights and water extraction; continued high equalization flows between Lake Powell and Lake Mead; lack of funding for staff and infrastructure.

The populations trends of some species are in decline and are beginning to warrant concern that the park and surrounding areas will not eventually serve the needs of the Park, even though the trend remains stable overall, however not without concerns for specific values. Uncertainty exists over effects of climate change, invasive species, and drought-caused wildfires of increasing intensity, and if these will require future attention. For example, concerns exist for vegetation in the face of climate change, deterioration of habitat for some species like humpback chub, and the invasion of bison on the north rim. The status of more than 85 taxa in the Colorado River corridor is uncertain, with at least 14 vertebrate species extirpated there in the past, as well as several other large wide-ranging vertebrates (including wolves, jaguar, and grizzly bear) from the middle and upper elevations of the Park. The increase in visitation, from 4.5 million to around 6 million annually, is putting pressures on the park. If this trend continues and no sustainable solution to visitation occurs, park resources could be negatively affected by unregulated and unplanned development. The park must meet the resource requirements to manage and intervene on key threats to ensure the protection of the park into the future.

► **Assessment of the current state and trend of other important biodiversity values**

High Concern
Trend: Stable

The great ecosystem diversity within the park is largely stable, owing to the parks large size, extreme range in elevation and topography, and the extent of protected area. However, some of the park's numerous threatened and endangered animal species require management intervention to assure progress toward recovery. The humpback chub, for example, is a major NPS priority on the Colorado River, and has expanded its range and added a subpopulation (Rogowski et al., 2019). Rare plants are largely stable but monitored and protected (NPS, 2020). Important biodiversity values are monitored through established, institutional programs.

Additional information

Benefits

Understanding Benefits

► **Wilderness and iconic features**

Outstanding natural values including natural sounds, dark skies (Grand Canyon was designated a Dark Sky Park in 2019), clean air, relative solitude, and wilderness character. Over one-million acres of undeveloped backcountry, hundreds of trail miles, and 277 river miles (containing world- class white-water) provide tremendous opportunity for exploration, personal challenge, discovery, learning, social interaction, and/or solitude.

Factors negatively affecting provision of this benefit :

- Pollution Impact level - Low, Trend - Continuing
- Overexploitation Impact level - Moderate, Trend - Continuing

The park has sociological study and monitoring of visitor use levels. Visitors seek solitude, wilderness conditions, natural quiet, etc., but visitors are also the source of localized impact upon these very values (with 6.4 total visitors in 2019), which can be high at destination locations but generally low to moderate. Information is available on some pollution (on air quality) and habitat change (especially on the river).

► **History and tradition,
Sacred natural sites or landscapes,
Cultural identity and sense of belonging**

The preservation of the National Parks scientific, natural and wilderness values are significant to contemporary relationship with eleven American Indian tribes have known ties to Grand Canyon, and some consider the canyon their original homeland and place of origin. The 11 Federally recognized associated tribes are: Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab Band of Paiute Indians, Las Vegas Band of Paiute Indians, Moapa Band of Paiute Indians, Navajo Nation, Paiute Indian Tribe of Utah, San Juan Southern Paiute Tribe, Yavapai- Apache Nation, and Zuni Tribe.

Factors negatively affecting provision of this benefit :

- Overexploitation Impact level - Low, Trend - Continuing

The Park's high level of visitation is listed as as having low impacts on spiritual values. But, it has the potential to be much greater, and possibly is to some individuals and/or Tribes. Visitation can alter or preclude the connection some associated Tribal groups wish to continue with Grand Canyon, especially at sacred sites, which in some cases must be protected without drawing undue attention to their existence. However, the situation park wide is much improved over what it was in the past. The park is re-envisioning Desert View as a cultural heritage site. Included in that is first-person interpretation, tribal tourism, and a focus on understanding the rich history of native peoples to the Canyon. In addition, the park is developing a tribal focused welcome video that will be shown at the visitor center theater opposite the NPS orientation film (IUCN Consultation, 2020).

► **Outdoor recreation and tourism**

The approximately 6.4 million visitors to Grand Canyon spent around \$947 million in communities near the park. This spending support 12,600 jobs in the local area and had a cumulative benefit to the local economy of ca. \$1.2 billion (NPS, 2018), with \$377 million in labor income and \$673 million in value added (IUCN Consultation, 2020).

► **Wilderness and iconic features**

Wilderness landscapes are an important current resource and future preserve. Park boundaries extend beyond canyon walls to include 1,904 square miles (1,218,376 acres) of which 94 percent is managed as wilderness. When combined with additional contiguous public and tribal lands, this area comprises one of the largest undeveloped areas in the U.S. Grand Canyon offers outstanding opportunities for visitor experiences including extended solitude, natural quiet, clean air, dark skies, and a sense of freedom from the mechanized world's rigors.

Factors negatively affecting provision of this benefit :

- Overexploitation Impact level - Moderate, Trend - Continuing
- Habitat change Impact level - Low, Trend - Continuing

Impacts and development at popular destinations can detract from expected experiences for some visitors (per decades of monitoring). High visitation levels are a major impact to those seeking solitude, but demand continues to climb (even among those seeking solitude) and with low to moderate impact for most (per decades of research and monitoring).

Summary of benefits

Grand Canyon landscapes are an important current resource and future preserve. Park boundaries extend beyond canyon walls to include 1,904 square miles (1,218,376 acres) of which 94 percent is managed almost exclusively for natural and cultural values. When combined with additional contiguous public and tribal lands, this area comprises one of the largest undeveloped areas in solitude, natural quiet, clean air, dark skies, and a sense of freedom from the mechanized world's rigors. It also offers a refuge and preserved landscape that protects unique scientific values, incredible natural history and geologic landform and unique educational opportunities. It is a unique place for inspiration and connection with World Heritage values. The U.S. Grand Canyon offers outstanding opportunities for visitor experiences including hundreds of trail miles, and 277 river miles.. The regional economic benefits are great and tourism is increasing. The 6.4 million visitors in 2018 generated an estimate \$947 million in total regional sales and \$1.2 billion in economic output in local gateway economies.

Projects

Compilation of active conservation projects

Nº	Organization	Brief description of Active Projects	Website
1	Grand Canyon Trust	Park policy support	Grandcanyontrust.org
2	Grand Canyon River Guides	Sandbar monitoring; interpretation of Park values to the public	GCRG: grandcanyonriverguides.org
3	NPS and partners in water resources and watershed	Water Resources Plan, potential hazards from uranium mining adjacent to park, development of water resources strategy	NPS
4	Park Facilities management, concessioners and cooperators	Develop facility management strategy with potential funding remedies	NPS Grand Canyon
5	Grand Canyon Wildlands Council	Inventory of springs, biota, and management project success	

REFERENCES

Nº References

- 1 Bair, L. S., Yackulic, C. B., Springborn, M. R., Reimer, M. N., Bond, C. A., & Coggins, L. G. (2018). Identifying cost-effective invasive species control to enhance endangered species populations in the Grand Canyon, USA. *Biological conservation*, 220, 12-20.
- 2 Boyer, J. K., & Rogowski, D. L. (2018). Colorado River Fish Monitoring in the Grand Canyon, Arizona—2017 Annual Report. Research Branch, Arizona Game and Fish Department, Phoenix Arizona.
- 3 Cart, J. (2014) National Park Service Calls Development Plans a Threat to Grand Canyon. .
- 4 Center for Biological Diversity. (2020). Tusayan, Developers Begin New Push for Massive Grand Canyon. [online] Available at: Project <https://biologicaldiversity.org/w/news/press-releases/tusay...> (Accessed 27 September 2020).
- 5 Coggins, L., Yard, M., and Pine W. (2011) Nonnative Fish Control in the Colorado River in Grand Canyon, Arizona: An Effective Program or Serendipitous Timing? *Transactions of the American Fisheries Society*, 140(2): 456-470.
- 6 Crawford, A.J. (2014) Grand Canyon on the Precipice.
- 7 Fonseca, F. (Associated Press) Grand Canyon National Park Hits Visitation Record. .
- 8 Glen Canyon Dam Adaptive Management Work Group (2016) Long-Term Experimental and Management Plan and Environmental Impact Statement. .
- 9 Grand Canyon Trust. (2017) Stopping Grand Canyon Escalade. .
- 10 Hamberg, S. *Sierra Club Bulletin*. Climate Change and the Grand Canyon Eco Region.
- 11 Hoff, V., Rowell, E., Teske, C., Queen, L., & Wallace, T. (2019). Assessing the relationship between forest structure and fire severity on the North Rim of the Grand Canyon. *Fire*, 2(1), 10.
- 12 Howard, C.H. (2016). U.S. Government says No to Grand Canyon Project. .
- 13 IUCN (1979) World Heritage Nomination - IUCN Technical Evaluation, Grand Canyon National Park (USA). Gland, Switzerland: IUCN. .
- 14 IUCN Consultation. (2020). World Heritage Confidential Consultation- Grand Canyon National Park, USA.
- 15 Mufson, S. (2017). The West's largest Coal-fired Power Plant is Closing. *The Washington Post*.
- 16 NPS (1995) Grand Canyon National Park General Management Plan. National Park Service, U.S. Department of the Interior. .
- 17 NPS (2006) Management Policies 2006: Managing the National Park System. National Park Service. .
- 18 NPS (2010) National Park Service Climate Change Response Strategy. National Park Service Climate Change Response Program, Fort Collins, Colorado. .
- 19 NPS (2011) Ecosystem Restoration and Management. National Park Service. .
- 20 NPS (2012). Climate Change Action Plan 2012-2014. National Park Service. .
- 21 NPS (2017) Tourism to Grand Canyon National Park Creates \$904 Million in Economic Benefits. News Release: 2 May 2017. <https://www.nps.gov/grca/learn/news/econ-benefit-2016.htm>>.
- 22 National Park Service. (2010) Foundation Statement. [online] Available at: <https://www.nps.gov/grca/learn/management/upload/grca-found...> (Accessed April 7, 2020).

N^o References

- 23 National Park Service. (2017). Foundation Document Overview. [online] Available at: https://www.nps.gov/grca/learn/management/upload/GRCA_OV_20... (Accessed 11 October 2019).
- 24 National Park Service. (2017). Initial Bison Herd Management Environmental Assessment. [online] Available at: <https://parkplanning.nps.gov/document.cfm?parkID=65&pro...> (Accessed April 8, 2020).
- 25 National Park Service. (2018). November 2018- High-Flow Experiment. [online] Available at: <https://www.nps.gov/grca/learn/nature/hfe.htm> (Accessed 11 October 2019).
- 26 National Park Service. (2019). Grand Canyon National Park Management. [online] Available at: <https://www.nps.gov/grca/learn/management/index.htm> (Accessed 11 October 2019).
- 27 National Park Service. (2019). Finding of No Significant Impact, Desert View Inter-tribal Cultural Heritage Site Plan. Available at: <https://www.nps.gov/grca/learn/news/finding-of-no-significa....> (Accessed April 8, 2020).
- 28 National Park Service. (2020) (Grand Canyon) Plants. [online] Available at: <https://www.nps.gov/grca/learn/nature/plants.htm> (Accessed April 8, 2020).
- 29 National Park Service. (2020b). Distance Learning. [online] Available at: <https://www.nps.gov/grca/learn/education/learning/index.htm> (Accessed 27 September 2020).
- 30 National Park Service. (2020c). Curriculum Materials. [online] Available at: <https://www.nps.gov/grca/learn/education/classrooms/curricu...> (Accessed 27 September 2020).
- 31 Navajo Times (2017) War over Escalade ends with Council's 'no' vote. November 2, 2017. .
- 32 Puryear, B. (2016) Proposed Grand Canyon Development Continues to Stir Controversy. .
- 33 Reimondo, E.L., T.D. Sisk and T.C. Theimer. 2015. Effects of introduced bison on wetlands of the Kaibab Plateau, Arizona. In *The Colorado Plateau VI: Science and Management at the Landscape Scale*. University of Arizona Press, Tucson AZ.
- 34 Rogowski, D. L., Osterhoudt, R. J., Mohn, H. E., & Boyer, J. K. (2018). Humpback Chub (*Gila cypha*) range expansion in the western Grand Canyon. *Western North American Naturalist*, 78(1), pp.26-38.
- 35 Sankey, J. B., Caster, J., Kasprak, A., & East, A. E. (2018). The response of source-bordering aeolian dunefields to sediment-supply changes 2: controlled floods of the Colorado River in Grand Canyon, Arizona, USA. *Aeolian research*, 32, pp.154-169.
- 36 Sisk, T. (2017) Grand Canyon Landscape Assessment. To be released August 2017 by National Park Service.
- 37 State Party of the United States of America. (2018). Report of the State Party to the World Heritage Committee on the state of conservation of the Grand Canyon National Park (United States of America). [online] National Park Service. Available at: <https://whc.unesco.org/en/list/75/documents/> (Accessed 11 October 2019).
- 38 Stortz, S. D., C. E. Aslan, T. D. Sisk, T. A. Chaudhry, J. M. Rundall, J. Palumbo, L. Zachmann, and B. Dickson. 2018. Natural resource condition assessment: Greater Grand Canyon landscape assessment. Natural Resource Report NPS/GRCA/NRR—2018/1645. National Park Service, Fort Collins, Colorado.
- 39 Tobin, B. W., Springer, A. E., Kreamer, D. K., & Schenk, E. (2018). The distribution, flow, and quality of Grand Canyon Springs, Arizona (USA). *Hydrogeology Journal*, 26(3), pp.721-732.
- 40 U.S. Department of the Interior (2016) Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan Final Environmental Impact Statement. December 2016. http://itempeis.anl.gov/documents/docs/LTEMP_ROD.pdf>.
- 41 UNESCO (2016) Report on the State of Conservation of Grand Canyon National Park. State of Conservation Information System of the World Heritage Centre. .

Nº References

- 42 UNESCO. (2018). Report on the State of Conservation of Grand Canyon National Park, United States of America. State of Conservation Information System of the World Heritage Centre. [online] Paris, France: UNESCO World Heritage Centre. Available at: <https://whc.unesco.org/en/soc/3670> (Accessed 11 October 2019).
-
- 43 World Heritage Committee (2006) Decision 30 COM 11B, Grand Canyon National Park (USA). Adoption of Statements of Significance. .
-
- 44 World Heritage Committee (2016) Decision 40 COM 7B.104. Grand Canyon National Park (USA). Istanbul, Turkey. .
-
- 45 World Heritage Committee. (2019). Decision 43 COM 8E. Adoption of retrospective Statements of Outstanding Universal Value- Grand Canyon National Park (USA). [online] Baku, Azerbaijan: UNESCO. Available at: <https://whc.unesco.org/en/decisions/7393> (Accessed 10 October 2019).
-
- 46 World Heritage Committee. (2019). Decision 43 COM 8E. Adoption of retrospective Statements of Outstanding Universal Value- Grand Canyon National Park (United States of America). [online] Baku, Azerbaijan: UNESCO. Available at: <https://whc.unesco.org/en/decisions/7393> (Accessed 11 October 2019).