

El Pinacate and Gran Desierto de Altar Biosphere Reserve

2020 Conservation Outlook Assessment

SITE INFORMATION

Country: Mexico
Inscribed in: 2013
Criteria: (vii) (viii) (x)



The 714,566 hectare site comprises two distinct parts: the dormant volcanic Pinacate Shield of black and red lava flows and desert pavements to the east, and, in the west, the Gran Altar Desert with its ever changing and varied sand dunes that can reach a height of 200 metres. This landscape of dramatic contrast notably features linear, star and dome dunes as well as several arid granite massifs, some as high as 650 metres. The dunes emerge like islands from the sea of sand and harbour distinct and highly diverse plant and wildlife communities, including endemic freshwater fish species and the endemic Sonoran Pronghorn, which is only to be found in northwestern Sonora and in southwestern Arizona (USA). Ten enormous, deep and almost perfectly circular craters, believed to have been formed by a combination of eruptions and collapses, also contribute to the dramatic beauty of the site whose exceptional combination of features are of great scientific interest. The site is also a UNESCO Biosphere Reserve.

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SUMMARY

2020 Conservation Outlook

Finalised on 16 Jan 2022

GOOD WITH SOME CONCERNS

EPGDABR is in a privileged position as the harsh environmental conditions and inhospitable terrain provide a high degree of natural protection, albeit with issues arising in maintaining ecological connectivity across international borders. The construction of the border wall presented significant challenges to the ecological connectivity between the site and other protected areas in the US, as physical border infrastructure disrupts free movement of wildlife, which can result in negative impacts on populations of several species, including the Sonoran pronghorn sheep and bighorn sheep. Water stress, alien invasive species and anticipated climate change will likewise put new pressures on the area. At the same time, the current capacity of the management to address these threats is limited by the lack of human and financial resources, affected by the recent overall budget cuts in Mexico's federal government programmes, which raises questions about the longer term capacity. Efforts should be soon implemented to address staff issues, in particular the appointment of a Director and increasing the number of personnel; as well as to ensure proper and sustainable funding to operate and manage the Reserve.

FULL ASSESSMENT

Description of values

Values

World Heritage values

► **Extraordinary landscape beauty**

Criterion:(vii)

The El Pinacate and Gran Desierto de Altar Biosphere Reserve (hereafter EPGDABR) is visually stunning through the stark contrast of the dark-colored volcanic shield with its spectacular craters and lava flows next to vast dune fields. At a finer scale, there is an impressive diversity of landscape features, colors, shapes and forms. The elevated areas permit magnificent views, all the way to the adjacent Gulf of California and even the Baja California Peninsula (World Heritage Committee, 2013).

► **Extraordinary volcanic and geological features**

Criterion:(viii)

The Pinacate, including the Gran Desierto, is the largest (500,000 ha) dune field in the New World and also has 200,000 ha of spectacular volcanic formations, one of the greatest concentrations in the world of giant Maar-type craters, and close to four-hundred cinder cones. A wide variety of volcanic and other geological features make the property geologically extremely complex. The Pinacate Volcanic Field boasts an exceptional aggregation, quality and conservation status of giant Maar craters and an unusual shield volcano, Volcán Santa Clara. The dynamic geomorphology of the dunes and the volcanic shield is highly diverse, intact and of large scale. The vast sea of sand dunes that surrounds the volcanic shield is considered the largest and most active dune system in North America (World Heritage Committee, 2013).

► **Scientific importance of volcanic and geological features**

Criterion:(viii)

Scientists have described EPGDABR as a "living textbook" due to the combination of the wide array of features, their excellent condition and the clear display of volcanic behaviour patterns and of different stages in Earth history. The combination of earth science features is an impressive laboratory for geological and geomorphological studies (World Heritage Committee, 2013). Its large sand sea originated from Colorado River sediments primarily in the Pleistocene, but lowered sea levels during the last glaciation also might have played a role, exposing an additional 50 km of sand below the present tides.

► **Rare, endangered and endemic species of flora and fauna**

Criterion:(x)

The seemingly inhospitable habitat mosaic is home to more than 560 species of vascular plants, 44 mammals, more than 225 birds, 44 reptiles, 5 amphibians and 2 native fresh-water fishes - the Sonoyta pupfish (*Cyprinodon eremus*) and the longfin dace (*Agosia chrysogaster*). Insect diversity is high and not even fully documented.

Endemics include two arenicolous lizards, the flat-tail horned lizard (*Phrynosoma mcallii*) and the Yuma fringe-toed lizard (*Uma rufopunctata*), both considered as Near Threatened (IUCN) (Bezy et al., 2017); a local endemic plant restricted to a small part of the volcanic shield and several subspecies of plants endemics of the dunes of the Gran Desierto. Endemics include two freshwater fish species. There is a population of the endemic Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*) which have recently declined markedly and should be closely monitored. The many other noteworthy species include the endangered subspecies of the Sonoran Pronghorn (*Antilocarpa sonorensis*), the Mexican subspecies of the bighorn sheep (*Ovis canadensis mexicana*) subjected to special protection, the Near Threatened lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*) and the endemic (listed as Vulnerable) fish-eating bat (*Myotis vivesi*).

► **Scientific importance (desert ecology and biology)**

Criterion:(x)

Among the North American deserts and even within the transboundary Sonoran Desert EPGDABR stands out as a rare large-scale area with limited past and current anthropogenic modifications, thereby constituting a rare and valuable baseline reference.

Assessment information

Threats

Current Threats

Low Threat

The large scale of the World Heritage site, its contiguity with an even larger set of protected areas, the high degree of natural protection and the dedicated conservation efforts combine to make the site comparatively resilient. However, a number of threats raise concerns, including invasive species, increasing water consumption in the broader region, as well as security measures and infrastructure along the international border between Mexico and the USA. The construction of the border wall presented significant challenges to the ecological connectivity between the site and other protected areas in the US, as physical border infrastructure disrupts free movement of wildlife, which can result in negative impacts on populations of several species.

► Other

High Threat

(Border security measures and infrastructure)

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

The construction of the border wall between the United States and Mexico which forms the northern boundary of the site presented significant challenges to the ecological connectivity between the site and other protected areas in the US including the Organ Pipe Cactus National Monument and Biosphere Reserve, Cabeza Prieta National Wildlife Refuge, and the Barry M. Goldwater Range which supports key elements of the site's OUV, most notably migratory ungulates such as Sonoran pronghorn sheep and bighorn sheep (IUCN Consultation, 2020). The infrastructure would represent a barrier that disrupts free movement of wildlife, which can result in negative impacts on populations of several species. Furthermore, alterations to the flow and disposal of surface water were also observed as a result of the construction (State Party of Mexico, 2020).

► Mining/ Quarrying

Low Threat

(Extraction and use of natural resources)

Inside site, extent of threat not known
Outside site

Largely brought under control but still reported to occur (World Heritage nomination dossier of the property and IUCN, 2013).

The localized impacts of past extraction of volcanic ash (Morusa) and cinder mining of volcanic rock and pyroclastic material will be visible for a long time. Gold mining further east in the state of Sonora deserves to be mentioned. Despite the distance from the property the mining area belongs to the range of the last Sonoran Pronghorns like the property itself. Mining may therefore negatively affect the flagship species of El Pinacate (Burquez y Martinez-Yrizar, 2006; Burquez y Castillo, 1994; Castillo-Sánchez, 1999).

Prior to the establishment of the Reserve, rock and sand extraction was one of the most productive activities (Brusca et al 2001). Currently, it seems that commercial extraction of sand, gravel and cinder in certain locations within the buffer zone is allowed. Plant extraction is currently practiced in the Pinacate Reserve on a small domestic scale and is not regulated. The principal species extracted are mesquite, ironwood, and ocotillo. Mesquite is used in construction and for firewood. As mentioned above, there are a few, scattered local settlements and it is from these settlements that the reserve is exploited of cinder, sand, volcanic rock, firewood, and fauna.

► Mining/ Quarrying

Low Threat

(Gold mining further east in the state of Sonora)

Outside site

Gold mining further east in the state of Sonora deserves to be mentioned. Despite the distance from the property the mining area belongs to the range of the last Sonoran Pronghorns like the property itself. Mining may therefore negatively affect the flagship species of El Pinacate (Burquez y Martinez-Yrizar, 2006; Burquez y Castillo, 1994; Castillo-Sánchez, 1999).

There is a large open-pit gold mine in the region ("Mina La Herradura") (31°8'56"N 112°51'47"W), some 125 Km from Caborca, outside the Reserve and close the town of Sonoyta and operating since 1997. It is own by Minera Penmont S de RL de CV, a subsidiary of Fresnil PLC. (<http://www.fresnilloplc.com/>; <http://www.desi.economia.gob.mx/empresas/empresas3.asp?Clave=977>).

► **Roads/ Railroads**

High Threat

(Expanding road network and energy transmission infrastructure)

Inside site, scattered(5-15%)

Outside site

The relatively recent construction of the coastal route has facilitated unprecedented access and could lead to new roads being created. The ongoing expansion of Route 2 near the border is accompanied by extraction of construction material and water, construction of temporary deviation and access tracks, noise, dust and pollution risks. The widespread, and apparently legally required, fencing of roads is likely to reduce connectivity (IUCN, 2013, Castillo - Sánchez, 1999).

While earlier plans for transmission lines along the coast were abandoned to conserve the visual integrity of the area, a major transmission infrastructure project is proceeding in parallel to Route 2 and the international border. It will connect the two Mexican States on the Baja California Peninsula with the Mexican power grid (IUCN, 2013).

► **Dams/ Water Management or Use, Other Ecosystem Modifications**

High Threat

(Water availability and quality)

Inside site, widespread(15-50%)

Outside site

Although the Reserve covers a large area, it has only a few small scattered settlements, and around 200 permanent residents. Settlements are concentrated in the buffer zone`s northeast region, near the town of Sonoyta, primarily along Highways 2 and 8 (Brusca et al. 2001). Increasing consumption from households and commercial agriculture in the wider ecosystem on both sides of the border threatens the long-term integrity of the property (Ganster, 1996; Hume, 2000; Mumme, 2000; Moya et al., 2011). Surface water (in particular the Sonoyta River) and groundwater are scarce and of utmost ecological importance in and around EPGDABR. The increasing pressure from pollution and overuse on both sides of the border in the broader region is likely to have long-term impacts on the entire Sonoran Desert (IUCN, 201).

The Colorado River Delta is located just west of the Altar Desert. The huge Colorado River system has been massively transformed and overused to the point that hardly any of its water reaches the Gulf of California. This clearly constitutes a major ecosystem modification of an area that has intricate geological and ecological linkages to the property and the adjacent Gulf (Chester, 2006; Hume, 2000; IUCN, 2011).

The Sonoyta River is known to suffer from pollution, mostly from industrial agriculture in the United States of America and sewage from the border town of Sonoyta (Mumme, 2002; Sistema de Areas Naturales Protegidas del Estado de Sonora (SANPES), 1994).

► **Tourism/ visitors/ recreation**

Low Threat

(Tourism and recreation)

Inside site, scattered(5-15%)

Outside site

In terms of infrastructure for visitors, the Reserve has among the most outstanding facilities of all Mexico`s federal reserves, at the Centro de Visitantes Shuck Toak (http://elpinacate.conanp.gob.mx/centro_de_visitantes.php), as well as a biological station.

Visitors to the center and the Reserve have augmented significantly over the last 20 years, from 3000 in 1997 to about 25,000 in recent years. However, these figures are far from the estimated 120,000 visitors the Reserve has capacity to house.

While harsh conditions set natural limits to tourism numbers, there are a number of concerns. Tourists for example may engage in illegal extraction of plants and animals and there are indirect concerns

related to water consumption in the nearby coastal tourism resort (World Heritage nomination dossier of the property).

Mainstream tourism takes place around the visitor centre and is restricted to its surroundings. Possible risks associated with tourists and scientists entering the property include unintended introductions of alien invasive species. Official and unofficial off-road rallies through the dunes of the Altar Desert are a concern. This sort of threat is growing and race organizers are looking more and more seriously on organized off road races, mainly along the western and southern edge of the reserve. They take place in areas that are very difficult to control conventionally. Indirect impacts of tourism are related to water consumption in the arid area and disturbance from increased traffic, in particular on the axis connecting the coast to neighbouring Arizona in the United States of America (IUCN, 2013; Burquez y Martinez-Yrizar, 2006).

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

High Threat

(Alien invasive species (AIS))

Inside site, widespread(15-50%)

Outside site

Seven non-natives have become invasive species that pose serious threats to the native ecosystems: red brome (*Bromus rubens*), buffelgrass (*Cenchrus ciliaris*), fountain grass (*C. setaceus*), Arabian and Mediterranean grasses (*Schismus arabicus*, *S. barbatus*), Sahara mustard (*Brassica tournefortii*), and tamarisk (*Tamarix chinensis*) (Felger et al. 2013).

One of the most widespread and serious threats to the Reserve, and to the entire Sonoran Desert ecoregion, is buffelgrass, an invasive exotic forage introduced on ranches throughout northern Mexico starting in the 1950s. Buffelgrass pastures are expanding especially quickly across the desert rangelands of Sonora, where since the early 1970s, nearly one million hectares of desert scrub have been cleared, tilled, and sown with buffelgrass to create cattle pastures (Brenner and Kanda 2013).

Buffelgrass has been transforming large parts of the Sonoran Desert (Búrquez and Martínez, 2006).

In addition to plants, at least 5-10 mammals, 2 amphibians, 50-60 fishes, and several reptiles have been introduced in the region (Felger et al. 2013). Known impacts mostly stem from feral livestock, competing with native species, disseminating non-native plants and raising concerns about wildlife diseases spread at waterholes (IUCN, 2013, Avila-Jiménez, 2005; Hayden, 1998).

Potential Threats

High Threat

While there is no current indication of dramatic impacts of Alien Invasive Species, the experience from other parts of the Sonoran Desert is alarming. Likewise, climate change may affect the delicate and highly particular microclimate with potentially major effects on water availability and thus most forms of life. The same can be said if mining activities are indeed permitted.

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

High Threat

(Alien invasive species (AIS))

Inside site, extent of threat not known

Outside site

Complex risks both from various plants and from feral livestock could lead to major ecosystem transformation as observable in other parts of the Sonoran Desert (see above). This is a threat that needs to be closely monitored, taken into account, among other, that tourism (and the associated risk of introduction of new invasive species) has been augmenting greatly in the Reserve in recent years.

► **Desertification**

High Threat

(Climate Change)

Inside site, throughout(>50%)

Outside site

Water quantity and distribution patterns are critical factor for the biodiversity of the Sonoran Desert. Anticipated climate change may affect some of the ecological particularities of the property (IUCN, 2013; Villers-Ruiz et al., 1998). Recent research on lizards of the genus *Sceloporus* showed that 12% of 200 Mexican populations have become locally extinct since 1975 as result warming environmental

temperatures (Sivervo et al. 2010).

For instance, Goode's horned lizard (*Phrynosoma goodei*) might be severely threatened by combined forces of climatic and landscape change (Lara-Resendiz et al. 2014).

► **Fire/ Fire Suppression**

High Threat

(Wildfire)

Inside site, extent of threat not known
Outside site

Wildfire is a well-documented key challenge elsewhere in the Sonoran Desert. The deliberate introduction of non-native grasses has increased fuel loads, triggering a process of gradual conversion of huge tracts of the Sonoran Desert into grasslands, as native systems lack major adaptations to fire. Effects on native flora are disastrous. So far EPGDABR has no major areas of introduced grasses. However, non-native grasses continue to be promoted in Mexico so the increase of infestation and a related increase in fire events is a potential future scenario for the property (Avila-Jiménez, 2005).

► **Volcanic activity**

Very Low Threat

(Renewed volcanic activity)

Inside site, extent of threat not known
Outside site

Although volcanic activity is dormant, the mean recurrence interval of eruptions is becoming better known and suggests that this interval is significantly shorter than the time that has elapsed since the last known eruption (Gutman et al. 2000; Gutman 2011)

► **Oil/ Gas exploration/development**

High Threat

(Gold Mining concessions and plans for salt extraction)

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

A recent study (Armendariz-Villegas et al. 2015) found that 10,804 ha (1.51%) of the total 714, 557 ha of El Pinacate & Gran Desierto de Altar Biosphere Reserve overlap with 15 mining concessions, 50% of which are reported as exploitation, 40% as exploration and data are not available for the remaining 10%. These are cause of concern and any potential mining plan should be closely monitored given the potential serious impact on the fauna and flora they might bring about.

Also, information provided (August 2017, personal communication) by former CONANP Reserve`s staff indicate that there are plans for salt mining in or near the Reserve`s buffer zone. In March 2017, an environmental impact assessment was submitted to the Ministry of Environment (SEMARNAT) by a private company but was not approved by CONANP. However, it seems the project is still being pursued.

Overall assessment of threats

Low Threat

The large scale of the World Heritage site, its contiguity with an even larger set of protected areas, the high degree of natural protection and the dedicated conservation efforts combine to make the site comparatively resilient. However, a number of threats raise concerns, including invasive species, increasing water consumption in the broader region, as well as security measures and infrastructure along the international border between Mexico and the USA. The construction of the border wall presented significant challenges to the ecological connectivity between the site and other protected areas in the US, as physical border infrastructure disrupts free movement of wildlife, which can result in negative impacts on populations of several species. Additionally, there are about alien invasive species and anticipated climate change. Both could lead to dramatic changes to the desert ecosystem. As regards invasive species, such change is already observable elsewhere in the Sonoran Desert where non-native grasses and associated increase in fire frequency and intensity have fundamentally altered the entire desert ecosystem. Mining concessions overlapping with the site and plans for salt extraction in its vicinity or even in its buffer zone also raise concerns.

Protection and management

Assessing Protection and Management

- **Management system** **Some Concern**

El Pinacate and Gran Desierto de Altar Biosphere Reserve is under the administration of the National Commission of Natural Protected Areas (CONANP). Its management is regulated by a Management Programme developed with the participation of local governments and different sectors of society involved in the area in 1996, which has been subsequently updated on a regular basis. Annual Operational Programmes are developed based on the Management Programme. As of 2020, the CONANP staff at the Biosphere Reserve is composed of a Director, an Assistant Director, three Chiefs Department, and an Analyst (State Party of Mexico, 2020).
- **Effectiveness of management system** **Some Concern**

The National Commission on Natural Protected Areas (CONANP) was developing an evaluation of the effectiveness of all or most federal protected areas, through its Sistema de Informacion, Monitoreo y Evaluacion para la Conservacion (SIMEC, <https://simec.conanp.gob.mx/evaluacion>); however, its results could not be found in the public domain.

Since 2019 and also in 2020, the federal administration has reduced the support to environmental protection in general, which has resulted in significant cuts to CONANP's budget. If this trend continues over the next few years, there is no doubt that the overall management of this site will be negatively impacted.
- **Boundaries** **Some Concern**

As noted by the World Heritage Committee at the time of inscription, it is conspicuous that the World Heritage site does not extend to the nearby Adair Bay, a formally protected area which is also a Ramsar site. This would add complementary and highly valuable areas, thereby covering the full mosaic and altitudinal gradient of the area. The buffer zones are, in accordance with Mexican legislation, formally protected and plausible in their design (IUCN, 2013). Greater protection of the area could be afforded by the inclusion of the extensive dune fields west of the western boundaries of the reserve, as far as to limit with the neighbouring Reserva de la Biosfera del Alto Golfo de California y delta del rio Colorado.
- **Integration into regional and national planning systems** **Some Concern**

Overall satisfactory with opportunities to coordinate even more closely with adjacent coastal areas and protected areas. The regional level also has a transboundary dimension in this case. Despite longstanding and functional relationships at the working level, there is room for in the bi-national ecosystem of the Sonoran Desert (IUCN, 2013; Castillo – Sánchez, C. 1999; Chester, 2006; Ganster, 1996; Morehouse et al., 2008; Salazar, n.d.). The ongoing construction of the border wall between the United States and Mexico which forms the northern boundary of the site presents significant challenges to the ecological connectivity between the site and other protected areas in the US including the Organ Pipe Cactus National Monument and Biosphere Reserve, Cabeza Prieta National Wildlife Refuge, and the Barry M. Goldwater Range which supports key elements of the site's OUV, most notably migratory ungulates such as Sonoran pronghorn sheep and bighorn sheep (IUCN Consultation, 2020).
- **Relationships with local people** **Some Concern**

The World Heritage site seems locally widely accepted. However, tensions between authorities and owners of land within the site (ejidos) were reported in the past (IUCN Consultation, 2017). The Biosphere Reserve has an Advisory Council composed of representatives from federal and local governments, academic and research institutions, NGOs, and communities and ejidos as well as members of the Tohono O'odham indigenous peoples. CONANP also runs a number of subsidy programmes to engage local communities (State Party of Mexico, 2020).
- **Legal framework** **Mostly Effective**

The legislation appears adequate. El Pinacate and Gran Desierto de Altar was established as a natural protected area through a decree in 1993 and was categorized as a Biosphere Reserve under the Mexican legislation (State Party of Mexico, 2020).

► **Law enforcement**

Some Concern

Enforcement is hindered by the lack of staff and financial resources. Further reduction of budgets of CONANP in 2019 and 2020 could further aggravate this issue.

► **Implementation of Committee decisions and recommendations**

Highly Effective

Given the recent inscription (2013) it would be immature to suggest any non-compliance. It is also important to note that the one and only Committee decision referring to EPGDABR at the time of preparing this assessment contains only one request whereas all other points are recommendations. The former is a request to ensure full compliance with Environmental Impact Assessment requirements as regards the ongoing expansion of Route 2. The latter include encouragement to (i) expand the property to include the adjacent Ramsar site of Bahía de Adair; (ii) strengthen cooperation with the United States of America in the Greater Sonoran Desert Ecosystem; (iii) further cooperate on the saving of the Sonoran Pronghorn from possible extinction; (iv) consider environmental concerns in security efforts along the international border. In all cases, follow-up seems highly desirable (whc.unesco.org).

► **Sustainable use**

Mostly Effective

Sustainable use is restricted to tourism (State Party of Mexico, 2013).

► **Sustainable finance**

Serious Concern

This is an area of serious concern. The Reserve needs sufficient and predictable funds to increase and maintain its staff, as well as for its operation (see above).

On the other hand, the operation of the Centro de Visitantes seems to be well financed with funds from FANP (Fondo para Areas Protegidas), co-managed by Fondo Mexicano para la Conservación and CONANP.

A significant issue since 2019 (which continued in 2020) is the reduced support from the present federal administration to environmental protection in general, which has resulted in significant cuts to CONANP's budget. If this trend continues over the next few years, there is no doubt that the overall management of this site will be negatively impacted.

► **Staff capacity, training, and development**

Serious Concern

This is an area of serious concern. The Reserve needs sufficient and predictable funds to increase and maintain its staff, as well as for its operation (see above).

As of 2020, the CONANP staff at the Biosphere Reserve is composed of a Director, an Assistant Director, three Chiefs Department, and an Analyst. There are also staff members hired for specific projects, composed of an Administrator for the Museum and Center of Culture for Conservation and two Field Technicians (State Party of Mexico, 2020).

► **Education and interpretation programs**

Mostly Effective

There is an exemplary Centro de Visitantes named Shuk Toak attracting increasing numbers of domestic and international visitors. Original interpretive pull-outs along the coast roads require better maintenance. The web site, both of the Reserve and the Centro de Visitantes, need much improvement so as to offer enough and up-to-date information to visitors.

► **Tourism and visitation management**

Mostly Effective

Further investment could be used to consolidate interpretation opportunities in the various field stations along main roads, in particular if the number of visitors continues to grow.

► **Monitoring**

Some Concern

At the time of the IUCN field evaluation, not all field stations, located at strategic entry points along main roads, were operational. The vast area with limited road infrastructure presents important logistical challenges. There is an urgent need for vehicles so that staff can properly survey key sites within the Reserve (IUCN, 2013).

► **Research**

Mostly Effective

There is a long history of research from various disciplines carried out mostly by Mexican and American scientists. Despite good personal relationships, not all of the research products are made available to park management. Results are available in English language and Spanish. Those results need to be available to both scientists and visitors through the Reserve and Centro de Visitantes web sites.

Overall assessment of protection and management

Some Concern

A number of concerns exist, particularly with regards to human and financial resources, also affected by the recent overall budget cuts in Mexico's federal government programmes, which raises questions about the longer term capacity. However, further reductions in federal budget allocations to CONANP in 2019 and 2020 could further aggravate the problem. Efforts should be soon implemented to increasing the number of personnel; as well as to ensure proper and sustainable funding to operate and manage the Reserve and mitigate the impacts of the construction of the wall between the World Heritage site and adjacent protected areas in the USA.

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

Some Concern

As mentioned above, management can be compounded by the lack of sufficient staff, vehicles and sufficient/predictable financial resources. This is also important in view of the recent conflicts with the land-owners (ejidos).

Park management is struggling to have a strong voice in other public sectors, namely road construction. The compliance with requirements defined in Environmental Impact Assessments is not always secured despite frequent complaints on the part of park management, indicating a relatively weak position. Working relationships with neighboring Mexican protected areas appear to be functional. The transboundary conservation dimension in the shared ecosystem appears to have been compromised by border security issues (IUCN, 2013; State Party of Mexico, 2013).

State and trend of values

Assessing the current state and trend of values

World Heritage values

► **Extraordinary landscape beauty**

Low Concern
Trend:Stable

Overall, the visual integrity remains intact despite inevitable impacts of expanding road and energy transmission infrastructure (IUCN, 2013).

► **Extraordinary volcanic and geological features**

Low Concern
Trend:Improving

There are important past improvements and no factors which are likely to alter or impact on these values. A small part of the volcanic field extends into the neighboring state of Arizona in the United States of America. While also formally protected there, there are concerns about the impacts of recent

increases in border security efforts (Castillo – Sánchez, C. 1999; Chester, 2006; Ganster, 1996; Morehouse et al., 2008; Salazar, n.d.).

► **Scientific importance of volcanic and geological features**

Good
Trend:Stable

Diverse research is ongoing, permanently adding to the wealth of available information and knowledge (e.g. Hayden, 1998; Gutmann 2008, 2011). Efforts should be made to share this information and knowledge among both Mexican scientists/managers and visitors from Mexico and the US

► **Rare, endangered and endemic species of flora and fauna**

Low Concern
Trend:Data Deficient

Despite multiple threats, flora and fauna do not appear to be under acute threat. However, the Sonoran Pronghorn continues to face an uncertain future. The site plays a role in that future but on its own cannot secure it (e.g. Castillo – Sánchez, C. 1999; Moya, 2011). Populations of several other species of concern, in particular the flat-tail horned lizard, the Yuma fringe-toed lizard, the Sonoyta pupfish, the Sonoyta mud turtle, the lesser long-nose and fish-eating bats, and Goode’s horned lizard, should be closely monitored. Recently, further concerns emerged about the possible negative impacts on populations of several species due to the construction of a border wall between Mexico and the USA, which would disrupt free movement of wildlife (State Party of Mexico, 2020). However, specific impacts remain to be assessed.

► **Scientific importance (desert ecology and biology)**

Low Concern
Trend:Stable

The extraordinary value as a rare baseline reference of a large-scale intact area within the Sonoran Desert is only partially taken advantage of (Goudie et al., 2011).

Summary of the Values

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

Low Concern
Trend: Stable

The visual integrity remains intact despite inevitable impacts of expanding road and energy transmission infrastructure. There are no factors which are likely to alter or impact on the geological values of the site. Despite multiple threats, flora and fauna do not appear to be under acute threat. However, the Sonoran Pronghorn continues to face an uncertain future. Recently, further concerns emerged about the possible negative impacts on populations of several species due to the construction of a border wall between Mexico and the USA, which would disrupt free movement of wildlife. Populations of the flat-tail horned lizard, the Yuma fringe-toed lizard, the Sonoyta pupfish, the Sonoyta mud turtle, the lesser long-nose and fish-eating bats, and Goode’s horned lizard, should be evaluated and monitored.

Additional information

Benefits

Understanding Benefits

► **Tourism-related income**

The local economy is largely dependent on fisheries and tourism. The diversification of the touristic offer beyond beach tourism and sports fishing seems most promising, although the lack of local employment is forcing residents to search for work in the nearby cities of Puerto Peñasco, Sonoyta, and San Luis Río Colorado. The growth in the number of visitors offer important opportunities, both to raise funds for the Reserve from tourist fees and to engage the ejidos on ecotourism. The latter would be important as to offer new and predictable sources of employment to land owners. The well-equipped Centro de

Visitantes and the biological station offer a great potential to attract visitors from both Mexico and the US, as well as for educational purposes for schools and universities on both sides of the border.

► **Wilderness and iconic features**

The property is widely recognized as the "heart of the Sonoran Desert" on both sides of the border.

► **Sacred natural sites or landscapes**

What is today the World Heritage property continues to be a key sacred site of major spiritual importance to indigenous peoples on both sides of the border. Numerous ancient trails, sleeping circles and artifacts illustrate that the area was used and inhabited for centuries and possibly millennia. The Tohono O'odham regard the Sierra El Pinacate not only as part of their native homeland but their place of origin and a spiritual center. The cultural history of the region is also rich and provides insight into our understanding of the early occupation of the American continent. The Pinacate region has long been a spiritual and cultural site for the modern Tohono O'odham ("Papago") people (Brusca et al. 2001).

► **Importance for research**

Outstanding record of and opportunities for research on a broad range of geological and volcanic features and phenomena and baseline reference for the understanding of the ecology of the Sonoran Desert, including on how its fauna and flora respond to climate change.

Summary of benefits

The World Heritage site is an important source of inspiration for traditional communities and visitors alike. A rare scientific reference area for many disciplines, the property also has a strong potential to further promote forms of tourism that are adapted to the fragile desert environment. It also offers an important platform to educate children and youth on nature and conservation on both sides of the border, thus promoting a shared sense of responsibility and cooperation between Mexico and the USA.

Projects

Compilation of active conservation projects

Nº	Organization	Brief description of Active Projects	Website
1	United States National Park Service (USNPS)	Cooperation between EPGDABR and adjacent protected areas in the United States of America, in particular provision of equipment for field monitoring.	.
2	International Cooperation	Exchange with Los Cardones National Park, Argentina.	.
3	Various academic and NGO partners	Various research projects, such as monitoring of various species. Scientific research is carried out within the reserve.	.

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