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UNESCO Region: LATINA AMERICA AND THE CARIBBEAN

SITE NAME: **Ischigualasto / Talampaya Natural Parks**

DATE OF INSCRIPTION: 2nd December 2000

STATE PARTY: ARGENTINA

CRITERIA: N (i)

DECISION OF THE WORLD HERITAGE COMMITTEE:

Criterion (i): The site contains a complete sequence of fossiliferous continental sediments representing the entire Triassic Period (45 million years) of geological history. No other place in the world has a fossil record comparable to that of Ischigualasto-Talampaya which reveals the evolution of vertebrate life and the nature of palaeoenvironments in the Triassic Period.

IUCN noted that existing pressures on the site are low, that the site is effectively managed and that a positive response was received from the State Party concerning a co-operative management plan.

A number of delegates, in supporting the nomination, highlighted the uniqueness of the site covering the whole Triassic period.

The Observer of Argentina thanked the Committee for the decision, which will strengthen the protection of natural areas in his country. He informed the Committee that the two areas are now well integrated and that a joint management plan is in place since 2 October 2000. He also agreed to a name change from Ischigualasto Provincial Park and Talampaya National Park to **Ischigualasto/ Talampaya Natural Parks** as suggested by some delegates who felt the name was complicated.

BRIEF DESCRIPTIONS

These two contiguous parks, extending over 275,300 ha in the desert region on the western border of the Sierra Pampeanas of central Argentina, contain the most complete continental fossil record known from the Triassic Period (245-208 million years ago). Six geological formations in the parks contain fossils of a wide range of ancestors of mammals, dinosaurs and plants revealing the evolution of vertebrates and the nature of palaeo- environments in the Triassic Period.

1.b State, Province or Region: Provinces of San Juan and La Rioja

1.d Exact location: 29° 42' S, 67° 35' W

**A PROPOSAL FOR THE NOMINATION
OF THE NATURAL – CULTURAL
PARKS ISCHIGUALASTO-TALAMPAYA
AS A WORLD HERITAGE SITE**

May 1999

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1. Identification of the properties:

- a. Country:
Argentina
- b. State, Province or Region:
Provinces of San Juan and La Rioja
- c. Name of Properties:
Ischigualasto Provincial Park
Talampaya National Park

- d. Exact location on map and indication of geographical coordinates:

The two parks form a single geographic unit located between 29° 42´
And 30° 15´ South Latitude and 67°35´ and 68° 20´ West Longitude

- e. Maps and graphics showing the boundary of the proposed area:

Please see maps, figures, graphics and video in the attached appendices

- f. Area of properties proposed for inscription (in hectares) and proposed buffer zone (if applicable):

Ischigualasto Provincial Park: 60,369 hectares, which includes a buffer zone and service area of approximately 12,000 hectares.

Talampaya National Park: 215,000 hectares, no buffer zone is designated

2. Justification for Inscription

- a. Statement of significance:

Ischigualasto-Talampaya represent the only known area in the world that contains a complete sequence of continental sediments with abundant fossil flora and fauna for the Triassic Period of geologic history. This period represents the origin of both mammals and dinosaurs, and offers the prospect of resolving one of the great enigmas of vertebrate paleontology—the rise to dominance of the dinosaurs and the suppression of mammalian evolution during 150 million years. During the Early Triassic the land fauna was dominated by mammalian ancestors in both the carnivorous and herbivorous ecological niches. The ancestors of dinosaurs were principally small carnivores or crocodile-like predators, no doubt active hunters but far from occupying the majority of the available ecologic niches. During the Middle Triassic there is a world-wide lack of fossiliferous continental sediments, probably due to the tectonic events associated with the breakup of the supercontinents Laurasia and Gondwanaland. In the Late Triassic abundant continental

sediments are found in all of the continents, the famous “Red Beds” known from Africa, Europe, and the Americas. In these strata the dominant fossil vertebrates are the dinosaurs, occupying both the carnivore and the herbivore habitats. The abundant fauna of proto mammals from the Early Triassic are extinct, leaving in their wake true mammals in the form of small rat-like species that were small in size and number. Dinosaurs went on to completely dominate the vertebrate fauna of the land, sea and air until their extinction 150 million years later. The great question of paleontology has been “what happened during the Middle Triassic and why did mammals, (considered anatomically superior to reptiles) not become the dominant fauna?” In the sediments of the Ischigualasto-Talampaya basin are found the fossil-bearing strata that document the transition from the Early Triassic proto-mammalian fauna to the age of dinosaur dominance and permit the analysis of what was perhaps the most significant faunal transition in earth history. Three geologic formations contain abundant vertebrate fossils that document the key changes in land faunas. In addition, five formations contain abundant fossil flora that documents climatic changes and dietary conditions for the animals. The combination of abundant fossil flora and fauna together with the geologic strata provide a unique set of data for the interpretation of Triassic paleoenvironments. From analysis of the sediments, it is apparent that the Triassic was characterized by great monsoon type storms that periodically caused flash floods, temporary swamps, and mud slides. These events were instrumental in the rapid burial of large numbers of animals, which in turn has provided the wealth of fossil material found in the area.

In addition to the scientific importance of Ischigualasto-Talampaya, the park contains outstanding scenic areas that attract thousands of visitors every year. The red cliffs of Talampaya and Ischigualasto, the white lunar-like landscape of the valley, the variegated colors and strange rock formations all form natural attractions that are both interesting and beautiful. Because the parks have been preserved in their completely natural state, with no modifications or constructions within the scenic areas, they also serve the educational purpose of showing and teaching natural ecologic systems unaltered by human activity.

The cultural importance of the parks is also of great significance, even though the detailed study of rock art, artifacts and archeological sites has just begun. Ischigualasto-Talampaya lies in the southernmost area of late Incan influence. Near the parks is Mount Famatina, the highest peak in South America outside of the Andes, and a place where the Incas mined gold. Most of the anthropological research in the area has focused on the Incas, however, there were important other paleoindian groups in the area that are just now being investigated. Cultural artifacts date from approximately 600 BC to the time of the Spanish conquest. Ancient cultures known as the Cultura de la Fortuna and Cultura de la Aguada date from 600 BC to approximately 1000 AD. Later tribes known as Diaguita and Huarpes were present up to the time of the Spanish conquest. Numerous sites of rock art, petroglyphs, camp sites, caves and

rock shelters have been discovered in the parks. Due to the dangers of depredation, most of the sites have not been made public. A special significance of the area is that the cultural artifacts not only document the very ancient cultures, but also show a mixing of cultural elements of the later Huarpes and Diaguita cultures. Preservation and protection of the park areas is essential to preserve the cultural information, which has not yet been studied but contains a wealth of information for future research.

Endangered flora and fauna are also part of the park areas. The unique desert environment, preserved in its natural state, contains a number of endemic species, some of which are rare and considered endangered or “vulnerable”. The following list, compiled by specialists from the National University of San Juan, represents the floral species considered in need of protection.

Bulnesia retama
Prosopis flexuosa
Prosopis abbreviata
Ramorinoa girolae
Blossfeldia liliputana
Argythamnia malpigipila

Among the vertebrates, degradation of habitat due to domestic cattle activity has been the principal cause of population reduction. The creation of the parks has had a significant effect in restoring the natural wildlife of the area, but problems still exist. The following species are considered either endangered or vulnerable:

Mammals

Chlamyphorus truncatus (severely endangered)
Abroma cinerea
Octomys mimax
Lagostomus maximus
Dolichotis patagonum

Aves

Pterocnemis pennata
Teledromas fuscus
Pseudoseisura gutturalis

Reptiles

Chelonoidis chilensis
Liolaemus pseudoanomallus
Liolaemus riojanus

Other species, such as foxes and pumas are part of the biodiversity of the parks and are somewhat threatened by the activity of surrounding cattle ranchers who consider them a threat to their animals and actively try to destroy them. Condors are abundant in the park areas and are a major attraction for bird watchers, who can climb the cliffs near the nesting areas and have excellent views of these great birds.

Ischigualasto-Talampaya represent a combination of unique and valuable assets in the areas of geology, paleontology, archeology, biology and

ecology, that are not known anywhere else in the world. The significance of the area lies not only in the contributions made to science and the scenic attraction, but also in the future prospects for research and exploration.

b. Possible comparative analysis

Ischigualasto-Talampaya is comparable in part to the Natural Sites of Dinosaur Provincial Park in Canada (criteria N I, III) and the Australian Fossil Mammal Site (criteria N I, II), Lake Malawi National Park (criteria N II, III, IV for biodiversity) and the cultural sites Rock Drawings of Valcamonica, Italy (criteria C III, IV), Rock Art of the Mediterranean Basin (criteria C III), Rock Painting of the Sierra de San Francisco, Mexico (criteria C I, III). However, none of these sites combine the Natural, Cultural and scenic significance of the proposed parks.

c. Authenticity and integrity

There are no towns, populations or private property within the proposed site. There has been in the past some small scale mining activity and on occasion cattle stray into the protected areas. In Talampaya there has been vandalism of some of the rock paintings, mainly before the area was declared a provincial park. The increasing number of tourists who visit both parks represent a potential danger if greater measures are not taken to control and supervise the tourist activity. As presently constituted, both areas are completely natural with no construction or modification of the natural environment. There are no paved roads within the intangible areas of the parks and visitors are accompanied at all times by park employees.

d. Criteria under which inscription is proposed

Ischigualasto-Talampaya is proposed as both a Natural and a Cultural Heritage Site. Under the criteria presented in the Operational Guidelines of the World Heritage Convention, updated as of February 1997, the proposed site meets the following criteria:

Natural Heritage Criteria:

- I. An outstanding example representing major stages of the earth's history, including the record of life, including the ongoing geological development of landforms and significant geomorphic and physiographic features.
- III. Contains superlative natural phenomena and areas of exceptional natural beauty and aesthetic importance.
- IV. Contains significant natural habitats for in-situ

conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Cultural Heritage Criteria:

- III. An exceptional testimony of a civilization or cultural tradition that has disappeared.
- V. An outstanding example of human land use which is representative of a culture vulnerable under the impact of irreversible change.

3. Description

a. Description of the property

1). Geography of the site

Geographically the Ischigualasto-Talampaya region is a desert area forming the western border of the Sierras Pampeanas of central Argentina. The average altitude is approximately 1200 metres above sea level with barren mountains that reach 3000 metres. Rainfall is scarce, less than 200 millimetres per year, with most rainfall during the summer months, sometimes causing flash floods and rapid erosion. Temperatures tend to be extreme, 45 degrees Centigrade in the summer and 10 degrees below zero Centigrade in the winter. Soils in the area are immature, consisting principally of sand and gravel of various grades. Due to the high evaporation rate, the soils are usually quite saline. Drainage features are intermittent arroyos, dry during most of the year but subject to flash floods with the potential to move large boulders. The climate is dry, humidity is usually no higher than 20%, the days are cloudless and the clarity of the air permits long views of the horizon and spectacular star gazing on moonless nights.

2). Geology

The site forms almost the entire sedimentary basin known as the Ischigualasto-Villa Union Triassic Basin. The sedimentary formations consist of continental sediments deposited by rivers, lakes and swamps over a period of time covering the entire Triassic Period, from approximately 245 million years before the present to 208 million years. The river deposits include large areas of flood plains with overbank and crevasse splay sediments that indicate rapid flooding, probably after monsoon type storms. Lake and swamp deposits contain large amounts of fossil plants, some of them forming coal seams, others that are preserved as mummification of the actual plants, an extremely rare form of preservation known from very few localities. Six geologic formations make up the Triassic basin, the earliest of which are the Talampaya and Tarjados formations, red sandstones that form the impressive cliffs of the Talampaya park. The remaining formations are composed of lake beds, swamps, river channels and flood plain deposits. Most of the fossil vertebrates are found in the flood plain deposits or at the margin of the lake beds. Within the sediments are frequent layers of

volcanic ash, which allow radiometric dating of the formations and contribute significantly to the mineral content of the sediments. The clay formed from the volcanic material tends to create a very hard layer just below the surface, which prevents plants from taking root, thereby creating the barren white surface characteristic of the Ischigualasto valley and giving it the popular name “Valley of the Moon”.

3). Paleontology, fossil fauna and flora

The fossil plants and vertebrates of Ischigualasto are of great importance to the science of paleontology and evolutionary biology. As noted previously, they are key elements in understanding the origins of both mammals and dinosaurs and the early history of our modern world.

The plants are providing a greater understanding of the drastic changes that took place at the end of the Permian period, when approximately 80% of the worlds flora and fauna became extinct and the survivors began an new chapter in world history at the beginning of the Triassic. The modern world began in the Triassic with the breakup of the great continents and the establishment of new life forms, both plants and animals on land and in the sea. The complete sequence of rock-time for the Triassic period found in Ischigualasto-Talampaya is one of the great scientific treasures of the world. The wealth of fossils found there continues to amaze and impress the world of paleontology. Currently at least 50 genera of vertebrates are known, the number of species has not yet been defined, and at least 100 species of fossil plants, with more being added as research continues. Among those who carry out the field work of exploration and recovery of material it is generally observed that for every four weeks of exploration a new genus or species will be discovered. The first vertebrate paleontologist to work in the area, the distinguished Harvard paleontologist and director of the Museum of Comparative Zoology, Dr. A.S. Romer, expressed the discovery in these words, “Every vertebrate paleontologist dreams of finding, someday, a virgin territory strewn with fossil skulls and skeletons. Almost never does this dream come true. To our amazement and delight, it did come true for us at Ischigualasto” (Romer 1962). Not all of the six geologic formations that make up the Triassic basin contain abundant fossils. At present most of the fossil vertebrates come from three of the named formations, although it should be noted that approximately 60% of the total park area remains unexplored. Many of the areas are virtually inaccessible, even by mule because of the lack of water. This of course implies that there is a great frontier for future research and exploration in the area, and also a corresponding need to preserve and protect it.

Inventory of fossil fauna and flora by formation

1. **Talampaya Formation.** This is the oldest of the Triassic sediments, Representing the beginning of the new world. No vertebrate fossils have been found, but there are fossil footprints assigned to the ichnite genus *Chirotherium*, a quadruped vertebrate assumed to be related to the crocodiles and dinosaurs. Current research is being done to search for pollen and spores, but the results are not yet available.

2. **Tarjados Formation.** These strata lie above the Talampaya Formation and together form the impressive cliffs of the Talampaya park. Vertebrate fossils are scarce but fragments have been found, identified as Dicynodonts, members of the mammalian ancestral group. Current examination is under way for microfossils and plants.

3. **Ischichuca-Chanares Formation.** This formation represents an ancient lake bed (Ischichuca) and the shallow water beach area, (Chanares). In the Chanares section fossil vertebrates are abundant and provide an excellent census of the terrestrial fauna at the end of the Early Triassic and beginning of the Middle part of the period. Most of the fossils (approximately 80%) belong to the ancestral group of the mammals, termed Therapsida, and clearly dominate the ecology with both carnivorous and herbivorous populations. The large herbivores are termed Dicynodontia, stout animals ranging in size from that of a bear to a small elephant. Their jaws were covered by a horny beak similar to that of turtles and they possessed the singular characteristic of a prominent pineal eye, (the mystical third eye) located in the middle of the forehead. The other group is named Cynodontia and consists of both carnivorous and herbivorous representatives, usually small in size. Within this group are the direct ancestors of all modern mammals and even at this early stage show many of the advanced anatomical characters that are considered superior to the reptiles. Also present in the Chanares Formation are the direct ancestors of the dinosaurs. This group, termed Archosauria, consists of the ancestors of dinosaurs (and by extension birds), crocodiles and lizards. Although a minor part of the land fauna (less than 20%) they were already highly diversified, mostly carnivores and some them had achieved bipedal locomotion. The Chanares Formation therefore represents a classical example of the fauna and flora just before the origin of dinosaurs. The fossil content is as follows (as of 1997):

ARCHOSAURIA

Luperosuchus fractus
Chanaresuchus bonapartei
Gualosuchus reigi
Gracilosuchus stipanicicuorum
Lagosuchus talampayensis
Lagerpeton chanarensis
Lewisuchus admisxtus

DICYNODONTIA

Chanaria platyceps
Dinodontosaurus brevirostris

CYNODONTIA

Probelesodon lewisi
Probainognathus jenseni
Massetognathus major
Megagomphodon oligodens

ICHNITES (fossil footprints)
Unnamed tridactyl bipedal prints

PLANTS

Neocalamites cf. carrerei
Dicroidium zuberi
Dicroidium stelznerianum
Dicroidium dubium

4. **Los Rastros Formation.** This formation consists of a series of cyclic Deposits, mainly sandstones of gradational sizes, that represent tectonic and climatic changes. The tectonic events signal the beginning of the breakup of the Gondwana supercontinent by the formation of rift valleys along great fracture zones in the earth's crust. Together with the river and streambed deposits are occasional coal seams that represent ancient swamps in the overflow areas of the rivers. Vertebrate fossils are not abundant, but there is a wealth of fossil plants. It should also be noted that this formation has been explored in less than 20% of its area, due to the difficult terrain and lack of water.

AMPHIBIA

Fragments assigned to the Labyrinthodontia

FISH

Myrilepis elongatus

INVERTEBRATES

Estheria sp.
Palacomutela gelabra
Palacomutela occidentalis

ICHNITES (fossil footprints)

Rigalites ischigualastianus
Unnamed tridactyl prints

PLANTS

Equisetites fertilis
Phyllothea australis
Neocalamites carrerei
Neocalamites ischigualasti
Neocalamites ramaccioni
Cladophlebis kurtzi
Cladophlebis mesozoica
Dicroidium odontopteroides
Dicroidium lancifolium
Dicroidium dubium
Dicroidium stelznerianum
Dicroidium coriaceum
Dicroidium zuberi
Harringtonia argentinica
Xylopteris elongata

Xylopteris dinsifolia
Xylopteris argentina
Yabeiella mayaresiaca
Yabeiella spathulata.
Yabeiella brackebuschiana
Thinnfeldia praecordillerae
Podozamites elongatus
Pterorrachis problematica
Desmiophillum sp.
Czekanowskia rigali
Pelourdea polyphylla
Baiera sp.
Neoggerathipsis sp.
Cardiopteridium cr. cyclopteroides
Cycadocarpidium andium

It should be noted that the list of fossil flora is undergoing continuous revision as new discoveries are made.

5. **Ischigualasto Formation.** These are the striking white and variegated sediments that form the valley known as the Hoyada de Ischigualasto. They represent the lush meadows and flood plains on either side of an ancient braided river that flowed from west to east during the Triassic and was the successor to the river system of the Los Rastros Formation. The sediments bear eloquent testimony of the stream channels, and occasional flash floods that broke through the natural levees and trapped grazing animals in deadly soft mud. The rapid burial of large numbers of animals, as well as plants and even large trees indicates sudden and powerful storm systems, similar to the monsoons of the eastern Pacific. Other paleoclimatic evidence found in the sediments confirms this interpretation and has opened up a new field of research into the events of the Triassic period. Literally thousands of specimens have been collected from the Ischigualasto Formation, including reptiles, amphibians, therapsids, and a great number of plant species. The vertebrate specimens contain the earliest dinosaurs, *Eoraptor*, the nearly ideal primitive dinosaur, and its more advanced contemporary *Herrerasaurus*. Especially interesting is the relation of the Archosauria to the Therapsida. In the Chanares Formation the ratio was 80% Therapsida to less than 20% Archosauria. In Ischigualasto the ratio is about 50-50%, but with the notable relationship that most of the carnivorous cynodonts have become extinct and the archosaurs completely dominate the carnivorous ecologic niche. Also of note is that the earliest dinosaurs were already bipedal and with the limbs rotated under the body, a condition that provided greater speed and agility. Also, with the forelimbs free and the body erect, the dinosaurs also developed forward looking wide-angle vision, perhaps stereoscopic, and large claws on the forelimbs for manipulating and tearing prey. These features may have been keys to the success of the dinosaurs, although the question is still in the process of discovery, discussion, and sometimes heated debate. The mammalian ancestors, in spite of their many anatomical advances, retained the more primitive system of locomotion, and even today have not produced an active bipedal carnivore.

ARCHOSAURIA.

Dinosaurs

Eoraptor lunensis)

Herrerasaurus ischigualastensis

Pisanosaurus mertii

Ischisaurus cattoi

Freguelisaurus ischigualastensis

Crocodylian relatives

Saurosuchus galilei

Sillosuchus longicervix

Trialestes romeri

Venaticosuchus rusconii

Aetosauroides scagliai

Proterochampsia barrionuevoi

Chanaresuchus sp.

Rhynchosaurs

Scaphonyx sanjuanensis

Hyperodapedon sp

THERAPSIDA

Dicynodontia)

Ischigualastia jenseni

Cynodontia

Exaeretodon frenguelli

Proxaeretodon vincei

Ischignathus sudamericanus

Chiniquodon theotonicus

Ekteninion lunensis

Ikanotheria arcucci

AMPHIBIA

Labyrinthodontia

Promastodonsaurus bellmani

Pelorocephalus ischigualastensis

PLANTS

Neocalamites carrerei

Cladophlebis kurtzi

Dicroidium heteromerum

Dicroidium coriaceum

Dicroidium zuberi

Xylopteris argentina

Xylopteris elongata

Podozamites elongatus

Araucarites sp.

Yabeiella sp.

Protojuniperoxylon ischigualastensis

Michelilloa waltoni

Pterophyllum sp.
Rhexoxylon piatnitskyi

6. **Los Colorados Formation.** This formation is the last in the series of Triassic strata and represents the beginning of the Age of Dinosaurs. The red cliffs of this formation correlate well with the classic Red Bed formations known all over the world, and from which an abundance of dinosaur fossils are known. The red color of the hard sandstones, together with other structures, indicate a change in climate to a dryer environment with intermittent streams, some sand dune areas and much less vegetation. The change from the Ischigualasto fine grained sands and mudstone is gradual and can be clearly documented in the valley. Most of the fossils are found in the uppermost levels of the formation and consist almost entirely of archosaurs, including large herbivorous and carnivorous dinosaurs, true primitive crocodiles, and primitive true mammals about the size of a rat. In the lowermost strata of the formation, just above the contact with Ischigualasto a last remnant of the Therapsida has been found, a small dicynodont, together with some scattered bones of crocodile relatives. Fossil plants are scarce, as would be expected in a semi-desert environment. With the Los Colorados Formation the transition to the brave new world of dinosaur dominance is completed. The rest of the Mesozoic Era, the Jurassic and Cretaceous periods complete the break-up of the continents to their modern shapes and the evolutionary expansion of the dinosaurs to occupy virtually all of the prominent ecologic niches on land, sea and in the air, including their offspring the birds, (the evolutionary history of birds is still hotly debated among the specialists).

ARCHOSAURIA

Dinosaurs

Coloradia brevis
Riojasaurus incertus
Coelurosauria indet

Crocodiles and their relatives

Hemiprotosuchus leali
Neoaetosauroides engaeus
Fasolasuchus tenax
Pseudohesperosuchus jachaleri
Riojasuchus tenuiceps

THERAPSIDA

Dicynodontia

Jachaleria colorata

Cynodontia

Chalimnia musteloides
Tritylodon sp.

Tortoises

Paleochersis talampayensis

4). Ecology, native fauna and flora

The site classification is in the category Provincia Monte Occidental, which consists of xerophytic shrubs, cactus, and desert adapted trees such as the mesquite. Vegetation covers between 10 and 20 percent of the surface. Rainfall is less than 200 millimetres per year, humidity is usually under 20 percent. Water supply for inhabitants is from wells, the aquifers being in the shallow alluvial sediments that cover the metamorphic bedrock or Triassic sediments. The native fauna and flora is typical of the arid regions of western Argentina. Much of the population of large mammals and birds, especially guanaco and ostrich, have been reduced due to uncontrolled hunting by local residents. The creation of the natural parks has had a very significant result in bringing back the populations of the native species. In the Ischigualasto valley there are now three herds of guanaco, numbering at least 60 individuals. On the alluvial plain just outside the park, but within the reserved area, at least one flock of suri (small mountain rhea) has become established. With the resurgence of the guanaco herds, pumas have returned to the area as well as foxes, partridges and armadillos. Clandestine hunting is still carried out, especially in the Talampaya area, and control needs to be improved. Nevertheless, the difference the park systems have made in the conservation of native fauna is significant. Similar results are noticed with regard to the flora. Most inhabitants depend on wood for their family fuel and professional wood cutters have in the past taken out large quantities of mesquite trees (genus *Prosopis*) and quebracho (genus *Aspidosperma*). Creation of the parks has stopped most of that activity, especially the commercial level. A current inventory of known native fauna and flora is as follows:

Mammals

Didelphis azatae
Myotis albescens
Myotis levis
Chaetophractus vellerosus
Tolypeutes matacus
Lepus europaeus
Dolichotis patagonum
Akodon varius
Phyllotis darwini
Graomys griseiflavus
Microcavia australis
Lagostomus maximus
Lagidium viscacia
Octomys mimax
Ctenomys fulvus
Conepatus chinga
Felis concolor
Dusicyon culpaeus
Dusicyon griseus
Lama guanicoe

AVES (36 species total, most prominent follow)

Vultur griphus
Cathartes aura
Buteo polypsoma
Falco sparverius
Eudromia elegans
Milvago chimango
Otus choliba
Rhea americana
Pterocnemis pennata
Cariama cristata
Chunga burmeisteri
Cyanoloxia glaucomcaerulea
Athene cunicularia
Aeronautes andecolus
Mimus saturninus
Guira guira
Phrygilus gayi
Pyrocephalis rubinus
Pitangus sulphuratus
Tyrannulus savana
Polyborus australis
Teledromas fuscus
Pseudoseisura gutturalis
Zonotrichia capensis

REPTILES (18 species total, major species follow)

Crotalus durissus terrificus
Bothrops ammodytoides
Bothrops neuwiedi diporus
Philodirys burmeisteri
Boa constrictor occidentalis
Homonota underwoodi
Teius teius
Lystrophis semicinctus
Micrurus pyrrhocryptus
Liolaemus darwinii
Liolaemus pseudoanomallus
Liolaemus riojanus
Leiosaurus catamarcensis
Chelonoidis chilensis

AMPHIBIANS

Bufo arenarum
Pleurodema nebulosa

INVERTEBRATES

A wide variety of Coleoptera, Orthoptera, Hymenoptera, Diptera, Lepidoptera, and Mantids, many of the species

are still undetermined

PLANTS (total of 172 species, most abundant follow)

Trees

Geoffrea decorticans
Prosopis nigrans
Prosopis alba
Ramorinoa girolae
Schinus polygamus
Aspidosperma sp.

Shrubs

Atriplex sorianoi
Bulnesia retama
Cercidium australe
Grabowskya obtusa
Larrea cuneifolia
Larrea divaricata
Larrea nitida
Acacia funcatispina
Trichomaria usillo
Mimoziganthus carinatus

Cactus

Opuntia sulphurea
Trichocereus strigosus.
Cereus aetiops
Echinopsis leucanta

Herbs and grasses, partial listing

Aristida adscencionis
Butelova aristidioides
Setaria hunzikeri
Tillandsia xiphioides
Sporolobus phleoides
Sporolobus pyramidatus
Heterostachys ritteriana
Atriplex lampa
Lippia salsa
Halophyton ameghinoi

It should be noted that there are a number of unstudied herbs that are used by local inhabitants for medicinal purposes

5). Endangered fauna and flora

According to biologists from the National Park Service and the University of San Juan, the following species are either vulnerable or in danger of extinction in the proposed World Heritage Site.

Mammals

Chlamyphorus truncatus
Abroma cinerea
Octomys mimax

Reptiles

Chelonoidis chilensis
Liolaemus pseudoanomallus
Liolaemus riojanus

Aves

Pterocnemis pennata
Teledromas fuscus
Pseudoseisura gutturalis

Plants

Ramorinoa girolae
Halophyton ameghinoi

6). Archeological sites

A large number of sites containing extensive examples of prehispanic Rock art have been identified in the area of the two parks. At Talampaya 32 sites have been identified and are easily accessible. Some of the sites cover large areas of the red sandstone cliff faces. In the Ischigualasto park six sites of rock art have been identified, with very little specific exploration, as most of the scientific work has been oriented toward paleontological exploration. In addition to the rock art, cave and rock overhang habitation sites have been discovered throughout the park areas, as well as burial sites, campgrounds, and tool-making areas. According to published and personal communication, (see bibliography), the sites range from very ancient extinct cultures dating from about 600 BC to the Indian cultures that were present at the time of the Spanish conquest. Radiocarbon dating of organic materials found at various sites shows an occupational history dating from 2.590 to 960 years before the present. Numerous artifacts have also been found, including burial sites of infants within large ceramic jars. The habitation sites have not been made public in order to avoid depredation by private collectors and commercial “pot hunters”. In the Talampaya area there has been some vandalism of rock art, mainly before the designation of the area as a protected park. Of additional interest is the continuity of usage of some of the same sites by the early colonists and cattle drivers who crossed the area and left remnants of their passage side by side with the earlier Indian petroglyphs.

Description of the rock art.

Current literature does not present a definite classification of the rock art in the proposed site area. However, it is possible to classify much of the art in terms of geometric figures, human figures and combined scenes. Geometric designs include simple lines, zigzag lines both single and double, curved lines, also single and double, various rectangular forms, some of them complex, circular forms, the so-called “sand clock” and a radiating sun figure. There are also spirales, “S” lines, concentric circles, simple and curved crosses. The repertoire of human figures includes isolated figures, pairs and groups. Some of the figures are static, some are in action positions. Some have decorations on the head or around the

body. Animals are represented by individual species, especially guanaco, in groups of two or more. Some are in dynamic positions, most are static. Some of the animal figures appear to represent masks worn by dancers or important members of the group. Animal and human footprints are also common in the rock art. The human footprints are easily recognizable, among the animal prints are found puma, ostrich (rhea), guanaco. Additional scenes combine animal and human drawings, sometimes showing a direct relationship between the human and the animal. In one scene the guanaco is connected to the human figure by a straight line, in another the human is facing directly a puma.

7). Tourist attractions

The combination of scientific importance and natural beauty has made the two neighboring parks major tourist attractions for Argentina. Most of the visitors are drawn by the unspoiled beauty of the area and the impressive scenery that is unique and totally different from most of the natural areas in Argentina. In Talampaya the tourists walk or drive through the impressive canyon of sheer red walled sandstone nearly 200 metres high, see the strange figures sculpted into great works of art by the forces of nature and enjoy a desert landscape quite different from the surroundings of their daily life. In Ischigualasto the visitors enter into a valley characterized by white and multicolored sediments that form a lunar landscape with strange erosional features, an eerie silence, and the opportunity to see herds of guanaco unafraid of humans and great condors flying overhead. In addition, a number of fossil remains have been left in situ to show how fossils look when they are discovered. Each of the parks has a small interpretive center with displays showing the history, formation and life forms of the Triassic period. Both parks provide visitors with the opportunity to see and enjoy natural beauty and experience both an educational and ecological visit that for many of them is an important part of their lives.

b. History and development

Before the Spanish conquest the area was inhabited by several groups of aborigines, usually semi-nomadic hunters and gatherers. Archeological evidence indicates habitation from approximately 600 BC by the primitive La Fortuna and Aguada cultures to 1000 AD. Later groups of the Huarpes and Diaguita cultures inhabited the area until the time of the Spanish conquest. Incan influence reached the region shortly before the Spaniards arrived and is present mainly in the higher elevations. After 1600 the Spanish colonization of western Argentina was carried out from Santiago, Chile, advancing slowly towards the east. Jesuit missions arrived in the 1700's and permanent settlements were formed in the later part of the eighteenth century. The early settlements were along the watercourses near the mountains and in areas where natural springs were found. Subsistence farming and cattle raising were the main activities, with some small scale mining in the metamorphic rocks of the mountains. During the last half of the nineteenth century great cattle drives were organized to deliver beef to the miners across the Andes in Chile. Thousands of head of cattle were driven from central Argentina across the Ischigualasto-Talampaya area,

wintered in the precordillera area then crossed into Chile the following summer. The remnants of this activity is found throughout the area in the form of camps, temporary shelters and artifacts. Early in the twentieth century the coal beds of the Los Rastros Formation in Ischigualasto were mined, but due to the low quality of the coal the activity did not last long. However, at the coal mine fossil footprints were found in 1929 and described by the German paleontologist Friedrich Von Huene. Later the Italo-Argentine geologist Joaquin Frenguelli collected the first fossil skull of a cynodont from the Ischigualasto formation and sent it to the La Plata Museum where it was described by the paleontologist Angel Cabrera in 1944. In 1958 a joint expedition from Harvard University and the Argentine National Museum of Natural History made the first paleontological expedition to Ischigualasto and discovered fossiliferous character of the sediments. A later expedition discovered the Chanares locality in the Talampaya area, adding to the scientific importance of the area. Later work was carried out by the University of Tucuman under the direction of Prof. Oswaldo Reig and Jose Bonaparte, who also discovered the fossiliferous nature of the upper portion of the Los Colorados formation. Beginning in 1970 the provincial universities of San Juan and La Rioja began extensive field work in the areas and the parks were created by provincial laws, Ischigualasto in 1971, Talampaya in 1975. In 1997 Talampaya became a National Park.

c. Form and date of most recent property records

All properties in the proposed site belong to the provincial or national governments. Ischigualasto is registered as Dominio Publico del Estado Provincial in the property records of San Juan province as Number 4383, Volume 43, Folio 4383, year 1998, as published in the Official Bulletin, page 123.188. Talampaya was transferred to the National Park System by Argentine National Law number 24846/97 and incorporated into the system according to the Law of National Parks number 22.351.

d. Current conservation status

No commercial or private activities are currently present in the parks (rest rooms and basic food service are available at the entrance). The natural fauna and flora are protected by the conservation legislation incorporated into the laws that created the parks. All visitors are accompanied by authorized park employees. Hunting and wood cutting are prohibited. Vehicles are only permitted on designated unpaved circuits. Protective conservation legislation is detailed and severe in its content. However, application is sometimes less than adequate due to budgetary restraints.

e. Policies and programs related to the presentation and promotion of the properties

Both parks are actively promoted by the provincial tourist offices and by the National tourist secretariat. Through travel agencies, web sites, posters and attendance at international meetings both areas have acquired international exposure. The presentation policy is based on the concept of Ecotourism, which according to market specialists is the major trend for future

development of natural tourist attractions.

4. Management

a. Ownership

1. Provincial property. All of Ischigualasto provincial park, consisting of 60,369 hectares is the property of the government of San Juan
2. National property. All of Talampaya National Park, consisting of approximately 215,000 hectares is the property of the national government of Argentina.
3. Private property. Within the proposed site there is no officially recognized private property. Any claims to the contrary will be settled by local courts with indemnization procedures.

b. Legal status

The laws governing the legal status of Ischigualasto-Talampaya are as follows:

Ischigualasto

Provincial Law 3098/64 created the Museum of Natural Sciences and designated it as the custodian of paleontological discoveries in the province.

Provincial Law 3666/71 created the Ischigualasto Provincial Park and expropriated all property within the designated area.

Provincial Law 6385/97 provides judicial protection for all cultural and natural reserved areas in the province.

National Decree 752/95 declares the Ischigualasto Natural Park to be a National Historic Paleontologic Site

Talampaya National Park

Provincial Law 3509/75 establishes the Talampaya Provincial Park.

National Law 24846/97 accepts the transfer of the Talampaya National Park to the federal government and places it under the administration of the National Park System as stipulated by National law 22.351.

c. Protective measures and means of implementing them

The previously mentioned legislation provides provincial and national Park Rangers with law enforcement authority within the park boundaries. Additional protective measures are:

1. All visitors are accompanied by an authorized guide
2. A single roadway allows access to the parks
3. Park Rangers live year around at the park
4. Park Rangers regularly patrol the park by vehicle or on horseback

5. The universities of San Juan and La Rioja have continuous research programs that monitor the ecology of the park areas

d. Agencies with management authority

Talampaya is managed by the National Park Service in accordance with international standards for the management of natural reserves

Ischigualasto Natural Park is managed by the provincial tourism agency, in conjunction with the subsecretariat of environmental protection and the Museum of Natural Sciences of the University of San Juan

National: Secretaria de Turismo de la Presidencia de la Nación.

f. Level at which management is exercised, name and address of responsible Person for contact purposes

San Juan provincial tourism agency, EnProTur, Sarmiento 5 Sur, 5400
San Juan, Argentina
Te: 0264-4210004.
Fax: 0264-4225778.
Director, Dr. Alberto Semino

Museo de Ciencias Naturales de San Juan, España 460 Norte
5400, San Juan, Argentina
Tlifax: 0264- 4216774.
Director, Lic. Alfredo Monetta

Subsecretaria de Medio Ambiente Edificio 9 de Julio
Ave. Ignacio de la Roza
5400 San Juan, Argentina
Te: 0264-4217498
Fax: 0264-4227278.
Lic. Zulma Invernizzi

Administracion de Parques Nacionales Ave. Santa Fe 690
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Fax: 00-54-11-4311-6633.
Regional Director
Lic. Ana Balabusic

Secretaria de Turismo Nacional Suipacha 1111, Piso 21
1368 Buenos Aires, Argentina
Te: 00-54-11-4311-2089.
Fax: 00-54-11-4313-6834.
E:mail: pablo@turismo.gov.ar
Director of International Relations
Lic. Pedro Neiff.

f. Plans related to property development

1. Federal government through the Commission for Historical and Natural Monuments has approved the construction of a larger visitors center at Ischigualasto to include a laboratory and residence for scientists. The National Park Service has plans to expand the facilities and equipment for Park Rangers at Talampaya.
2. The provincial government of San Juan has completed a study for the construction of service and recreational facilities just outside the Ischigualasto Park area.
3. Private developers are planning hotels, service stations, stores and restaurants near the park areas.

Only the federally sponsored visitors center will be located within the park boundaries, all other commercial and development will be outside the protected areas.

g. Sources and levels of finance

Visitors pay a small entry fee to visit the parks. These funds are managed by EnProTur in San Juan and the National Park Service in La Rioja. Additional funds are provided by subsidies from provincial and national organizations and by research funds from the universities that work in the area. As tourism increases more funds will become available through concessions for additional tourist activities.

h. Sources of expertise and training in conservation and management

National Park Rangers receive extensive university training at the National Ranger Training School before being assigned to work in the park system. The provincial employees at Ischigualasto are local residents who are trained by specialists from the University of San Juan, principally to explain the geology and paleontology of the Ischigualasto Valley to visitors. Private tourism companies must have guides that are licensed by EnProTur.

i. Visitors facilities and statistics

At present there are no lodging facilities at either of the parks. Primitive camping is permitted in the buffer zone at Ischigualasto with use of the rest rooms and water facilities. Small buffet style food service is available at both parks. In spite of the lack of services, visitors to the natural parks are increasing at the rate of 15% per year. In 1998 34,000 tourists visited the area. Nearly all of them combine their visit to include both Ischigualasto and Talampaya. A recent study by Baker Leisure Group International shows that without any improvements in roads or services during the next ten years the number of tourists will increase to at least 100,000 per year. If lodging and other services are added the increase will be 600,000. At present approximately 7% of the tourists are from countries outside of Argentina, principally from Brazil, Japan, Europe and the U.S.A. Most of the national tourists come from Buenos Aires, followed by Cordoba and Mendoza. In addition, 200 school buses visited the parks last year and numerous scientific delegations from universities and research centers from around the world. At present the economic impact for the area is limited principally to the entry fees at the parks. Some secondary benefits are derived to the nearby towns of San Augustin, located 80 kilometres from Ischigualasto and Patquia and

Villa Union similarly located in La Rioja from Talampaya. The eventual economic impact will be considerably greater if service facilities are added to the area, as they surely will be as demand increases.

j. Property management plan and statement of objectives

The National Park Service has well developed management plans for all of The national parks it administers. These plans are based on international standards and local needs and conditions. The Ischigualasto park currently has a three year study under way by the University of San Juan to establish the scientific basis for a comprehensive management plan to be implemented by the Secretariat of Environmental Planning and the Provincial Tourism Agency. The National Secretariat of Tourism also contributes a global perspective to the planning procedures for administration of the parks. All management plans will be in accordance with the international ISO 14000 standards. The objectives of the management plans are first of all to preserve and protect the natural areas as a permanent testimony of rare and completely natural scenic and scientific areas. Secondly the objective will be to develop plans for rational use that will satisfy the needs and desires of visitors without degrading the natural system that forms the reason for the visitor to come. A third objective is to serve as an educational instrument for increasing the awareness and need to conserve our natural heritage.

k. Staffing levels (professional, technical, maintenance)

Staff at the national park consist of highly trained professional Park Rangers, local technicians and maintenance personnel. Scientists from the University of La Rioja and other national institutions serve as advisors and participate in research and environmental monitoring activities. At Ischigualasto the full time staff consists of local residents who have received on-the-job training in order to explain the park to visitors. They have the advantage of knowing the area very well and serve as guides for scientific expeditions and can find specific plants, animals or rock formations with ease. Supervisory personnel are provided by the three management agencies; the tourism agency, the subsecretariat for the environment and the museum of natural science.

5. Factors affecting the property

a. Development pressures

At present there are no significant developments in the area. The land is not suitable for agriculture and cattle raising is on a small scale. Sometimes cattle stray into the park areas and there is some concern that they compete with the wildlife for the available pasture. Park rangers and guides are responsible for notifying the owners to remove the animals and have the authority to dispose of them if they are not rapidly removed. There are plans to construct tourist service areas in the vicinity of the parks. Local governments are responsible for zoning regulations to control future development and assure environmental quality control. In San Juan the subsecretariat for environmental planning has already drawn up the

guidelines for future development. In the area of influence of the park. In La Rioja the controls will be determined by the National Park Administration.

b. Environmental pressures (pollution, climate change)

There are no industries in the area to produce industrial pollutants. Over grazing by cattle is a possibility due to the relatively scarce grazing land. A significant environmental pressure is the trash left behind by tourists. Both parks are currently using small scale land fill systems to remove the residues, but as tourism increases higher level measures will be required. At Ischigualasto they have instituted a three part separation of trash, but the results have not been very successful to date. Climatic fluctuations are rare, the most common being an unusual increase in rainfall associated with the “El Niño” climatic effect. When there is significant rainfall the parks shut down as the roads become impassible.

c. Natural disasters

The proposed site lies at the eastern edge of the Andes earthquake zone.

Earthquakes are felt here but have not produced serious damage, even though none of the rural homes are built to seismic resistance standards.

Flash flooding along usually dry stream beds can disrupt travel, but usually passes quickly and damage is easily avoided because the stream beds are well known. Minor brush fires sometimes occur on the slopes of nearby mountains but are usually small scale and do not affect the park areas simply because there is so little vegetation available.

d. Visitors/tourism pressures

The increasing numbers of tourists is a potential problem as well as an economic advantage to the area. Currently tourists must use their own vehicles to travel through the park at Ischigualasto. This increases the erosion of the roadway and when there are a number of vehicles and only one guide there is insufficient control over the activity of the visitors and the careless disposal of trash. Future planning will require that visitors leave their vehicles at the park entrance and travel in groups in environmentally sensitive vehicles and remain under the supervision of a qualified guide.

At Talampaya pickup trucks are used to transport tourists in small groups, with the same problems that exist at Ischigualasto.

e. Number of inhabitants within the property and adjacent area

There are no inhabitants within the proposed site. 10 kilometres south of the Entrance to Ischigualasto is the small village of Baldecitos inhabited by Eleven families. Larger towns with full service facilities, lodging, commerce, medical care, and populations between two and three thousand inhabitants are San Augustin, located 87 kilometres south of Ischigualasto and Villa Union, located 70 kilometres north of the entrance to Talampaya.

f. Other factors

Because the parks are not fenced, it is possible for clandestine hunters to enter the areas on foot or with horses or mules. Currently, the park personnel do not have adequate transportation or communication equipment to detect or intercept these hunters. A second factor is the occasional

entrance into the parks by Enduro type motorcycles, entering by way of stream beds in the outlying areas of the parks that are relatively inaccessible.

6. Monitoring

a. Key indicators for measuring the state of conservation

Currently, the principal indicators for analysis of conservation are:

1. Ground water quality. This is measured by taking samples from the family and public wells in the Baldecitos village area. Wells are periodically sampled by the provincial water department and a contaminant threat survey report is issued.
2. Census of guanaco herds and domestic animals within the park areas. This is carried out yearly by the Biology Department of the University of San Juan, also noted, when discovered, are the kills made by pumas.
3. Vegetation survey, carried out by the Biology Department of the University of San Juan. Special attention is given to the pasture availability for wildlife and the potential of overgrazing by domestic animals.
4. Statistical analysis of tourist activity by the Provincial Tourism Agency with regular inspections of the facilities at the park headquarters.

b. Administrative arrangements for monitoring property

The National Park Administration monitors the Talampaya park, the Ischigualasto area is monitored by the three agencies responsible for the protection of the park: the Provincial Tourism Agency, the University of San Juan, and the Subsecretariat for Environmental Planning.

c. Results of previous reporting exercises

Reports from the different agencies involved in monitoring the areas are summarized as follows:

1. Ground water analysis shows high salinity in the area of Talampaya, suitable and abundant water in the Baldecitos-Ischigualasto area, free of contamination except for wells near septic tanks or corrals.
2. Biologists report a concern with regard to stray cattle in the area that compete with guanaco for pasturage, also they report the presence of wild burros in the park area and an increase in the number of pumas, that have apparently migrated into the Los Rastros area from the precordillera region of Jachal.
- 3- Park employees report three cases of illegal hunters that entered the Ischigualasto park from the La Rioja border during the last year.
4. The subsecretariat for environmental planning has approved the Construction of a national highway that will cross part of the buffer zone of the Ischigualasto park. They have required environmental impact reports from the national highway commission and the construction of passageways for the safe migration of wildlife across the future highway.
5. The University of San Juan continues to carry out geologic and Paleontologic exploration and research in Ischigualasto. The University of La Rioja also continues its program of exploration and

research in the Talampaya area. Each year significant discoveries are made and duly reported in scientific journals.

7. Documentation

- a. Photographs, slides, videos, printed materials
See attachments
- b. Copies of property management plans
The National Park Service is in the process of preparing a site management plan for Talampaya within the guidelines already established for National Parks in Argentina.

In Ischigualasto, the University of San Juan is carrying out a three year study of the ecosystem to present the scientific basis for a management plan to the provincial government. The study will be completed in December of 1999, (see attached Advance Report).

- c. Bibliography
See below
- d. Address where archives are stored
National Secretary of Tourism, Buenos Aires
Provincial Government records office of San Juan and La Rioja
National Park Service administrative offices, Buenos Aires

8. Names and signatures of National Agency responsible.

Secretaría de Turismo de la Presidencia de la Nación.
Suipacha 1111 Piso 21. C.P 1368. Buenos Aires.
Te: 00-54-11-4311-2089 – Fax: 00-54-11-4313-6834.
E:mail: pablo@turismo.gov.ar

Secretario de Estado de Turismo: D. Francisco MAYORGA.

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The following records represent a very small part of the scientific and popular literature regarding Ischigualasto and Talampaya. For example, there are more than 650 references to the geology and paleontology of the area. The biology, ecology and archeology of the area have not been studied near as much but represent a frontier of research and exploration for future work.

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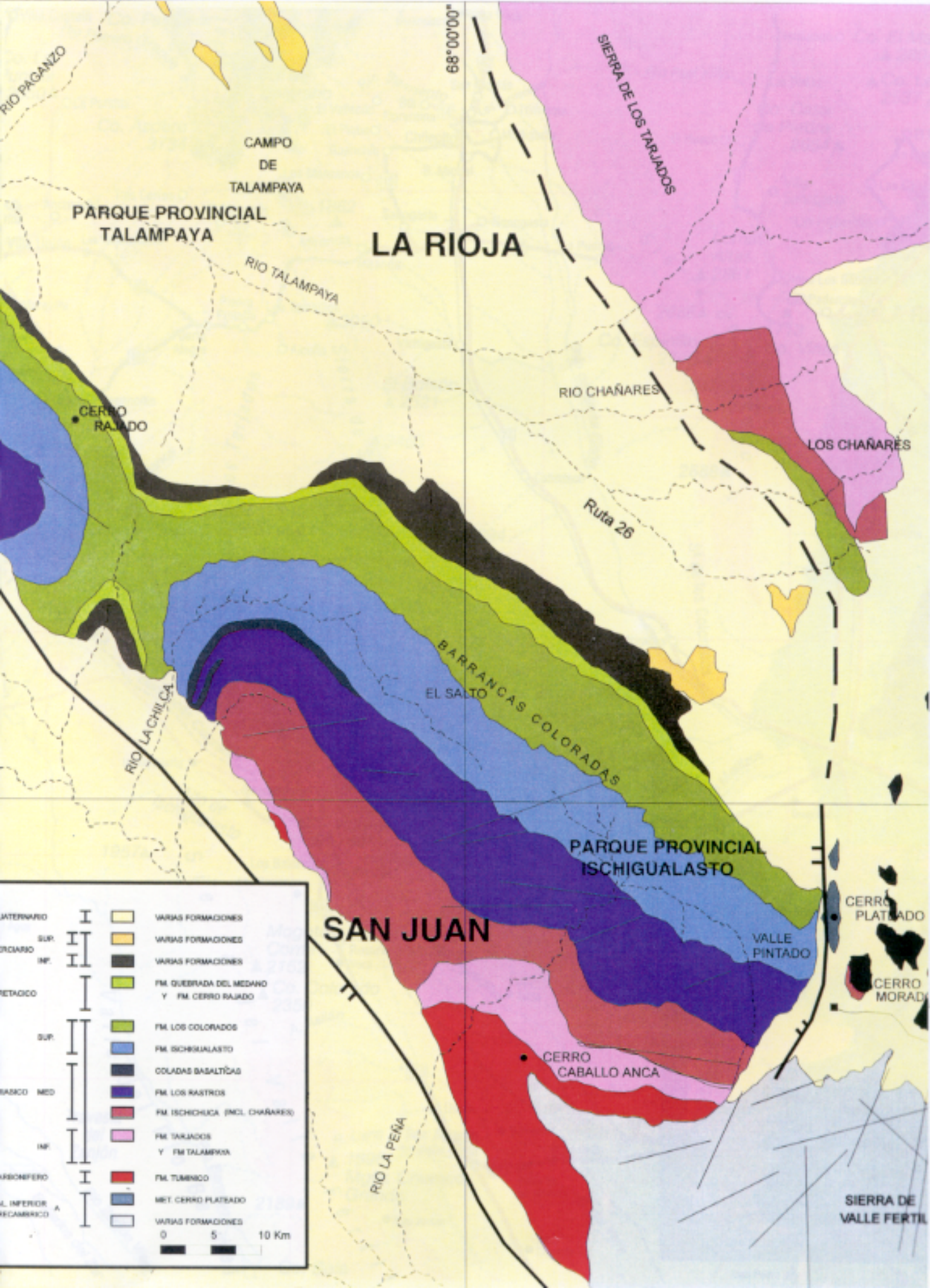
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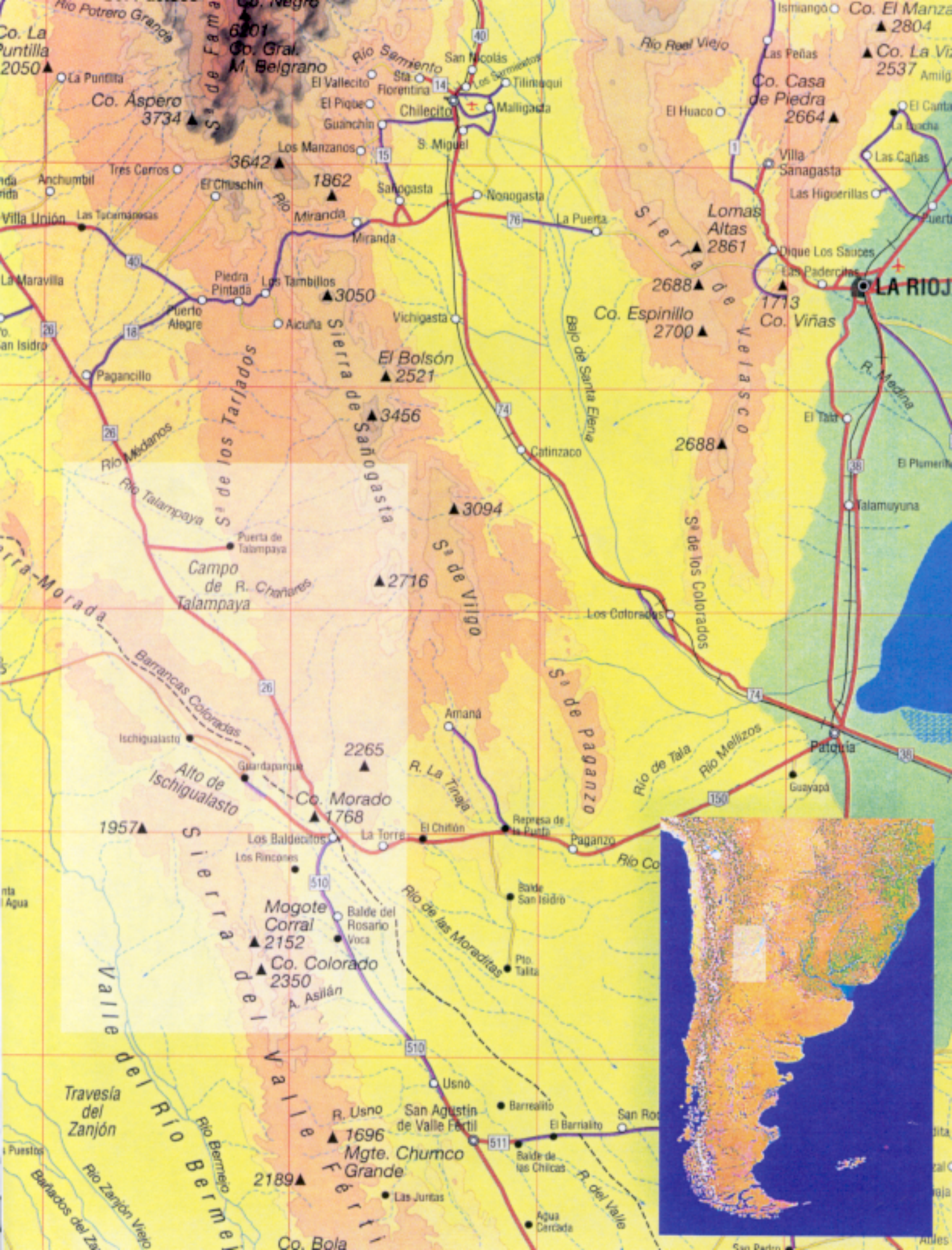
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h a l



TERCIARIO	I	VARIAS FORMACIONES
CRETACEO	SUP.	VARIAS FORMACIONES
	INF.	VARIAS FORMACIONES
MESOZOICO	SUP.	FM. QUEBRADA DEL MEDANO Y FM. CERRO RAJADO
	INF.	FM. LOS COLORADOS
CUATERNARIO	SUP.	FM. ISCHIGUALASTO
	INF.	COLADAS BASALTICAS
CENOZOICO	SUP.	FM. LOS RAISTROS
	INF.	FM. ISCHICHUCA (INCL. CHAÑARES)
MESOZOICO	SUP.	FM. TAJADOS Y FM. TALAMPAYA
	INF.	FM. TUMBUICO
CUATERNARIO	SUP.	MET. CERRO PLATADO
	INF.	VARIAS FORMACIONES







WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

ISCHIGUALASTO PROVINCIAL PARK-TALAMPAYA NATIONAL PARK
(ARGENTINA)

1. DOCUMENTATION

- i) **WCMC Data Sheet:** (9 references)
- ii) **Additional literature consulted:** 1998. **Monograph on Ecosystems and Palaeontology of Ischigualasto Natural Park.** Argentina; 2000. **Criteria and Actions for Co-operative Management of the Ischigualasto-Talampaya Parks;** Sill, W. 2000. **Comparison of the world's Triassic vertebrate localities - a synopsis.** Unpublished Ms., 2pp; Olsen, P. 2000. **The Triassic World.** Columbia University; Wells, R. T. 1996. **Earth's Geological History – a contextual framework for assessment of World Heritage fossil site nominations in Global Theme Study of World Heritage Natural Sites,** IUCN, Switzerland, 43pp.
- iii) **Consultations:** Specialists from the National Secretariat of Tourism, University of San Juan, Museum of Natural Sciences, staff of Ischigualasto Provincial Park, Argentine National Parks Administration, University of La Rioja, local government and authorities.
- iv) **Field visit:** Paul Dingwall. March, 2000.

2. SUMMARY OF NATURAL VALUES

The nominated site comprises two contiguous parks: Ischigualasto Provincial Park (Category II, IUCN) created in 1971, and Talampaya National Park (Category II, IUCN), originally established as a provincial park in 1975 but reclassified as a national park in 1997. Located respectively in the provinces of San Juan and La Rioja, in the desert region on the western border of the Sierras Pampeanas of central Argentina, the parks encompass a single geographical unit of 275,369ha (see maps 1 and 2). The parks were established to protect geological formations of the Triassic Period, and associated landscapes, scenery and biota.

The site constitutes almost the entire sedimentary Ischigualasto-Villa Union Triassic Basin, consisting of continental sediments deposited during the entire Triassic Period of geological time, from approximately 245 to 208 million years ago. There are six geological formations, the earliest of which are the red sandstones of the Talampaya and Tarjados Formations, exposed as 200m-high cliffs in Talampaya NP. The Ischichuca-Chenares Formation is composed of lake beds and beach deposits, the latter containing fossils of an ancestral group of mammals, termed Therapsida, including animals ranging in size from a bear to a small elephant. Also present are fossils of a group termed Archosauria - animals that are ancestors of the dinosaurs (and by extension birds), crocodiles and lizards. The Los Rastros Formation, cyclic sediments deposited in rift valleys during the earliest breakup of the Gondwana supercontinent, has a wealth of fossil plants, especially ferns such as *Cladophlebis*. The Ischigualasto Formation, composed of strikingly white floodplain sediments, is immensely rich in fossil specimens of reptiles, amphibians, therapsids and plants. The vertebrate specimens contain the earliest primitive dinosaurs, *Eoraptor*, and its more advanced contemporary *Herrerasaurus*. Finally, the Los Colorados Formation comprises classic red sandstones with an abundance of dinosaur fossils, almost entirely archosaurs and including large herbivorous and carnivorous dinosaurs, primitive true crocodiles, and primitive true mammals.

Ischigualasto-Talampaya is of outstanding scientific importance as the only known area in the world that contains a complete sequence of continental sediments with abundant fossil fauna and flora for the Triassic Period of geological history. This period is very significant for understanding the evolution of life on earth, as it represents the origin of both mammals and dinosaurs. Further, it offers the prospect of resolving one of the greatest enigmas of palaeontology - the rise to dominance of the dinosaurs and suppression of mammalian evolution over a period of 150 million years. The rich diversity of fossils includes some 56 known genera of vertebrates (species

numbers yet to be determined), and at least 100 species of plants. Together with the geological strata, the fossils provide a unique window for viewing Triassic palaeoenvironments.

Additional to the scientific importance of the site are its scenic landscapes and features of great aesthetic and cultural value, including 1500 year-old petroglyphs. Outstanding among these are the 200m-high red sandstone cliffs of the Talampaya Fm. in Talampaya NP. In Ischigualasto Provincial Park, the white and multicoloured sediments of the Ischigualasto Fm. create a stark, lunar-like landscape entitled “El Valle de la Luna - the Valley of the Moon”.

The site has typical El Monte (desert) vegetation, which is sparse and characterised by xeric shrubs and cactus, with mesquite and quebracho trees. Among the 172 species of higher plants recorded are six considered in need of special protection because they are endemic and/or rare. Among the vertebrates, those considered endangered or vulnerable include five species of mammals, three species of birds and three species of reptiles.

3. COMPARISON WITH OTHER GEOLOGICAL SITES

The Triassic Period opens the Mesozoic Era of geological time, known as the “Age of Dinosaurs”. Comprising three major stages, it was a critical period in the evolution of life on earth because all of the groups of tetrapods (4-legged animals) evolved by its end (Olsen, 2000). Continental Triassic sediments like those in Ischigualasto-Talampaya are found at several world localities, but they are generally limited in extent and not rich in fossils (Sill, 2000). Germany, Switzerland, Italy and the U.K. have Early and Late Triassic exposures. Russia’s Ural Mountains have an important Early Triassic site, and there are others in China and India, the latter having the continent’s only well known Late Triassic fossils. The Karoo of southern Africa is a major reference for the Early Triassic, while Algeria, Libya and Morocco have some Late Triassic sites. In North America, Early Triassic vertebrates are found only in scattered localities in the southwest, and there are extensive Late Triassic sediments in eastern USA extending into Canada, and in the red beds of the southwest, notably in the Chinle Fm. of Arizona. In Antarctica Early and Late Triassic sites are known, principally bearing fossil plants with some vertebrates.

Unlike any other place in the world, the Argentine Ischigualasto-Talampaya site has seven sequential Triassic formations representing the entire Triassic Period. The Middle Triassic here is undoubtedly the best representative of that age currently known anywhere.

Few Triassic sites are protected. Only two in the United States are protected as national parks or monuments: the Petrified Forest NP in Arizona, which has several plant and animal groups represented, but is limited to the Late Triassic; and Dinosaur NM in Utah, with its outstanding dinosaur assemblage of great scientific importance, which is mostly Late Jurassic in age. Among existing World Heritage sites, the one most noted for its fossil dinosaurs is Canada’s Dinosaur Provincial Park but it is much younger than Ischigualasto-Talampaya, dating from the Late Cretaceous only 75 million years ago. Of the other important palaeontological sites on the World Heritage List - Australian Fossil Sites, Messel and Miguasha - none is Triassic in age. Wells (1996), in providing an indicative representative list of the world’s fossil sites with potential for World Heritage status, selects Ischigualasto for its exceptional Mid-Late Triassic record of early dinosaurs.

Attached is an Annex which documents the qualities of the nominated site against the IUCN criteria for establishing the universal value of fossil sites (Wells, 1996). The results provide a good demonstration of the World Heritage significance of the site.

4. INTEGRITY

4.1 Boundaries

The boundaries of the nominated site encompass the surface expression of the entire Triassic age Ischigualasto-Villa Union sedimentary basin, thus including all key fossiliferous strata within the protected area. It is a holistic geological site containing an entire geosystem with all interrelated components - continuous sequences of rock outcrops, erosional forms, outwash areas and depositional features. Although most of the boundaries follow straight lines rather than topographic contours, this is not a problem given the poor definition of catchments in the desert landscape.

4.2 Management

The nominated site is public land with strong legal protection. Although about 20% of the area is managed under Provincial law, this provides statutory protection equivalent to the national park. There is no formally approved management plan for the site, but the plan for Talampaya NP is in the final stages of public consultation, and for Ischigualasto there is a comprehensive resource management document providing the basis for a future plan. The national and provincial authorities are establishing a single cooperative management regime for the site. Already, there is a documented agreement specifying common management objectives, planning processes and zoning procedures, and integrated action in respect of staff training, tourism management, control measures, research, institutional supervision and support, among others. Oversight of joint management will be provided by a standing Coordinating Committee, assisted by a single Technical Advisory Group representative of key local scientific institutions, provincial agencies and non-governmental conservation organisations. This should ensure the application of uniform management policies, programmes and standards across the entire site.

Management resources are limited and park infrastructure is only rudimentary at present. However, the need for improvement is well recognised by the administering agencies, and appropriate provisions are included in the draft management plan. There is a commitment to implement the management plan by the key authorities at all levels - park, municipal, provincial and national. Among the priority management requirements are:

- increased staffing levels above the existing complement at Ischigualasto of one ranger and eight certified guides, and at Talampaya of two rangers and 17 unofficial guides;
- more vehicles for park maintenance and visitor guiding purposes;
- improved administration and visitor facilities, such as interpretation centres, rangers' accommodation, toilets, stores, restaurants, camping facilities and walking trails; and
- increased funding.

The parks are zoned appropriately for protection and use, and currently there are no significant threats to the values protected in the nominated site. Impacts from tourist use, unauthorised grazing and exotic pests are minimal and are within acceptable levels that can be sustained without serious loss of park values. Research and collection of specimens are strictly controlled, and there are heavy penalties for illegal collecting and poaching, which appear to be minimal. The parks are very well served by scientific and technical advice for underpinning their research, education, training and interpretive programmes. A feature at the site is the strong interaction between the parks and the surrounding communities.

Overall, the nominated site adequately satisfies all key conditions of integrity.

5. ADDITIONAL COMMENTS

No additional comments.

6. APPLICATION OF WORLD HERITAGE NATURAL CRITERIA

Ischigualasto-Talampaya is nominated in accordance with World Heritage natural criteria (i), (iii) and (iv).

Criterion (i): Earth's history and geological features

Unlike any other place on earth, Ischigualasto-Talampaya is made up of a complete sequence of fossiliferous continental sediments representing the entire Triassic Period of geological history. As such, it is one of the most important palaeontological sites in the world, and of great scientific and conservation value. This is the fundamental basis of its claim to outstanding universal value in representing a major stage of earth's geological evolution.

In the sediments of Ischigualasto-Talampaya are found fossil-bearing strata that document the transition from Early Triassic mammalian ancestors to the age of dinosaur dominance in the Late Triassic. No other place in the world has fossils that can compare to those preserved in the Chanares, Los Rastros and Ischigualasto Formations in these parks for revealing the evolution of vertebrate life and the nature of palaeoenvironments in the Triassic

Period, which ushered in the Age of Dinosaurs over the next 150 million years. Although there are Triassic sites on other continents, they are generally small and scattered with limited fossil abundance, and they represent only a restricted period of the 45 million years of Triassic time. IUCN considers that the nominated site meets this criterion.

Criterion (iii): Superlative natural phenomena or natural beauty and aesthetic importance

Ischigualasto-Talampaya contains some spectacular scenery. The many canyons in Talampaya NP are bounded by towering 200m high bright red-coloured walls, some eroded into cathedral-like spires, while in Ischigualasto PP stratified rock formations are carved by rain and wind into erosional shapes, protruding conspicuously above a stark, ash-coloured landscape colloquially referred to as “El Valle de la Luna- the Valley of the Moon”. Also the rock formations and landscapes of the parks have become visual icons for the region and the country, ranged alongside the images of Argentina’s other World Heritage sites - the peaks and glaciers of Los Glaciares and the cataracts of Iguazu Falls. However, when compared to other World Heritage sites inscribed under this criterion, the nominated site does not rank high. IUCN does not consider that the nominated site meets this criterion.

Criterion (iv): Biodiversity and threatened species

The biodiversity values of the site are not well documented in the nomination, and the claim made against this criterion is, therefore, not established. The plants and wildlife of the parks are still not completely known. The vegetation has been broadly mapped throughout, and an inventory of the plants in Ischigualasto Provincial Park only recently conducted. On the positive side, the natural habitats of the site are important because they are largely in an unmodified state. The site is large (about three quarters of a million hectares) and protects a very substantial representative piece of El Monte(desert) ecosystems - certainly more than any of the several other protected areas in the desert region. On the negative side, the biota and habitats here are typical of the region rather than outstanding and, apart from three plants being reported as endemics, they lack special features. Nor is the vegetation here of a type that is unique in the world - being essentially replicated in the great Sonoran Desert of southwestern USA. IUCN does not consider that the nominated site meets this criterion.

7. RECOMMENDATION

The Bureau recommended to the Committee to **inscribe** Ischigualasto Provincial Park and Talampaya National Park on the World Heritage List under natural criterion (i). The Bureau noted that the site contains a complete sequence of fossiliferous continental sediments representing the entire Triassic Period (45 million years) of geological history. No other place in the world has a fossil record comparable to that of Ischigualasto-Talampaya which reveals the evolution of vertebrate life and the nature of palaeoenvironments in the Triassic Period.

The Bureau suggested that the State Party, along with the relevant Provincial authorities, proceeds as soon as possible with the establishment of a single cooperative management regime, including completion of an integrated management plan and provision of adequate human and financial resources to implement effective management.

ANNEX I: EVALUATION CHECKLIST FOR FOSSIL SITES

Coverage of an extended geological time period

Ischigualasto-Talampaya has fossils covering virtually all of the Triassic Period, i.e. approximately 45 million years from 245 to 208 million years B.P. It is the only known area containing a complete sequence of fossiliferous continental sediments for the Triassic, so is of immense scientific importance.

Rich species diversity

The site provides a wide variety of both plant and vertebrate fossils. At least 56 genera of vertebrates are known, including fish, amphibians and a great variety of reptiles and direct mammalian ancestors. Some 100 species of fossil plants have been identified. Palynological (pollen) studies are incomplete but will increase the known diversity of the ancient flora. Three species of fossil freshwater invertebrates have been identified.

Uniquely representative of a geological time period

The nominated site is unique in presenting a complete sequence of continental fossil bearing strata from the Triassic. Other sites, especially in South Africa, Russia and the USA, have representative Triassic faunas of the Early and/or Late Triassic, but none of them has extensive Middle Triassic specimens. Moreover, none of them can document the transition from Therapsida (ancestral mammals) in the Early Triassic to the dominant dinosaur fauna of the Late Triassic.

Contribution to understanding life on earth

The nominated site is one of the principal locations for studies on the origins of dinosaurs, and on the early faunal transition that was eventually to lead to dominance of dinosaurs in all the earth's ecological niches on land, sea and in the air, a most significant faunal transition in the history of life on earth. The abundance of fossil biota enables comprehensive interpretation of palaeoenvironments and landforming processes that existed more than 200 million years ago.

Prospects for ongoing discoveries

Literally thousands of specimens have been recovered from the sediments of the parks, and many fossils are added to the collections annually. There are excellent prospects for further significant discoveries of fossil flora and fauna at the site. Due to the very rugged terrain, more than half of the site has not yet been thoroughly explored.

International level of interest

The fossil plants and vertebrates of Ischigualasto-Talampaya are of great significance to the sciences of palaeontology and evolutionary biology. The site is of international renown in scientific circles as a principal location for in-situ study of the world's earliest dinosaurs. Palaeontological research has been conducted here for 70 years, and most of the 627 scientific papers related to the area are published in international journals. Specimens from the site are of high quality and are in great demand for research and display, such as for the special exhibit on the world's oldest dinosaurs held at the Texas Memorial Museum in 1997.

Associated features of natural value

Among the other notable natural features are spectacularly scenic rock formations and landscapes, protected wildlife and endemic plants characteristic of "El Monte" (desert) vegetation.

State of preservation of specimens

The site is remarkable for the recovery of whole skeletons of vertebrate animals, enabling detailed study of the physiology and behaviour of the earliest dinosaurs and proto-mammals. Studies of jaw structures, for example, have revealed feeding mechanisms, skull shapes record the evolution of forward-looking eyes, and limb anatomy displays the early development of bipedalism and upright stance among the dinosaurs.

Curation, study and display of site and fossils

Specimens from the site, both palaeontological and biological, are fully catalogued and curated by the Museum of Natural Sciences at the University of San Juan, which is the principal research centre for the parks. The senior researcher has worked in the parks for more than 30 years, is an expert on the geology of the Triassic and one of the world's leading vertebrate palaeontologists. Researchers from the University of La Rioja are also very active at the site. While specimens are freely available for study, strict laws control all collecting of specimens, and all research is supervised by the University of San Juan. There are displays of the specimens at the museum, where a major new display of fossils and Triassic palaeoenvironments is planned. Exhibits at the park visitor interpretive centres are rudimentary but will be improved as resources allow. There are some in-situ displays of fossils in the parks. Rangers or guides accompany all visitors to the parks.



**Map 1: Location Map – Ischigualasto Provincial Park–
Talampaya National Park**



Map 2: Site Map – Ischigualasto Provincial Park–Talampaya National Park

CANDIDATURE AU PATRIMOINE MONDIAL - ÉVALUATION TECHNIQUE UICN

PARC PROVINCIAL D'ISCHIGUALASTO - PARC NATIONAL DE TALAMPAYA (ARGENTINE)

1. DOCUMENTATION

- i) **Fiches techniques UICN/WCMC** (9 références)
- ii) **Littérature consultée:** 1998. **Monograph on Ecosystems and Palaeontology of d'Ischigualasto Natural Park. Argentina;** 2000. **Criteria and Actions for Co-operative Management of the d'Ischigualasto-Talampaya Parks;** Sill, W. 2000. **Comparison of the world's Triassic vertebrate localities - a synopsis.** Unpublished Ms., 2pp; Olsen, P. 2000. **The Triassic World.** Columbia University; Wells, R. T. 1996. Earth's Geological History – a contextual framework for assessment of World Heritage fossil site nominations in **Global Theme Study of World Heritage Natural Sites,** IUCN, Switzerland, 43pp.
- iii) **Consultations:** Spécialistes du Secrétariat national au tourisme, Université de San Juan, Muséum d'histoire naturelle, personnel du Parc provincial d'Ischigualasto, Administration des Parcs nationaux d'Argentine, Université de la Rioja, gouvernement local et autorités locales.
- iv) **Visite du site:** Paul Dingwall, mars 2000.

2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

Le site proposé se compose de deux parcs contigus: le Parc provincial d'Ischigualasto (Catégorie II, UICN), créé en 1971 et le Parc national de Talampaya (Catégorie II, UICN), établi en tant que parc provincial, en 1975, puis reclassé parc national, en 1997. Situés respectivement dans les provinces de San Juan et de La Rioja, dans la région du désert à la limite ouest des Sierras Pampeanas du centre de l'Argentine, les parcs constituent une seule unité géographique de 275 369 hectares (voir cartes 1 et 2). Ils ont été créés pour protéger les formations géologiques du Trias et les paysages, la flore et la faune associés.

Le site correspond presque entièrement au bassin sédimentaire triassique d'Ischigualasto-Villa Union et se compose de sédiments continentaux déposés durant la période géologique du Trias (de -245 à -208 millions d'années). On y trouve six formations géologiques dont la plus récente est celle des formations de grès rouge de Talampaya et de Tarjados, exposées en falaises de 200 mètres de haut dans le Parc national de Talampaya. La formation d'Ischicuca-Chenares se compose de dépôts dans les lits lacustres et sur les plages qui, dans ce dernier cas, contiennent des fossiles d'un groupe ancestral de mammifères, appelé «Therapsida» qui comprend des animaux allant de la taille d'un ours à celle d'un petit éléphant. Il y a aussi des fossiles d'un groupe appelé Archosauria - ancêtres des dinosaures (et par extension des oiseaux), des crocodiles et des lézards. La formation Los Rastros, des sédiments cycliques déposés dans des vallées de rift au tout début de la séparation du supercontinent du Gondwana, possède des trésors de plantes fossilisées, en particulier des fougères telles que *Cladophlebis*. La formation d'Ischigualasto, composée de sédiments de plaines d'inondation d'un blanc éclatant est extrêmement riche en spécimens fossiles de reptiles, d'amphibiens, de therapsidés et de plantes. Les spécimens de vertébrés contiennent les premiers dinosaures primitifs, *Eoraptor*, et leurs contemporains plus avancés, *Herrerasaurus*. Enfin, la formation Los Colorados se compose de grès rouges classiques et contient en abondance des fossiles de dinosaures, presque tous des archosaures mais aussi de quelques grands dinosaures herbivores et carnivores, de vrais crocodiles primitifs et de vrais mammifères primitifs.

Ischigualasto-Talampaya est d'importance scientifique exceptionnelle car c'est la seule région connue au monde qui contienne une séquence complète de sédiments continentaux avec une faune et une flore fossiles abondantes de la période géologique du Trias. Il s'agit d'une période clé pour comprendre l'évolution de la vie sur terre car elle représente l'origine à la fois des mammifères et des dinosaures. En outre, elle offre la possibilité de résoudre une des plus grandes énigmes de la paléontologie - la montée en puissance des dinosaures et l'arrêt de l'évolution des mammifères sur une période de 150 millions d'années. La riche diversité des fossiles présente environ 56 genres connus

de vertébrés (le nombre d'espèces est encore à déterminer) et au moins 100 espèces de plantes. Avec la strate géologique, les fossiles constituent une fenêtre unique sur les paléoenvironnements du Trias.

Les superbes paysages viennent compléter l'importance scientifique du site, de même que des caractéristiques de grande valeur culturelle et esthétique, notamment des pétroglyphes vieux de 1500 ans. Parmi les éléments les plus spectaculaires, on peut noter les falaises de grès rouge de 200 mètres de haut de la formation de Talampaya dans le Parc national de Talampaya. Dans le Parc provincial d'Ischigualasto, les sédiments blancs et multicolores de la formation d'Ischigualasto créent un paysage frappant, lunaire, et qui a d'ailleurs été baptisé «El Valle de la Luna – la Vallée de la lune».

Le site présente une végétation typique d'El Monte (désert) c'est-à-dire éparse et caractérisée par des buissons xériques et des cactus, la mesquite et les quebrachos. Parmi les 172 espèces de plantes supérieures répertoriées, on considère que six méritent des mesures spéciales de protection parce qu'elles sont endémiques et/ou rares. Parmi les vertébrés, cinq espèces de mammifères, trois espèces d'oiseaux et trois espèces de reptiles sont considérées comme menacées ou vulnérables.

3. COMPARAISON AVEC D'AUTRES SITES GÉOLOGIQUES

La période du Trias ouvre l'ère géologique du Mésozoïque appelée aussi «âge des dinosaures». Avec ses trois grandes étapes, elle fut une période critique pour l'évolution de la vie sur Terre parce que tous les groupes de tétrapodes (animaux à 4 pattes) ont évolué vers la fin de cette période (Olsen, 2000). Les sédiments continentaux du Trias tels que ceux d'Ischigualasto-Talampaya sont présents dans plusieurs sites, dans le monde entier, mais généralement limités dans leur étendue et pauvres en fossiles (Sill, 2000). L'Allemagne, la Suisse, l'Italie et le Royaume-Uni ont des sédiments exposés du début et de la fin du Trias. Les monts de l'Oural, en Russie, contiennent un site important du début du Trias et on en trouve en Chine et en Inde, cette dernière possédant les seuls fossiles bien connus de la fin du Trias de tout le continent. Le karoo, en Afrique australe, est une référence majeure pour le début du Trias, tandis que l'Algérie, la Libye et le Maroc ont des sites de la fin du Trias. En Amérique du Nord, on trouve des vertébrés du début du Trias en sites épars dans le sud-ouest, et il y a d'importants sédiments de la fin du Trias dans l'est des États-Unis, zone qui s'étend jusqu'à l'intérieur du Canada et dans les lits rouges du sud-ouest, en particulier dans la formation Chinle, en Arizona. On connaît, en Antarctique, des sites du début et de la fin du Trias qui contiennent surtout des fossiles de plantes avec quelques vertébrés.

À la différence des autres sites de la planète, le site d'Ischigualasto-Talampaya, en Argentine, présente sept formations séquentielles du Trias couvrant toute la période du Trias. Il s'agit sans doute du site où le Trias moyen est le mieux représenté.

Peu de sites du Trias sont protégés. Aux États-Unis, seuls deux sont protégés dans des parcs ou monuments nationaux: le Parc national de la forêt pétrifiée en Arizona où plusieurs groupes de plantes et d'animaux sont représentés mais qui se limite à la fin du Trias; et le Monument national Dinosaur en Utah avec son assortiment extraordinaire de dinosaures de grande importance scientifique datant essentiellement de la fin du Jurassique. Parmi les biens du patrimoine mondial existant, le plus célèbre pour les fossiles de dinosaures est le Parc provincial Dinosaur du Canada, sur un site beaucoup plus récent qu'Ischigualasto-Talampaya car il date de la fin du Crétacé, (- 75 000 millions d'années seulement). Parmi les autres sites paléontologiques importants se trouvant sur la Liste du patrimoine mondial - les Sites fossilifères australiens, Messel et Miguasha - aucun ne date du Trias. Wells (1996) a publié une liste indicative et représentative des sites fossilifères de la planète méritant éventuellement le statut de bien du patrimoine mondial et il y sélectionne d'Ischigualasto pour l'assemblage exceptionnel de dinosaures du Trias moyen à tardif.

Ci-joint se trouve une annexe qui évalue les qualités du site proposé par rapport aux critères UICN permettant d'établir la valeur universelle des sites fossilifères (Wells, 1996). Les résultats permettent de démontrer de manière satisfaisante l'importance du site pour le patrimoine mondial.

4. INTÉGRITÉ

4.1. Limites

Les limites du site proposé comprennent l'expression en surface de tout le bassin sédimentaire triassique d'Ischigualasto-Villa Union et, en conséquence, les principales strates fossilifères au sein de l'aire protégée. C'est un site géologique complet contenant un géosystème entier, avec tous les éléments liés - séquences continues d'affleurements rocheux, formes d'érosion, zones de lessivage et structures sédimentaires. Bien que les limites suivent

essentiellement des lignes droites plutôt que les contours topographiques, cela ne pose pas de problème car, dans un paysage désertique, les bassins versants sont mal définis.

4.2. Gestion

Le site proposé appartient au domaine public et bénéficie d'une protection juridique forte. Bien qu'environ 20% de la région soit gérée en vertu de la loi provinciale, celle-ci fournit une protection légale équivalente à celle d'un parc national. Il n'y a pas de gestion officiellement approuvée pour le site mais le plan pour le Parc national de Talampaya est entré dans les dernières étapes de la consultation publique; pour Ischigualasto, il existe un document de gestion de référence complet qui fournit les bases d'un plan futur. Les autorités nationales et provinciales sont en train de mettre sur pied un régime de gestion unique et conjoint pour le site. Il existe déjà un accord documenté précisant les objectifs de gestion communs, les processus de planification et les procédures de zonage ainsi que les mesures intégrées relatives à la formation du personnel, à la gestion du tourisme aux mesures de contrôle, à la recherche, à l'appui et à la surveillance institutionnelle, entre autres. La gestion conjointe sera placée sous l'égide d'un comité de coordination permanent bénéficiant de l'assistance d'un groupe consultatif technique représentatif des principales institutions scientifiques clés, des organismes provinciaux et des organisations de conservation non gouvernementales. Cela devrait permettre une application de politiques, programmes et normes de gestion uniformes pour l'ensemble du site.

Les ressources de gestion sont limitées et l'infrastructure du parc est, pour l'instant, rudimentaire. Toutefois, la nécessité d'apporter des améliorations est reconnue par les agences chargées de l'administration et des dispositions pertinentes ont été intégrées dans le projet de plan de gestion. Les autorités compétentes, à tous les niveaux - parcs, municipal, provincial et national - se sont engagées à appliquer le plan de gestion. Parmi les priorités de gestion, il y a :

- augmentation des effectifs du personnel en plus des effectifs qui comprennent, à Ischigualasto, un garde et huit guides certifiés et, à Talampaya, deux gardes et 17 guides non certifiés;
- augmentation du nombre de véhicules nécessaires pour l'entretien du parc et pour guider les visiteurs;
- amélioration de l'administration et des locaux d'accueil des visiteurs avec, par exemple, des centres d'interprétation, des logements pour les gardes, des toilettes, des magasins, des restaurants, des terrains de camping et des sentiers de promenade;
- augmentation du financement.

Les parcs sont correctement zonés en vue de la protection et de l'utilisation et actuellement il n'y a pas de menaces importantes aux valeurs protégées dans le site proposé. L'impact de l'utilisation par le tourisme, du pâturage non autorisé et des ravageurs exotiques est minime et maintenu à des niveaux acceptables pouvant être maîtrisés sans perte grave pour les valeurs du parc. La recherche et le ramassage de spécimens sont strictement contrôlés et de fortes amendes sont prévues pour le ramassage illicite et le braconnage, ces deux activités semblant être minimales. Les parcs disposent de conseillers scientifiques et techniques compétents pour les programmes de recherche, d'éducation, de formation et d'interprétation. Une des caractéristiques du site est la forte interaction entre les parcs et les communautés des alentours.

Globalement, le site proposé satisfait aux principales conditions d'intégrité.

5. AUTRES COMMENTAIRES

Pas d'autres commentaires.

6. APPLICATION DES CRITÈRES DU PATRIMOINE MONDIAL

Ischigualasto-Talampaya est proposé pour inscription au titre des critères naturels (i), (iii) et (iv) du patrimoine mondial.

Critère (i): histoire de la terre et processus géologiques

À la différence d'autres sites de la planète, Ischigualasto-Talampaya présente une séquence complète de sédiments fossilifères continentaux représentant toute la période géologique du Trias. À ce titre, il s'agit d'un des sites paléontologiques les plus importants du monde, qui présente une grande valeur pour la science et pour la conservation.

C'est sur cette base qu'est invoquée la valeur universelle exceptionnelle du site qui représente une étape majeure de l'évolution géologique de la Terre.

Dans les sédiments d'Ischigualasto-Talampaya, on trouve des strates fossilifères qui illustrent la transition entre les ancêtres des mammifères du début du Trias et l'âge des dinosaures, à la fin du Trias. Aucun autre lieu au monde n'a des fossiles pouvant se comparer à ceux qui sont préservés dans les formations de Chenares, Los Rastros et Ischigualasto de ces parcs et qui révèlent l'évolution de la vie vertébrée et la nature des paléoenvironnements de la période du Trias qui ont favorisé l'avènement de l'âge des dinosaures qui a duré 150 millions d'années. Bien qu'il existe des sites du Trias sur d'autres continents, ils sont généralement petits et éparpillés, contiennent peu de fossiles et ne représentent qu'une période limitée des 45 millions d'années du Trias. L'UICN considère que le site proposé remplit ce critère.

Critère (iii): phénomènes naturels éminemment remarquables ou de beauté exceptionnelle

Ischigualasto-Talampaya présente quelques paysages spectaculaires. Les nombreux canyons du Parc national de Talampaya sont bordés par des falaises brillamment colorées de rouge qui s'élèvent à 200 mètres de hauteur, certaines érodées en clocher de cathédrale tandis que les formations rocheuses stratifiées du Parc national d'Ischigualasto sont sculptées par la pluie et le vent et se détachent nettement sur le paysage sévère, couleur de cendre, localement appelé «El Valle de la Luna - la Vallée de la Lune». Les formations rocheuses et les paysages des parcs sont devenus des emblèmes de la région et du pays, aux côtés des images d'autres Biens argentins du patrimoine mondial - les pics et les glaciers de Los Glaciares et les chutes d'Iguazu. Toutefois, si on les compare à d'autres biens du patrimoine mondial inscrits au titre de ce critère, le site proposé ne se classe pas bien. L'UICN considère que le site proposé ne remplit pas ce critère.

Critère (iv): diversité biologique et espèces menacées

Les valeurs du site pour la diversité biologique ne sont pas bien documentées dans la proposition et la justification de ce critère n'est donc pas établie. Les plantes et la faune des parcs ne sont encore complètement connues. La végétation a été grossièrement cartographiée et un inventaire des plantes du Parc provincial d'Ischigualasto a été réalisé récemment. À l'actif du site, les habitats naturels sont importants car ils sont essentiellement intacts. Le site est grand (environ 750 000 ha) et protège un élément assez représentatif des écosystèmes d'El Monte (le désert) - certainement plus que n'importe laquelle des autres aires protégées de désert de la région. Du côté négatif, la faune et la flore et les habitats sont typiques de la région et non exceptionnels en dehors de trois plantes signalées comme endémiques; ils manquent de caractéristiques spéciales. La végétation n'est pas non plus d'un type unique au monde - car c'est essentiellement une réplique du grand désert de Sonora dans le sud-ouest des États-Unis. L'UICN considère que le site proposé ne remplit pas ce critère.

7. RECOMMANDATION

Le Bureau recommande au Comité **d'inscrire** le Parc provincial d'Ischigualasto et le Parc national de Talampaya sur la Liste du patrimoine mondial au titre du critère naturel (i). Le Bureau a noté que le site contient une séquence complète de sédiments continentaux fossilifères représentant la totalité de la période d'histoire géologique du Trias (45 millions d'années). Aucun autre lieu au monde ne possède un ensemble de fossiles comparable à celui d'Ischigualasto-Talampaya, qui révèle l'évolution de la vie vertébrée et la nature des paléoenvironnements de la période du Trias.

Le Bureau suggère que l'État partie et les autorités provinciales pertinentes procèdent dès que possible à l'établissement d'un régime de gestion conjoint et unique, achève le Plan de gestion intégrée et fournisse des ressources humaines et financières suffisantes pour appliquer efficacement le plan de gestion.

ANNEXE I: FICHE D'ÉVALUATION DES SITES FOSSILIFÈRES

Période de temps géologique étendue

Ischigualasto-Talampaya possède des fossiles qui couvrent pratiquement toute la période du Trias, c'est-à-dire environ 45 millions d'années (-245 à -208 millions d'années). C'est la seule région connue qui contienne une séquence complète de sédiments continentaux fossilifères du Trias, elle est donc d'importance scientifique considérable.

Riche diversité des espèces

Le site contient une grande variété de fossiles de plantes et de vertébrés. Il y a au moins 56 genres de vertébrés connus, y compris des poissons, des amphibiens et une grande diversité de reptiles et d'ancêtres directs des mammifères. Environ 100 espèces de plantes fossiles ont été identifiées. Les études palynologiques (études des pollens) sont incomplètes mais devraient renforcer la diversité connue de la flore ancienne. Trois espèces d'invertébrés fossiles d'eau douce ont été décrites.

Représentativité unique d'une période géologique

Le site proposé est unique car il présente une séquence complète de strates du Trias contenant des fossiles continentaux. D'autres sites, notamment en Afrique du Sud, en Fédération de Russie et aux États-Unis présentent des faunes représentatives du Trias supérieur et/ou tardif mais aucune n'a de spécimens abondants du Trias moyen. En outre, aucun ne peut illustrer la transition des Thérapsidés (ancêtres des mammifères) du Trias supérieur à la faune de dinosaures dominante du Trias tardif.

Contribution à la compréhension de l'évolution de la vie sur Terre

Le site proposé est un des principaux lieux d'étude sur l'origine des dinosaures et sur les débuts de la transition faunique qui a fini par conduire à la dominance des dinosaures dans tous les milieux écologiques de la Terre, terrestres, marins et aériens, une transition faunique extrêmement importante dans l'histoire de la vie sur Terre. L'abondance de la faune et de la flore fossiles permet une interprétation complète des paléoenvironnements et des processus de formation des sols il y a plus de 200 millions d'années.

Possibilités de découvertes futures

Des milliers de spécimens ont été recouverts par les sédiments dans les parcs et de nombreux fossiles sont ajoutés aux collections chaque année. Il y a d'excellentes perspectives de réaliser de nouvelles découvertes importantes concernant la flore et la faune fossiles dans le site. En raison du terrain très accidenté, plus de la moitié du site n'est encore été entièrement exploré.

Intérêt au plan international

Les plantes et les vertébrés fossiles d'Ischigualasto-Talampaya sont très importants pour la paléontologie et la biologie de l'évolution. Le site est connu au plan international dans les cercles scientifiques comme le principal lieu d'études *in situ* pour les premiers dinosaures de la Terre. La recherche paléontologique est menée ici depuis 70 ans et la majeure partie des 627 articles scientifiques relatifs à la région est publiée dans les journaux internationaux. Les spécimens du site sont de grande qualité et extrêmement demandés pour la recherche et les expositions, telles que l'exposition spéciale des plus anciens dinosaures du monde qui a eu lieu au Texas Memorial Museum en 1997.

Caractéristiques associées de valeur naturelle

Parmi les autres caractéristiques naturelles remarquables il y a les formations rocheuses spectaculaires et les paysages, la faune protégée et les plantes endémiques caractéristiques de la végétation d'El Monte (désert).

État de préservation des spécimens

Le site est remarquable car il a permis de mettre au jour des squelettes entiers de vertébrés et donc de conduire des études précises sur la physiologie et le comportement des premiers dinosaures et protomammifères. Des études de structures de mâchoires, par exemple, ont révélé les mécanismes de nourrissage, la forme des crânes illustre l'évolution

des yeux tournés vers l'avant et l'anatomie des membres, le développement précoce du bipédisme et de la position érigée chez les dinosaures.

Conservation, étude et exposition du site et des fossiles

Les spécimens du site, paléontologiques et biologiques, sont catalogués et conservés par le Muséum des sciences naturelles de l'Université de San Juan qui est le principal centre de recherche pour les deux parcs. Le responsable scientifique travaille dans les parcs depuis plus de 30 ans, est un expert de la géologie du Trias et l'un des paléontologues spécialiste des vertébrés les plus éminents du monde. Les chercheurs de l'Université de la Rioja sont également très actifs dans le site. Les spécimens sont librement disponibles pour l'étude mais des règlements stricts contrôlent tout prélèvement de spécimens et toute la recherche est supervisée par l'Université de San Juan. Il y a des expositions de spécimens au Musée où l'on prévoit une grande exposition nouvelle sur les fossiles et les paléoenvironnements du Trias. Les expositions, dans les centres d'interprétation du parc pour les visiteurs sont rudimentaires et seront améliorées si les ressources le permettent. Il y a quelques expositions *in situ* de fossiles, dans les parcs. Des gardes et des guides accompagnent tous les visiteurs à l'intérieur des parcs.



**Carte 1: Localisation – Parc provincial d’Ischigualasto –
Parc national de Talampaya**



**Carte 2: Carte du site – Parc provincial d’Ischigualasto -
Parc national de Talampaya**