Carlsbad Caverns National Park

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: United States of America (USA)
Inscribed in: 1995
Criteria: (vii) (viii)

This karst landscape in the state of New Mexico comprises over 80 recognized caves. They are outstanding not only for their size but also for the profusion, diversity and beauty of their mineral formations. Lechuguilla Cave stands out from the others, providing an underground laboratory where geological and biological processes can be studied in a pristine setting. © UNESCO

SUMMARY

2020 Conservation Outlook

Finalised on 02 Dec 2020

GOOD WITH SOME CONCERNS

The cave resources of the site which form the basis of its Outstanding Universal Value are generally protected. However, concern remains about continued small but permanent damage from tourists. The site will be able to maintain current biodiversity only with heightened diligence, funding and direction, particularly to address the threat to air and water quality from adjacent development outside the park. More baseline studies of surface ecosystems are needed as a measure of probable impacts from climate change. There are no current threats to the geological values of the site for which it was inscribed. But increased oil and gas development reduces the quality of views from the park due to air pollution and light pollution at night, and poses a small risk of air pollution in some caves from natural gas leaks.
FULL ASSESSMENT

Description of values

Values

World Heritage values

▶ Geological features  
Criterion:(viii)

Carlsbad Caverns National Park is one of the few places in the world where ongoing geological processes are most apparent and rare speleothems continue to form, enabling scientists to study geological processes in a virtually undisturbed environment (World Heritage Committee, 2006). Capitan Reef is the largest exposed Permian Reef in the world, approximately 250 million years old. The Capitan Reef, in which Carlsbad Caverns and Lechuguilla Cave (and other caves) formed, is one of the best preserved and most accessible complexes available for scientific study in the world. The more than 100 limestone caves within Carlsbad Caverns National Park are outstanding and notable worldwide because of their size, mode of origin (i.e. dissolution via sulphuric acid), exceptional geological features and unique rock formations.

▶ Rare and unique speleothems  
Criterion:(vii)

The park’s primary caves, Carlsbad and Lechuguilla, are well known for the abundance, diversity and beauty of their decorative rock formations. Lechuguilla Cave exhibits rare and unique speleothems, including a great abundance of large calcite and gypsum formations, including the largest accumulation of gypsum ‘chandeliers’, some of which extend more than six metres (18 feet) in length (World Heritage Committee, 2006).

Other important biodiversity values

▶ Biodiversity

The park contains a large number of species of birds, mammals and reptiles (Bailey, 1928). Over 15 species of bats have been recorded in the park, including a large colony of Brazilian free-tailed bats which sometimes exceeds 1,000,000 in number (Geluso & Geluso, 2004; West, 1995). Approximately 900 species of plants are found in the park, with many examples of species at the margins of their range. Recent studies have discovered several moth species new to science and others new to the United States and some new to New Mexico (Metzler et al., 2013; Metzler & Knudson, 2011). Numerous single-celled organisms live in the caves, especially Lechuguilla Cave (Cunningham et al., 1995), and exhibit adaptations to cave existence, feeding on inorganic materials. Studies show the potential for cancer inhibiting properties in some of them. A ten-year study is expected to show a high degree of biodiversity with several thousands of species present.

Assessment information

Threats

Current Threats  
Low Threat

There are no threats to the geological values of the site. However, exotic plants and animals threaten the biological stability of native ecosystems.
### Invasive Non-Native/ Alien Species

*(Exotic plants and animals)*

- **Low Threat**
  - **Inside site**, scattered (5-15%)
  - **Outside site**

Exotic plants and animals threaten the biological stability of native ecosystems. Barbary sheep are the primary invasive animal. The park is also threatened by about a dozen plant species, especially a non-native thistle, that occur mostly along park roads and trails, brought in and distributed on the feet and vehicles of visitors.

### Other Ecosystem Modifications

*(Habitat shifting)*

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

Change in plant composition due to grazing, climate change and habitat fragmentation on the boundaries of the park. Additionally, the US Air Force is proposing training flights over the vicinity of the park which may affect the park's bat populations. Studies and negotiations are currently in progress on this question.

### Livestock Farming / Grazing

*(Trespassing livestock)*

- **Very Low Threat**
  - **Inside site**, localised (<5%)

There have been no breaches of the boundary fence in the past five years.

### Potential Threats

Increased oil and gas development could result in groundwater contamination and lower water levels in the Capitan Aquifer, which is the primary water supply for the City of Carlsbad, but it will not impact the water supply, water resources, or caves in the park because they are above the water table (except for one small pool). A leak from a natural gas well could threaten the air quality of some caves in the park, and their associated ecosystems, but the caves formed primarily vertically. The horizontal extent of their passages and associated conduits and fractures have a low probability of extending far enough from the park to be affected significantly by leaks from natural gas wells off-site. Currently, the most significant impact by the region's oil and gas development on the park is on the views from the park. Flaring has increased haze, limiting views of daytime vistas, and increased ambient light to impact views of the night sky.

### Oil/ Gas exploration/development

*(Oil and gas development)*

- **Low Threat**
  - **Outside site**

Increased oil and gas development can result in contamination of water resources for the area but not for the park or its caves. A release of natural gas has a low potential to pollute some cave atmospheres.

### Other

*(White-Nose Syndrome)*

- **Low Threat**
  - **Outside site**

Carlsbad Caverns is home to 17 species of bat. While evidence of White-Nose Syndrome has not necessarily been reported in the area, it is a serious threat to bat populations around North America and its reach is expected to spread (IUCN Consultation, 2020).

### Overall assessment of threats

There are no current threats to the geological values of the site for which it was inscribed. However, exotic plants and animals threaten the biological stability of native ecosystems. Except for daytime and night-time views from the park, the potential for adverse impacts from increased oil and gas development in the area is low.
Protection and management

Assessing Protection and Management

▶ **Management system**

Highly Effective


▶ **Effectiveness of management system**

Highly Effective

The management system in place appears adequate and is being fully implemented (State Party of the United States of America, 2013).

▶ **Boundaries**

Mostly Effective

Boundaries of the site are adequate to protect the site’s Outstanding Universal Value; however, they could be improved (State Party of the United States of America, 2013). The site has no formal buffer zone, but most of the surrounding land is controlled by other federal agencies and those agencies coordinate their activities with the park to minimize adverse impacts. Additionally, negotiations are currently in progress to acquire an in-holding of private land and add it to the park.

▶ **Integration into regional and national planning systems**

Mostly Effective

Interagency planning and coordination occurs between the park and adjacent federal lands, principally the US Forest Service and the Bureau of Land Management (BLM). The BLM has agreed to prohibit oil and gas operations within a designated exclusion zone north of the park to prevent impacts to Lechuguilla Cave, and more recently to restrict such operations to east of Highway 62/180 (an average 6-10 km from the park boundary).

▶ **Relationships with local people**

Mostly Effective

Overall, the relationship with local people is good, although while local communities provide some input, they do not have a direct role in the management of the site (State Party of the United States of America, 2013). Park staff are active in the community in multiple ways, including the cooperative development of the Guadalupe Ridge Trail that extends through the park, adjoining federal lands, and to other properties to the City of Carlsbad.

▶ **Legal framework**

Mostly Effective

Carlsbad Caverns was designated as a national park in 1930. Two-thirds of the area is also gazetted as wilderness. The Federal Government has full jurisdiction over all lands within the park boundary through the US Department of the Interior and National Park Service. A Land Protection Plan approved in 1984 is in place covering the private tract. The most recent Periodic Report notes some deficiencies in the implementation of the legal framework (State Party of the United States of America, 2013).

▶ **Law enforcement**

Mostly Effective

NPS has cooperative enforcement agreements in place with adjacent jurisdictions that supplement park ranger staff.
### Implementation of Committee decisions and recommendations

No decisions issued requiring implementation.

### Sustainable use

Small but cumulative permanent damage occurs from tourists in Carlsbad Cavern. The park is aware of it and continues to seek ways to minimize and prevent it.

### Sustainable finance

The available budget is sufficient; however, further funding could help enhance the management of the site to international best practice standards (Levine & Pyne, 2010; State Party of the United States of America, 2013).

### Staff capacity, training, and development

Current staffing is sufficient for natural resources, interpretive, and law enforcement personnel. Additional staff is needed for maintenance and facilities, which might be gained through a recently-announced increase in maintenance funding for US national parks.

### Education and interpretation programs

Education and interpretation programs are in place and improved following increases in staffing, expansion of the Visitor Center and its exhibits, increased local outreach, and the upgrade in interpretive signage throughout the park that should be complete by the end of 2020. The notable deficiency in education and interpretation is the self-guided nature of most tours, which greatly limit contact and educational experience with the park's interpretive personnel.

### Tourism and visitation management

Tourism is generally well-managed. However, monitoring of damage in Carlsbad Cavern finds continued damage from tourists on self-guided tours. While the amount of damage over a given period is generally small, most is permanent and irreparable and cumulatively increases in significance. Park resource staff are evaluating options to reduce and prevent further damage. On the positive side, the parks plans to replace the trails in the cave within a couple of years with materials that are less harmful to the cave environment.

### Monitoring

There is considerable monitoring of management needs: vegetation and soils, oil and gas methane emissions and development impacts on exotic species, monitoring of cave temperature, noise, carbon dioxide, lighting/lampenflora, damage from tourists to develop appropriate visitor use numbers and management methods.

### Research

There is considerable research ongoing, both scientific and management related. A survey of archaeological resources along the newly-established Guadalupe Ridge Trail has begun. See the list of projects for more research information.

### Overall assessment of protection and management

Overall, protection and management of the site are mostly effective with multiple management and monitoring programs active and in development, within the strong legal framework of the US National Park system complemented by interagency planning between the park and adjacent federal lands, principally the US Forest Service and the Bureau of Land Management (BLM). Monitoring activities have identified some concern about continuing small but permanent damage from tourists, for which
the park management are actively engaged in mitigating.

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

Mostly Effective

Oil and gas extraction in the area is a low threat to the park. Exotic species remain a concern. Livestock have not been found on the park in five years, although some boundary fences need repair and funds are sought, which might be available through a just-announced increased in funding for US national parks maintenance.

▶ Best practice examples

The park actively supports research funded through its own budget and outside sources, such as universities, to better understand its resources, impacts to those resources, and how to better manage them.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ Geological features

Good

Trend: Stable

The unique geological features of the site have been well preserved and remain in good state.

▶ Rare and unique speleothems

Low Concern

Trend: Deteriorating

The cave resources of the site which form the basis of its Outstanding Universal Value are mostly protected, yet small but cumulative damage is occurring. Park staff continue to develop new strategies to reduce and eliminate such damage.

Summary of the Values

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

Low Concern

Trend: Deteriorating

The cave resources of the site which form the basis of its Outstanding Universal Value are mostly well protected, yet small but cumulative permanent damage continues from tourists.

▶ Assessment of the current state and trend of other important biodiversity values

Low Concern

Trend: Improving

Biodiversity values of the park, and what needs to be done to maintain them, are studied through research on certain species and niches as park funding and scientists with independent funding become available. A comprehensive survey of the surface ecosystem is needed as a baseline to compare to probable upcoming impacts from climate change. A comprehensive survey on the park’s cave fauna has not been published since 1928. Exotic species continue to degrade the park environment, primarily along trails and roads, and are addressed by remediation methods such as pulling out of exotic plants.
Additional information

Benefits

Summary of benefits

Having a World Heritage Site in the community of southeastern New Mexico helps to raise the status of the area and calls attention to the unique resources and values of the park, while promoting visitation to the park, especially by international visitors. However, World Heritage designation is primarily appreciated by non-US visitors. In general, US citizens are unaware of World Heritage and some communities, including those near Carlsbad Caverns National Park, do little to celebrate or recognize it. Continued effort by the park may help improve this situation.

Projects

Compilation of active conservation projects

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<th>Organization</th>
<th>Brief description of Active Projects</th>
<th>Website</th>
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<tr>
<td>1</td>
<td>Searching for close relatives of Pseudogymnoascus destructans and clues to natural defenses in bats at Carlsbad Caverns National Park, New Mexico</td>
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<td>2</td>
<td>Population dynamics and ecology of Ocotillo.</td>
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<td>3</td>
<td>University of New Mexico</td>
<td>Late Pleistocene and Holocene paleoclimatology of the southwestern United States.</td>
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<td>4</td>
<td>CHDN uplands vegetation and soils monitoring.</td>
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<td>5</td>
<td>University of Texas at El Paso</td>
<td>Critical loads of nitrogen deposition in grasslands at Carlsbad Caverns National Park</td>
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<td>6</td>
<td>Texas Tech University</td>
<td>Biological invasions, fire, and changes in landscape flammability in the arid west</td>
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<td>7</td>
<td>Penn State University</td>
<td>Quantification of methane emissions from natural gas extraction in the Permian Basin</td>
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<td>8</td>
<td>MSC Project-University of Tennessee, Knoxville</td>
<td>Improving recreation and conservation in environments shared by humans and bats</td>
<td><a href="http://fwf.ag.utk.edu/mgray/wfs512/SeminarFA18/ShapiroFlyer.pdf">http://fwf.ag.utk.edu/mgray/wfs512/SeminarFA18/ShapiroFlyer.pdf</a></td>
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<td>9</td>
<td>Is the causative agent of White-nose Syndrome, Pseudogymmoascus destructans, present in Carlsbad Caverns?</td>
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<td>10</td>
<td>University of Texas at Austin, Austin, TX, United States</td>
<td>Late Guadalupian evolution of the Delaware Basin: insights from stable isotope and trace element Geochemistry</td>
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<td>11</td>
<td>Assessing quaternary tectonics in the Guadalupe Mountains of New Mexico using cave shelfstones as tilt meters</td>
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<td>12</td>
<td>Senckenberg am Meer, Marine Research Department</td>
<td>Subaqueous celestite crystals forming in Lechuguilla Cave.</td>
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<tr>
<td>13</td>
<td>The geomorphic extent of Rockslide Cave determined through survey and inventory</td>
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<tr>
<td>14</td>
<td>National Cave and Karst Research Institute</td>
<td>Cave lighting and algae study, Carlsbad Caverns National Park, New Mexico</td>
<td><a href="http://www.nckri.org">www.nckri.org</a></td>
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## REFERENCES

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