

World Heritage Sites

Protected Areas and World Heritage



GRAND CANYON NATIONAL PARK ARIZONA, UNITED STATES OF AMERICA

This is the most spectacular gorge in the world, carved by the Colorado river 1,600m into the plateau that has risen around it. It bisects half the Grand Canyon National Park, and its strata record the geological history of the past 2 billion years. There are also traces of prehistoric human adaptation to this harsh environment.

COUNTRY United States of America - Arizona

NAME Grand Canyon National Park

NATURAL WORLD HERITAGE SITE

1979: Inscribed on the List of World Heritage sites under criteria vii, viii, ix and x.
One of the first four natural World Heritage sites to be established.

IUCN MANAGEMENT CATEGORY

II (National Park)

BIOGEOGRAPHICAL PROVINCE

Rocky Mountains (1.19.12)

GEOGRAPHICAL LOCATION

In northwestern Arizona, 90 km north of Flagstaff between 35°43' to 36°45'N and 111°36' to 113°56'W.

DATES AND HISTORY OF ESTABLISHMENT

1893: First protected as a Forest Reserve by Presidential proclamation; mining, lumbering and hunting were permitted;

1906: Upgraded to a Game Reserve, giving protection to the wildlife;

1908: Redesignated a National Monument by President Roosevelt decree 794;

1919: Designated a National Park by Act of Congress 40 Stat.1175;

1975: Enlarged from 363,389 ha by Act of Congress 88 Stat 2089 to include all the lands previously designated as Grand Canyon and Marble Canyon National Monuments, with the Granite Gorges section of Lake Mead National Recreation Area (NRA), Glen Canyon NRA, Kaibab National Forest and other public and private lands. 34,000ha were simultaneously removed from Park administration and incorporated in Havasupai Indian Reservation.

LAND TENURE

491,470 ha is federally owned, of which 9,833 ha is administered by the United States Bureau of Indian Affairs for the Navajo Indian Tribe. A further 1,795 ha comprise private smallholdings. Managed by the National Park Service (NPS) of the Department of the Interior.

AREA

493,077 ha. Downstream from Glen Canyon NRA and upstream of Lake Mead NRA, both on the river. The Park is adjoined by Grand Canyon-Parashant National Monument (411,500 ha) on the northwest, the Havasupai and Hualapai Reservations on the southwest, the Navaho Reservation on the east and the Kaibab National Forest both north and south.

ALTITUDE

518m to 2,708m (Point Imperial). South Rim: -2,100m; North Rim: -2,400m.

PHYSICAL FEATURES

The Park is dominated by the spectacular Grand Canyon; a twisting many-colored gorge, 443 km long, 1.6 kilometres deep and an average of 16 km wide, carved by the Colorado River into the Colorado plateau as it rose during the past six million years. It divides the Park into the North Rim on the Kaibab plateau and the slightly lower South Rim of the Coconino plateau. The buttes, spires, and mesas in the canyon seen from these viewpoints are themselves small mountains. Within the canyon is a series of at least 22 layers of limestones, sandstones and shales laid down over 2,000 million years in warm coastal and shallow marine environments often grading from east to west. This includes two unconformities where intervening rocks deposited over hundreds of millions of years have disappeared. Resistant rocks such as the Coconino sandstone and Redwall limestone stand out as cliffs; in softer layers, the sides slope as in the mid-level Tonto platform, into which the river has carved a deep ravine.

The strata provide one of the world's most complete and undisturbed cross-sections of geological history from the fossil-less early Precambrian Vishnu schist and Zoroaster granite, through late Precambrian, Palaeozoic, Mesozoic and Cenozoic sedimentary rocks to the cap of Kaibab limestone 1,600m above the river. The first fossils appear in the late Precambrian Bass limestone with early plant forms. Later fossils from the Palaeozoic era catalogue a sequence of deposition of both marine and terrestrial forms, showing that the whole region was alternately raised and submerged at that time. The Mesozoic rocks in the Park have been largely removed by erosion, but tracks made by early reptiles are found in the Navajo Indian reservation to the east, and there are a few fossil mammal remains from the Cenozoic.

There are some 1,000 caves mostly in limestone, which have preserved relics in their dry interiors, faults hundreds of metres long exposed on cliff faces, and many signs of volcanic activity during the last six million years. Physical widening of the canyon has been limited by the dryness of the climate but continuing erosion by tributaries has produced impressive waterfalls and over 100 rapids along the length of the canyon over rocks washed downstream. Springs and seeps become small oases of dense life. Soils are sandy, fast-draining and skeletal except in the North Rim forests. Fragile biological crusts exist, mainly of blue-green algae, lichens, mosses and a few xerophytic liverworts (NPS, 2007b).

CLIMATE

The area's climate is basically dry but the local climates range from desert to mountain conditions depending on altitude. The South Rim at an elevation of about 2,135m has mild summers averaging 29° to 12°C with sometimes violent thunderstorms, and cold winters averaging 5° to -7°C with 147cm of snow on the South rim to 360cm on the North rim. The higher North Rim at about 2,440m averages some 4°C colder than the South Rim and winter snow makes it almost inaccessible in winter. The hottest point on the canyon floor at 720m (Phantom Ranch) averages 11°C hotter in summer and 10°C warmer in winter than the South Rim though snow can occasionally fall even there. Annual precipitation on the Kaibab plateau is 655mm but in the dry valley can be as low as 15.5mm. Visibility is sometimes decreased by haze from the pollutants from distant power plants. However, the weather is usually clear and dry which gives high diurnal variations in temperature (NPS, 2007a,b).

VEGETATION

The plateau surrounding the canyon is semi-arid desert but owing to the elevational differences in the Park there is a great variety of vegetation and 129 plant communities have been described. 1,737 vascular plants, 200 species of trees and shrubs, 167 fungi, 64 mosses and 195 lichens are recorded, in four main life zones. 12 species are endemic to the Park and 171 species (9.8%) are exotic (NPS, 2007a).

The highest forest type is found on the North Rim above 2,400m This is a spruce-fir forest, of Englemann spruce *Picea engelmannii*, Colorado blue spruce *Picea pungens*, Douglas fir *Pseudotsuga menziesii*, white fir *Abies concolor*, Rocky Mountain maple *Acer glabrum*, aspen *Populus tremuloides*, and mountain ash *Sorbus scopulina*. There are montane meadows and subalpine perennial grasslands and sedges. Between 1,900m and 2,400m lie transitional forests of *Pinus ponderosa* and gambel oak *Quercus gambelii* with New Mexico locust *Robinia neomexicana*, mountain mahogany *Cercocarpus montanus* and prickly pear cactus *Opuntia phaeacantha*. Semi-desert shrub-grasslands occur at Toroweap Valley and above the Grand Wash Cliffs with galleta *Hilaria jamesii*, Indian ricegrass *Achnatherum hymenoides* and blue grama *Bouteloua gracilis*. From 1,300m to 1,900m there is Upper Sonoran woodland of pinyon pine *Pinus edulis*, one-seed, Utah and Rocky Mountain junipers *Juniperus*

monosperma, *J. osteosperma* and *J. scopulorum*, with the shrubs big sagebrush *Artemisia tridentata*, cliffrose *Purshia stansburiana*, bitterbrush *P. tridentata*, broom snakeweed *Gutierrezia sarothrae*, mormon tea *Ephedra viridis*, Utah agave *Agave utahensis*, banana and narrowleaf yuccas, *Yucca baccata* and *Y. angustissima* and winterfat *Krascheninnikovia lanata* (NPS, 2007b).

Above the river corridor is mainly a Sonoran desert scrub community though Mohavean desert scrub intrudes from the west to near the confluence of the Little Colorado River, with creosote bush *Larrea tridentata* and white bursage *Ambrosia dumosa*. Typically Sonoran desert species are brittle brush *Encelia farinosa*, catclaw acacia *Acacia greggii*, ocotillo *Fouquieria splendens*, rubber rabbitbrush *Chrysothamnus nauseosus*, honey mesquite *Prosopis glandulosa* var. *torreyana*, mormon tea, manzanita *Arctostaphylos* sp. and many cacti. There are even Chihuahuan desert species such as mariola *Parthenium incanum* and four-wing saltbush *Atriplex canescens*. Hanging gardens, seeps and springs often harbour rare plants. Along the Colorado River is a riparian community where the predominant species are coyote willow *Salix exigua*, seep willow *Baccharis salicifolia*, arrowweed *Pluchea sericea*, honey mesquite, catclaw acacia *Acacia greggii*, and the alien saltcedar *Tamarix ramosissima*. Upstream of the Little Colorado River, in Marble Canyon and on the Tonto Platform, are species more characteristic of the Great Basin Desert, such as big sagebrush, blackbrush *Coleogyne ramosissima*, and rubber rabbitbrush (NPS, 2007b).

Sentry milkvetch *Astragalus cremnophylax* var. *cremnophylax* is nationally endangered, and 11 nationally threatened plants are found in the Park: goldenweed *Haplopappus salicinus*, Palmer amsonia *Amsonia palmeri*, *Draba asprella* var. *kaibensis*, plains cactus *Pediocactus bradyi*, scouler catchfly *Silene rectiramea*, phacelia *Phacelia filiformis*, primrose *Primula hunnewellii*, clute penstemon *Penstemon clutei* and the wild buckwheats *Eriogonum darrovii*, *E. thompsonae* var. *atwoodi* and *E. zionis* var. *coccineum*.

FAUNA

373 bird, 91 mammal, 49 reptiles, 8 amphibians and 17 fish species have been recorded in the Park. 12 species are endemic and 171 species are exotics (NPS, 2007a). Of the 34 mammals found along the riverside, 15 are rodents and eight are bats which forage from upland caves. Since Glen Canyon dam was built, beavers *Castor canadensis* have flourished; coyote *Canis latrans*, ringtail *Bassariscus astutus*, spotted skunk *Spilogale gracilis* and antelope squirrel *Ammospermophilus leucurus* are common. Raccoon *Procyon lotor*, longtailed weasel *Mustela frenata*, bobcat *Lynx rufus*, gray fox *Urocyon cinereoargenteus* and mountain lion *Puma concolor* are present but are much rarer; muskrat *Ondatra zibethicus* and river otters *Lutra canadensis* are very rare. Desert bighorn sheep *Ovis canadensis* thrive, no longer having to compete with burros which were removed in the 1980s. 50 species inhabit the desert scrub, mostly lizards, rodents and bats using the many caves. Generations of three woodrats *Neotoma* spp. live in middens which have been studied as indicators of past climatic conditions and the associated vegetation. 52 species live in the conifer forests on the Kaibab Plateau, among them porcupines *Erethizon dorsatum*, red squirrels *Tamiasciurus hudsonicus*, Kaibab squirrel *Sciurus kaibabensis*, endemic to the plateau, and Abert squirrel *S. aberti*, black bear *Ursus americanus*, pronghorn antelope *Antilocapra americana*, elk *Cervus elephas* and mule deer *Odocoileus hemionus*, who visit in the canyon for food (NPS, 2007b).

Of the 373 bird species, 250 are found along the river corridor where there is lush vegetation and a diversity of plants. 48 species regularly nest there; the others are migrant or overwintering such as the bald eagle *Haliaeetus leucocephalus*. Since Glen Canyon Dam was built, 19 species and large numbers of waterfowl winter on the river including the California brown pelican *Pelecanus occidentalis californicus*, the Yuma clapper rail *Rallus longirostris yumanensis* and the southwestern willow flycatcher *Empidonax triallii extimus*. Approximately 30 bird species breed primarily in the desert uplands: 100 pairs of American peregrine falcons *Falco peregrinus anatum* nest on the cliffs of the inner canyon and several re-introduced endangered California condor *Gymnogyps californianus* (CR) live in the eastern part of the Park. Some 90 bird species breed in the coniferous forests. 51 are summer residents and at least 15 are neotropical migrants. Northern goshawks *Accipiter gentilis* and some Mexican spotted owls *Strix occidentalis lucida* find refuge in the Park mainly in these forests and upper side canyons on both rims.

49 species of lizards and snakes live in the Park, more densely near the river where ten are relatively common. These include gila monsters *Heloderma suspectum*, chuckwalla lizards *Sauromalus ater*, six rattlesnake species, four being subspecies of the western diamondback *Crotalus* spp. The sub-species Grand Canyon rattlesnake *Crotalus viridis abyssus* occurs only in the canyon; and the threatened

desert gopher tortoise *Gopherus agassizii* (VU) occurs in the west of the Park. The mountain short-horned lizard *Phrynosoma hernandesi*, is abundant in the piñon-juniper and ponderosa pine forests. The three most common of eight amphibian species in the Grand Canyon are the canyon treefrog *Hyla arenicolor*, red-spotted toad *Bufo punctata*, and Woodhouse's rocky mountain toad *B. woodhousii*. These live near the river though two other species are also found in mesic upland habitats. Of 25 species of fish, 12 are exotics. Until Glen Canyon Dam was completed in 1963, the river was dominated by eight native species adapted to highly variable seasonal fluctuations in sediment load, flow and temperature. Introduced game fish now compete with and prey on them: three species have died out and two are now endangered: the humpback chub *Gila cypha* (VU) and razorback sucker *Xyrauchen texanus* (EN). There are 33 species of crustaceans, 11 aquatic and 26 terrestrial molluscs, with one, the Kanab ambersnail *Oxyloma haydeni kanabensis*, listed as nationally endangered, and 8,480 known species of invertebrates (NPS,2007a,b).

CULTURAL HERITAGE

Nomadic hunter-gatherers of 4-12,000 years ago left the earliest evidence of settlement on the plateau, attested by ritual split-twig figurines dated to 3-4000 years ago. The Basketmaker Anasazi and Cohonina tribes lived in the area 2,500 years ago but some 1,00 years later they developed more advanced agriculture. Villages were developed on both rims and in the inner canyon by Pueblo Anasazi who followed a seasonally transhumant lifestyle. More than 4,800 documented prehistoric ruins and relics are preserved by the dry climate, including some 2,000 Pueblo sites of which the most accessible is the ruin of Tusayan Pueblo south of the Park. Sometime after 1200 AD, the area was abandoned probably because of drought, but after 1300 AD Navaho and Paiutes from the east and Cerbat from the west moved into the area, where they remained undisturbed until in 1848 the region was ceded to the United States and, following the Indian wars, they were moved onto reservations in 1882. The descendants of the Cerbat Indians are the Hualapai and Havasupai whose reservations lie to the south and southwest of the Park. Their village of Havasu is probably one of the oldest continuously occupied settlements in North America. To the east, the Navaho reservation is part of the largest reservation in the country. The canyon is revered by southwestern Indians as an ancestral homeland (NPS,2007b).

Although mining was attempted, tourism early became the most obvious use for the canyon and the early 20th century structures are outstanding examples of tourist development by private enterprise and the National Park Service. This included a railway service, a luxury destination in the El Tovar Hotel, as well as ordinary lodgings. Following a 1924 development plan, zones were delineated for tourist, residential, commercial and industrial uses, and roads and buildings were designed to blend into the environment. Hundreds of buildings and structures built during the 1930s are now on the National Register of Historic Places and/or are listed as National Historic Landmarks of which the most prominent are Grand Canyon Lodge and Grand Canyon Village

LOCAL HUMAN POPULATION

The area is sparsely populated. The small tourist village of Grand Canyon (809 ha) within the Park contains the administrative, maintenance and visitor centres. Tusayan village lies 11 km south. Eleven American Indian tribes or bands are affiliated to the Park Authority.

VISITORS AND VISITOR FACILITIES

In 2006 this was the second most visited National Park in the U.S.A. after the Great Smoky Mountains, with 4.4 million visitors. Many attractions and accommodations must be pre-booked, some by four months ahead, overnight stays need permits and the payment of fees and there are limits on group size. The South Rim is the most accessible, open year round and is well serviced. The much larger North Rim section is 346 km away by road, accessible by NPS Transcanyon shuttle, is less well serviced and is closed between mid October and mid May when snow may block access roads. Services include lodging for 1,135, 469 campground and 70 camper places, visitor centres, restaurants, shops, museum, medical clinic, interpretive programs, guided hikes, mule trips, horse rides, whitewater and smooth water rafting, air trips and shuttle bus tours; in winter snow skiing and snowshoe hiking but no snowmobiling. 82 km of maintained tracks and 946 km of trails run through the backcountry. There are further hotels at Tusayan village 11 km south. The main access to the Park is from the south or from the Grand Canyon National Park Airport, just outside the southern boundary (NPS,2007a).

SCIENTIFIC RESEARCH AND FACILITIES

Geological work began in 1858, but it was John Wesley Powell who led two expeditions through the canyon in 1869 and 1871 who created national interest in its geology, followed by detailed scientific studies in 1880-1 described by Dutton (2001). Many studies of the area have followed, of geology, soils, water resources, flora and fauna, ecological impacts, archaeology, sociology and fire management. The Grand Canyon National Park research library with a resource study collection of flora, fauna and human artefacts is located at the Park headquarters on the South Rim. The Grand Canyon Association is a non-profit partner of the National Park which publishes monographs and information and has set up the Grand Canyon Field Institute to provide educational services.

CONSERVATION VALUE

This 1,600m-deep canyon carved by the Colorado River is visually the most spectacular gorge in the world, and its strata record much of the past two billion years of geological history.

CONSERVATION MANAGEMENT

All of the Grand Canyon is within areas now administered by the Federal Government through the National Park Service, the Bureau of Indian Affairs, the Fish and Wildlife Service, the Bureau of Reclamation, and the Bureau of Land Management, all in the Department of the Interior, and the Forest Service of the Department of Agriculture. The first development plan was compiled for the South Rim Development Areas in 1924 and implemented during the 1930s as Park visitation expanded. The direction for future park management was based on the laws establishing the National Park Service and the Park, its purpose and its main resources. A 15-year General Management Plan was completed in 1995 replacing the first plan. The environmental impacts of implementing the plan were analysed in a Draft General Management Plan and Environmental Impacts Assessment. This was the culmination of a four year process that involved local citizens, American Indian tribes and public and private agencies. In 2006 plans were initiated to improve management of the North Rim and visitor use on the Colorado River. The Park has been zoned for management purposes. These comprise a natural zone including proposed Wilderness area (over 90%); Havasupai Uselands and non-wilderness areas and corridors; and a Development zone. Studies of potential boundary adjustments may result in recommendations to revise park boundaries (NPS, 1995).

MANAGEMENT CONSTRAINTS

The most serious management issue is that of tourism. Visitation increased dramatically in the late 1980s causing traffic congestion and crowding at popular daytime attractions. The present four to five million annual visitors, their vehicles and wastes, are gradually degrading the Park's resources both natural and cultural. Alien flora and fauna which compete with and sometimes exclude native plants are being systematically extirpated although they number 171 species; and campaigns have been needed to eliminate the feral burros and introduced trout. Destructive fires are reduced by thinning the forests which will allow the beneficial use of controlled burns. The air quality is affected by coal-powered plants in the region and copper smelters in Northern Mexico; regional haze results which can cut visibility by two thirds. The construction of Glen Canyon dam upstream noticeably reduced the rate of water flow and the amounts of silt and sediment carried down the Colorado, lowering the rate and pattern of sediment aggradation and the camping beaches used by river-runners; it has also affected the breeding of sediment-adapted native fish and reproduction of flood-dispersed cottonwoods, favoring invasion by exotic clearwater fish and the proliferation of tamarisk. Other intrusions have included trespassing cattle, now fenced out, commercial interests, mining, and aircraft overflights which are now limited (NPS, 2007b)

STAFF

In 2006 there were 415 permanent employees: 16 in the Superintendent's office and project management team, 38 in administration, 9 in planning & compliance, 41 in the science center, 38 in interpretation, 26 on the North Rim, 6 in concessions, 111 in maintenance, 105 in protection and 25 in the fire service (NPS, 2007a). Thousands of hours are contributed by volunteers.

BUDGET

The base operating appropriation for 2006 was \$19,067,600. Further funding for special projects was \$633,222, for equipment replacement \$547,962, for fire protection \$1,801,830 and \$96,000 was granted for roads. Additional funds received from concessions, donations and other sources came to \$12,872,332. The total recreation fee revenue kept back for 2006 was \$9,792,019 and has averaged \$14,679,860 over the past 10 years (NPS,2007a).

LOCAL ADDRESS

Superintendent, Grand Canyon National Park, PO Box 129, Grand Canyon, Arizona 86023, U.S.A.

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