



PARKS WATCH

Strengthening Parks to Safeguard Biodiversity

Park Profile – Venezuela Canaima National Park (Eastern Sector)

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Location: Bolívar State

Year created: 1962

Area: 1,086,250 hectares (Eastern Sector only)

Ecoregions: Guiana Savannahs, humid forests of Guiana, highland humid forests of Guiana

Habitat: Premontane moist forests and low montane forests, premontane dry forests, savannahs



*The tepuyes are the most outstanding features within Canaima
In the photo, the Cerro Budare or Ptari-tepui is seen (photo © Rodolfo Castillo)*

Summary

Description

Canaima National Park, Eastern Sector, also known as the Great Savannah, is located in the Guiana region of southeastern Venezuela. The park's landscape is dominated by open savannahs where the mountainous massifs, known locally as tepuyes, stand out. It is located on the Guiana Shield--one of the planet's oldest terrestrial centers. It includes the upper Caroní River Basin, which has great hydroelectrical potential: the downriver waters have already been used for hydropower.

Biodiversity

The Great Savannah has diverse and unique flora and fauna. Many endemic species are found here. At least 41 endemic species have been identified, including the yagrumo (*Cecropia kavanayensis*) (Steyermark 1979). Among the fauna, there are many keystone species and those of conservation interest, including the jaguar (*Panthera onca*), tapir (*Tapirus terrestris*) and harpy eagle (*Harpia harpyja*), as well as two Venezuelan endemics, the Tyler's mouse opossum (*Marmosa tyleriana*) and the Roraima mouse (*Podoxymis roraimae*).

Threats

Overall, Canaima is a well-conserved park, but is **vulnerable** to various threats that could compromise its protection and biodiversity maintenance in the future. Unregulated tourism is one of the principal threats, followed by wildfires, population growth, insufficient personnel and lack of management infrastructure.



*Hilly plains and a mosaic of savannahs and forests mark Canaima's eastern sector
(photo © Rodolfo Castillo)*

Description

Geography

Canaima National Park is located in Bolívar State in the Guiana Region in southeastern Venezuela. To the east, it is close to the border with the Esequibo Territory and to the south, to Brazil. Mountainous massifs, or impressive plateaus locally called tepuyes, dominate the park's landscape and are unique to the Guiana Region. These tepuyes are high mountains with slightly inclined lower slopes, then striking vertical walls, topped by rocky, flat summits.

The protected area is divided in two sectors: Western and Eastern. The Western Sector, called Canaima, includes a tourist locale of the same name, the Chimantá Massif (Chimantá-tepui) and the Auyán-tepui, where Angel Falls (Kerepakupai-merú) is located, the highest waterfall in the world at 979 m.

The Eastern Sector, also known as the Great Savannah, is a large expanse of extensive, open savannahs where many tepuyes stand out (MARNR 1992, Huber and Febres 2000, Michelangeli undated).



*Monte Roraima, also known as Cerro Roraima or Roroima-tepui is the highest tepui in the Guiana Shield (2.810 m)
(photo © Rodolfo Castillo)*

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Mapa del Parque Nacional Canaima (mapa © Dominic Hamilton 1998-2004)

The Great Savannah's high plains are slightly inclined, from 700 m in the south to 1,500 m in the northern Lema Range. Overall, the landscape is a mix of plains and rolling hills that are occasionally interrupted by larger hills and mountains, and where majestic and impressive tepuyes are spread throughout. The Sororopán-tepui (2,050 m) is located in the north, as is the highly visited Ptari-tepui (2,400 m), which is also known as Cerro Budare. The small meseta (or plateau) Apaurá-tepui (1,300 m), also known as La Urna because of its elongated, boxlike shape, is located in the west. Monte Roraima (Roroima-tepui, 2,810 m) is located in the park's extreme southeastern portion and it is the highest of all the Guiana Shield tepuyes. Next to Monte Roraima is a southeast-to-northwest mountain range that makes up another protected area called The Chain of Eastern Tepuyes Natural Monument, where the following tepuyes are located: Uei-tepui (Cerro del Sol, 2,150 m); its beautiful twin, tepui Cerro Kukenán (Matawí-tepui, 2,650); Yuruaní-tepui (Iwarkarimá-tepui, 2,400 m); Wadakapiapué-tepui (2,000 m); Karaurín-tepui (2,500 m); and finally Ilú-tepui (Urú-tepui, 2,700 m), with its attention-grabbing separate tower called Tramén-tepui that reaches 2,650 m (Schubert and Huber 1989, Huber and Febres 2000).

Numerous south-flowing rivers and streams wind through the Great Savannah; together these waterways form the upper Caroní River Basin. From west to east, the most important rivers are Karuai, which begins in Ptari-tepui and forms the border between the Western and Eastern Sectors of the park; Apongua; which begins in Lema Range; the Karaurín and Yuruaní rivers that originate in the Chain of Eastern Tepuyes; and the Kukenán and Arabopó rivers that start in the Kukenán and Roraima tepuyes (Schubert and Huber 1989, Huber and Febres 2000). Caroní River begins at the confluence between the Kukenán River and the Karuai River. It is strategically important for Venezuela because its downriver waters feed the Guri Dam,

Venezuela's largest hydroelectric plant whose full capacity is 10,000 MW (CVG – Edelca 2004a).

The Great Savannah is located in the northeastern sector of the Guiana Shield, which is one of the planet's oldest terrestrial cores. After this continental core solidified and cooled over three billion years ago, it endured a series of geological events and changes. First, it suffered from periods of intense volcanic and tectonic activity that created the first, fundamental geological formation of the Guiana Shield—an igneo-metamorphic base 2 to 3 billion years old. The next geological formation is a layer of Precambrian sedimentary rocks (sandstones, conglomerates and lutites) of the Roraima Group, deposited over the igneo-metamorphic base some 1.4 to 1.8 billion years ago. During the Mesozoic Era there was magmatic activity and large magma flows rose up through the fractures enabling igneous rocks to intrude into the sandstone strata (Schubert and Briceño 1987).

These sandstones became several thousands of meters thick, originally united in one or several plates that then fractured and eroded over hundreds of millions of years under periods of hot and climates. Important tectonic phenomena associated with the splitting of Gondwana approximately 220 million years ago caused rising and sinking of the earth, such that certain parts of the Shield were more exposed to erosion than others. For the last 30 million years erosive processes have dominated. In particular, mechanical fragmentation and chemical dissolution of the exposed surface sedimentary rocks have created the tepuyes' actual shape as well as the hilly plains associated with the sandstone substrate (MARNR 1992, Huber and Febres 2000, Schubert and Briceño 1987, Michelangeli undated).

Almost the entire extension of the Eastern Sector, or Great Savannah, is characterized by a heavy precipitation regime (typical of evergreen forests and rainforests) ranging from 1,800 to 2,000 mm per year (Michelangeli undated). The rainiest sites are in the northeastern zone of "La Escalera" and the Wonkén area in the southwest, where rainfall has reached 4,000 mm per year. In the Great Savannah's southeastern zone, there is a notable decrease in rainfall: 1,600 to 2,000 mm per year. Seasons differ depending on the part of the park, but in general, June to September are the wettest and characterized by heavy, prolonged, almost daily rains. The driest months, characterized by shorter, sporadic rains, are between December and April (Galán 1984, Huber and Febres 2000).

Annual average temperatures vary, depending on altitude. Macrothermic temperatures (tropical, greater than 24 °C) are found at the base of Lema Range in the north. Submicrothermic temperatures (18-20 °C) are found on the peaks and in the north-central portion of the Great Savannah. In the southern zones, the temperatures rise once again (20-22 °C) because of the lower altitudes (Galán 1984, Huber and Febres 2000, Michelangeli undated).

Rains are frequent on the summits of the tepuyes almost year round; there is very little seasonality here. Average annual temperatures on top of the tepuyes are between 9 and 12 °C; the low can reach 2 °C (Huber and Febres 2000).

Biodiversity

The Great Savannah harbors diverse and unique flora and fauna as well as several endemic species. Biogeographic evidence suggests that the area was probably a "Pleistocene refuge" during the glacial periods, which resulted in autochthonous flora represented by at least 41 endemic species, including the yagrumo *Cecropia kavanayensis* (Steyermark 1979). There are

many keystone fauna species and species of conservation interest, including the jaguar (*Panthera onca*), tapir (*Tapirus terrestris*), harpy eagle (*Harpia harpyja*), and two Venezuelan endemics, Tyler’s mouse opossum (*Marmosa tyleriana*) and the Roraima mouse (*Podoxymis roraimae*) (Huber and Febres 2000).

Vegetative formations typical of the Guiana Shield—those that grow on acidic soils derived from sandstone decomposition, which are nitrogen, phosphorus and potassium poor but aluminum rich—are found in the Eastern Sector of Canaima National Park. Savannahs and riparian forests dominate along the rivers and creeks. Typically, herbaceous plants cover the savannah and only occasionally do isolated trees or small groups of trees interrupt this coverage. Depending on the soil and altitude conditions, there are savannahs with moriche palms and shrub savannahs (Huber and Febres 2000, Michelangeli undated).



In the savannahs with palms, the dominant element is the moriche palm (*Mauritia flexuosa*)
(photo © Viviana Salas)

In the muddy, palm savannahs, grasses like *Andropogon*, *Eriochrysis*, *Panicum* and *Sorghastrum* thrive. The dominant tree is the moriche palm (*Mauritia flexuosa*), locally known as kuai, and is used frequently by Pemón indigenous communities. (Other common English names for this tree include mauritia palm and aguaje palm.) Small bodies of water form in the lowest portions of the palm groves, and diverse aquatic plant groups grow—both submerged and floating—including *Azolla*, *Salvinia*, *Lemna*, *Nympha*, *Sagittaria*, *Echinodorus*, *Mayaca*, *Tonina*, *Utricularia*, *Urospatha*, *Ludwigia* and *Montrichardia* (Michelangeli undated).

In the bush savannahs, the grasses (Gramineae) grow in bunches over dry, sandy, quartzous and rocky soils. Common genera include *Axonopus* and *Trachypogon*. Other typical plants include *Scleria cyperina* and *Bulbostylis paradoxa*, a with cylindrical stems that grows in clumps. Woody shrubs include *Bowdichia virgilioides*, *Byrsonima crassifolia*, *Anacardium occidentale*, *Casearia sylvestris*, *Palicourea rigida*, *Byrsonima verbascifolia* and *Manihot triste*. In the wetter and muddier zones, broad-leaved plants such as species of the *Stegolepis* genus are common (Huber and Febres 2000, Michelangeli undated).

Riparian forests grow along the rivers and are influenced by periods of flooded banks and increased water levels. During the rainy season, these forested strips are partially submerged. Trees in these forests grow between 15 and 20 m. Typical species include members of the palm family such as *Euterpe precatoria* and moriche (*Mauritia flexuosa*); species of the Bombacaceae family: ceibón (*Bombax s.*), and Guiana chestnut (*Pachira aquatica*); the Caesalpiniaceae family: *Campsiandra comosa*, *Dimorphandra davisii*, *Macrolobium bifolium*, *Pterocarpus officinalis*; the Clusiaceae family *Garcinia madruno*, of the Myrtaceae: *Eugenia puniceifolia*; the Rubiaceae family *Remijia densiflora*; and the Sapotaceae *Pouteria canaimensis* (Michelangeli undated).

On the summits of the tepuyes, tepuy forests grow. Typically, the trees are only 6 to 10 m high and have thick canopies formed almost entirely by coriaceous leaves. Plants of the following genera (among others) grow here: *Schefflera*, *Ocotea*, *Ficus*, *Rapanea*, *Podocarpus*, *Pagamea*, *Protium*, *Oxythece*, *Clethra*, *Didimopanax*, *Aldina*, *Macrocarpea*, *Drimys*, *Erythroxylum* and *Weinmania*. These forests can grow in different habitats, such as in sunny areas, over sandstone or igneous substrates, in dry areas, or in areas close to waterways. Close to the waterways, there are additional species of the following genera: *Aspidosperma*, *Amanoa*, *Aiovea*, *Cyrilla*, *Digomphia*, *Hieronyma*, *Pithecellobium*, *Rapanea*, *Remijia* and *Spathelia*. Tree ferns and palms also do well here, such as *Geonoma appuniana* and *Euterpe caatinga*. The understory includes dense or sparse Bromeliaceae (*Ayensua*, *Bocchinia*), Eriocaulaceae (*Syngonanthus*) and insectivore plants (*Drosera*, *Heliamphora* and *Utricularia*) (Michelangeli undated).

In the Lema Mountains, there are evergreen basimontane forests 600 to 700 m, with trees growing to 25 to 30 m high, with irregular canopies. Dominate families include leguminous, Lauraceae, Apocynaceae and Moraceae, among others. Between the altitudes of 700 and 1,400 m, there are several types of submontane evergreen forests (montane up to the summits). Trees grow between 10 and 15 m, canopies are very dense, with coriaceous leaves and frequent epiphytes. Tree families include Theaceae, Rubiaceae (*Isertia hypoleuca*), Euphorbiaceae, palms and Melastomataceae (*Miconia superba*). Colonies of the Rapataceae (*Stegolepis steyermarki*) are found in the understory, with colorful yellow ochre flowers. Shrubs growing on exposed rocks are mostly of the Rubiaceae, Clusiaceae, Melastomataceae and Ochnaceae families. A notable species is the giant terrestrial bromeliad (*Brocchinia micrantha*) (Michelangeli undated).

Of the mentioned floral species, the moriche palm is considered “vulnerable” in Venezuela because its palm frond is intensely harvested and because of habitat destruction for agricultural, grazing and petroleum activities. The palmito (*Euterpe precatoria*) is also considered vulnerable because of habitat loss and probable overharvest of the heart of palm (Llamoza and col. 1993).



Collared peccary (*Tayassu tajacu*) in Parupa Scientific Station (photo © Rodolfo Castillo)

Of Venezuela's 351 mammal species, 145 have been registered in Canaima National Park. Some of these species are widely distributed throughout the country, such as the southern opossum (*Didelphis marsupialis*), tapir (*Tapirus terrestris*), collared peccary (*Tayassu tajacu*), jaguar (*Panthera onca*) and some bats. Other species' distributions are restricted to the Guiana Shield, like the pale-throated three-toed sloth (*Bradypus tridactylus*), lesser ghost bat (*Diclidurus scutatus*), chestnut long-tongued bat (*Lionycteris spurelli*), the white-footed climbing mouse (*Rhipidomys leucodactylus*), and two animals endemic to Venezuela, Tyler's mouse opossum (*Marmosa tyleriana*) and Roraima mouse (*Podoxymis roraimae*). From an ecological point of view, one mammal group in the park requires forest coverage and includes rodents (paca, agouti and squirrel), bush dog (*Speothos venaticus*), Coatimundi (*Nasua nasua*), southern tamandua (*Tamandua tetradactyla*) and the giant armadillo (*Priodontes maximus*). The other mammal group inhabits the upper tepuyes herbaceous areas and savannahs and includes species like the short-tailed cane mouse (*Zygodontes brevicauda*), Brazilian guinea pig (*Cavia aperea*), crab-eating fox (*Cerdocyon thous*), jaguarundi (*Herpailurus yagouaroundi*), lutrine opossum (*Lutreolina crassicaudata*) and Pallas's mastiff bat (*Molossus molossus*) (Huber and Febres 2000, Linares 1998, Ochoa and col 1993).

Of the 1,323 bird species registered in Venezuela, 495 have been reported in the Great Savannah. The forests have the greatest diversity, where it is more difficult to see birds like parakeets, antbirds, ovenbirds, cotingas, cock-of-the-rock and some thrushes. Birds such as hawks, nighthawks, savannah seedeaters, parakeets and others inhabit the savannah. There is high bird endemism in the Great Savannah; one notable species is the Tepui tinamou (*Crypturellus ptaritepui*) that is only known to inhabit the Sororopán and Ptari tepuyes (BirdLife International 2003). Several Northern migratory species winter in the Great Savannah, such as spotted sandpiper (*Actitis macularia*), barn swallow (*Hirundo rustica*) and blackpoll warbler (*Dendroica striata*). There are also several Australian migrants such as the small-billed elaenia flycatcher (*Elaenia parvirostris*), variegated flycatcher (*Empidonomus varius*) and the lined seedeater (*Sporophila lineola*) (Lentino 1997, Lentino and col. 1996).

Regarding the herpetofauna, more than 60 amphibian (frogs, toads and caecilians) and 70 reptile (turtles, crocodiles, lizards and snakes) species have been identified. Notable endemic species are those of the *Oreophrynella* genus, which is a group of small toads living on the tepuyes; the *Tepuihyla* genus, which are white-lipped frogs; and the small lizard of the *Riolama* genus, among others (Gorzula and Señaris 1998, Huber and Febres 2000).

Fifty-two fish species have been registered, grouped in 5 orders and 17 families widely distributed in all of the Great Savannah's rivers. There are also 14 endemic species in the zone (Lasso 1989, Huber and Febres 2000).

The following table provides a summary of threatened fauna species inhabiting the park and their level of threat at the national and international levels.

Common name	Scientific name	Venezuela threatened status	Global threatened status
Giant Armadillo	<i>Priodontes maximus</i>	Endangered	Endangered
Giant Anteater	<i>Myrmecophaga tridactyla</i>	Vulnerable	Vulnerable
Tapir	<i>Tapirus terrestres</i>	Vulnerable	Vulnerable
Bush dog	<i>Speothos venaticus</i>	Vulnerable	Vulnerable
Little spotted cat	<i>Leopardus tigrinus</i>	Vulnerable	Almost threatened
Ocelot	<i>Leopardus pardalis</i>	Vulnerable	Not listed
Margay	<i>Leopardus wiedii</i>	Vulnerable	Not listed
Jaguar	<i>Panthera onca</i>	Vulnerable	Lesser risk, almost threatened
Roraima mouse	<i>Podoxymis roraimae</i>	Lesser risk, less concern	Not listed
Latrine opossum	<i>Lutreolina crassicaudata</i>	Lesser risk, less concern	Not listed
Harpy eagle	<i>Harpia harpyja</i>	Vulnerable	Lesser risk

Sources: Cat Specialist Group (2001), Downer, C. & Castellanos, A. (2001), Edentate Specialist Group (1996), Rodríguez and Rojas-Suárez (1999).

Management

Canaima National Park was created June 12, 1962 (República de Venezuela 1962) to protect the group of mountains known as the tepuyes and other elements of incomparable beauty, such as Angel Falls, the highest waterfall in the world. Initially, the park only included what is administratively called the Western Sector, covering 1,913,750 hectares that included the Canaima Tourist Locale, the Chimantá-tepui and Auyán-tepui Mountains, and Angel Falls. On September 9, 1975 (República de Venezuela 1975) the park was increased to include most of the Great Savannah and the headwaters of the Caroní River, which is the main source of the Guri Reservoir (CVG – Edelca 2004a). Today this section is known as the Eastern Sector and covers 1,086,250 hectares. In total, Canaima National Park covers more than 3 million hectares and is the second largest national park in Venezuela (MARNR 1992).



Canaima is well- marked by many signs (photo © Viviana Salas)

In December 1994, UNESCO declared the park a World Heritage Site (INPARQUES and UNESCO undated). After being evaluated and inspected by the World Conservation Union (IUCN), it was decided that the park met the four criteria established by the World Heritage Convention:

- It is a relevant sample, representing most historical periods of the earth's evolution.
- It is an outstanding example of significant geological and biological processes that are still in evolution and an example of developing terrestrial and aquatic ecosystems of plant and animal communities.
- It contains superlative, rare, or unique natural phenomena, as well as extremely beautiful formations, characteristics and areas.
- It is a habitat where rare or endangered plant and animal species survive.

The National Parks Institute ([INPARQUES](#)), of the Ministry of Environment and Natural Resources ([MARN](#)), administers and manages the park. Only Canaima's Eastern Sector, the Great Savannah, has *Management Plan and Use Regulations**, dated June 5, 1991 (República de Venezuela 1991). The Management Plan establishes the following seven management zones:

- **Integral Protection Zone:** Includes the ecosystems that justified the initial declaration of the protected area and that deserve absolute protection; there is no public use and the only permitted activities include environmental monitoring and scientific research. In the Eastern Sector, the Integral Protection Zone includes the primary forests at the base of Roraima; the Ptari, Kukenán, Apaurái, Sororopán and Cerro Venamo tepuyes; the Lema Range and headwaters of several rivers, including the Kukenán, Arabopó and Aponwao rivers.
- **Wild lands or Primitive Zone:** Includes relatively pristine environments that can tolerate moderate use including scientific research, environmental education, recreational hiking and camping-related activities. Included in the Primitive Zone are the moriche palm areas, edaphic scrublands, primary forests, gallery forests and the forests of the upper basins and waterfalls of Chinak-merú, Torón-merú and Karuay-merú.
- **Naturally Managed Environment Zone:** These areas include samples of the most significant characteristics of the park where low-impact activities like environmental

* Called *Plan de Ordenamiento y Reglamento de Uso* in Spanish

education, passive and extensive recreation, and construction of rustic infrastructure for visitors (refuges and lookouts) are permitted. Most of the Eastern Sector is zoned this way, including slopes, low plateaus and hilly landscapes with savannah vegetation.

- **Recreation Zone:** The recreation zone is for major recreation and higher visitor density is allowed. Permitted activities include construction of tourist service infrastructure, like visitor centers, eateries and park guard stations. There are 23 sites zoned this way along the following five routes: La Escalera – La Ciudadela – San Rafael de Kamoirán; San Rafael de Kamoirán – San Francisco de Yuruaní; San Francisco de Yuruaní – Paratepui de Roraima; San Francisco de Yuruaní – Puente Río Kukenán; y Luepa – Parupa – Kavanayén – Karuai.
- **Special Use Zone:** Includes areas where activities are developed according to restrictions and special regulations. For the most part, these activities are incompatible with the national park’s objectives, but were in existence prior to the park’s creation. The largest and most important indigenous communities are zoned as “Special Use” and include Kavanayén, Kumarakapai (San Francisco de Yuruaní), San Ignacio de Yuruaní and Wonkén. The religious missions of Kavanayén and Wonkén are also considered Special Use, as are other areas with public works, like the hydroelectric microcenters, electrical lines and landing strips.
- **Historic-Cultural Interest Zone:** This zone includes sites that have some historical significance and the zone’s objective is to conserve the cultural characteristics and ethnicity of the Pemón indigenous communities. There are 13 indigenous communities included in the Historic-Cultural Zone: San Isidro, Iboribó, Anonté, San Rafael de Kamoirán, San Juan de Kamoirán, Vista Alegre, Paratepui de Roraima, Chirimatá, Awarkay, Uroy-Uaray, Kako, Taukén Nuevo and Santa Cruz de Mapaurí.
- **Natural Recuperation Zone:** This zone includes sectors that have suffered anthropogenic alterations and that need either natural recuperation or restoration to return the site to its natural conditions. There are nine areas included in this zone, mostly located along roads, and the Roraima Tepuy, the only tepuy where visitors’ access is permitted.

The plan also describes basic guidelines and directions for the administrative and management programs needed to complete the park’s objectives. The following field actions are included: environmental quality, basic infrastructure, security, vigilance and control, citizen participation, Pemón ethnic cultural protection and promotion, research, education, recreation and tourism (República de Venezuela 1991).

Currently, a new management plan is being elaborated that includes both sectors of Canaima National Park. Indigenous communities and other stakeholders will be able to participate at every stage of its creation. In addition, the Paratepui de Roraima Special Plan is being revised. This plan will attempt to better manage tourists’ excursions to Cerro Roraima and develop infrastructure accordingly. In addition, meetings have begun to elaborate a tourism plan along Troncal 10 in order to manage tourism along this highway route.



The Central Administrative buildings “Aponwao,” located in Luepa (photo © Rodolfo Castillo)

The Great Savannah has five park guards, all of which are residents of the protected area and are of Pemón ethnicity. In addition, there are two technicians: sector director and his assistant. The main office is the Aponwao Administrative Center located at Luepa. There is also a visitors’ center with a conference center, a members’ house, a recreation area and the operations center for the CVG-Edelca Company.

There are park guard stations in San Ignacio de Yuruaní, Paraitepui de Roraima, Jaspe Creek (Kako-parú) and Pacheco Steam (Quebrada Arapán). In addition, Iboribó (Liwo-riwó) has staff but no official park guard station (the guard works out of his home), and the indigenous community destroyed the Kumarakapai station in 1995 (see “Threats” section for more information). There are plans to include stations and park guards at Kamá-merú and Suruape.

The Eastern Sector of Canaima has five vehicles (only two are functioning), four motorcycles (one functioning), and two bicycles. There is a radio communications system and fire-fighting equipment such as hoses, pools and pumps.

The Eastern Sector’s borders and each management zone are cartographically defined. There are plenty of signs posted along the borders, in recreation areas, near access routes and in the indigenous communities. These signs are designed in accordance with their surroundings and the materials used are in harmony with the environment.

The state company [CVG-Edelca](#) (Caroní Electrical Co. C.A), as part of its environmental policies, supports conservation and management within the Caroní River Basin. As was previously mentioned, the Caroní River feeds the country’s main hydroelectrical complexes and its headwaters are located in the Great Savannah. In 1986, the Great Savannah Authority was created. This interinstitutional organization under the direction of CVG-Edelca, coordinates all governmental activities in the entire sector. Recently, CVG-Edelca completed the *Study of Caroní Basin Master Plan*, which is an environmental and integral management strategy for the entire basin (CVG-Edelca 2004a).

Human influence



The Great Savannah is inhabited by indigenous Pemón people (photo © Rodolfo Castillo)

For more than three centuries the territory that is today Canaima National Park has been inhabited by the Pemón indigenous people, a Caribbean community that also extends into other nearby areas in Brazil and Guiana. Pemón, their self-determined name, translates to mean “people.” There are three sub-groups within their culture--the Kamaracoto, Taurepán and Arekuna. The Arekuna inhabit the Great Savannah (Huber and Febres 2000).

During the Colonial Period, the entire Guiana Region was well known because people were there in search of the mystic city of “El Dorado.” Several explorers and adventures made trips into the region. Despite these excursions, the higher lands, including the Great Savannah, were partially isolated because of their geography and were sheltered from outside influences, except for the Capuchin missionaries from Orinoco who settled there at the end of the 18th century and left at the beginning of the 19th. Since then, modern explorers have made more extensive trips into the zone, such as Robert Schomburgk, who explored the zone extensively between 1833 and 1844, thereby marking the beginning of scientific research in the Great Savannah. In the following years, many explorers and foreign naturalists have journeyed in the zone. Their journeys inspired Sir Arthur Conan Doyle to write his novel “The Lost World” (Huber and Febres 2000, Michelangeli undated).

During the 1910s, illegal immigrants and Adventist missionaries from British Guiana began arriving to the Great Savannah. They were later expelled by the Venezuelan Government in an act of leadership by Count Antonio Gastón Cattaneo Quirin, an Italian-born Venezuelan who was the Inspector General in Bolívar State as well as co-founder of the town of Santa Elena de Uairén with Lucas Fernández. In 1922, the Venezuelan government decided to sign an agreement with the Capuchin Order to evangelize Bolívar State’s southern territories, and later, they decided together to establish missionary centers within the Great Savannah. In 1931, the first mission was built in Akurimá (Santa Elena de Uairén), and in 1933, the second was established in Luepa, which was moved to Kavanayén in 1943—the year that the process to concentrate the indigenous population in the valley began (Huber and Febres 2000).

Many of the actual indigenous communities were established or founded during the 20th century. In the case of Paraitepui, the first inhabitants arrived around 1930 and the first constructions in Kumarakapai, an Pemón Adventist settlement, began in the 1950s, close to

where the Yuruani River barge would pass. This community has grown consistently over the last years because of increased tourism. San Ignacio de Yuruaní has a distinct origin. It was established in 1970 in order to relocate a group of indigenous refugees from Guiana. Today, their activities are mostly related to the CVG-Edelca operations center, the installations of an electrical microcenter and a firefighting brigade. Other important communities are Iboribó (Liwo-riwó), San Rafael de Kamoirán and Uroy-Uaray (Huber and Febres 2000).

According to the 1992 indigenous census (OCEI 1994), there were 8,094 Pemóns inhabiting Canaima National Park (both sectors). Although there is no official data available from the 2002 census, it is estimated that the current population is 11,836 inhabitants and that these people are distributed in a settlement pattern where no more than 300 people live in the same community (Medina 2004).

Originally, the Pemón had a very different settlement pattern. Typically, they used to settle in small communities of approximately seven homes, mostly in the savannahs, close to the forest's edge and small watercourses. Their settlement pattern changed in the 20th century due to changes in their social dynamics and missionary influences. They then became concentrated in certain zones like the Kavanayén Valley, where the actual population is greater than 300 inhabitants (Huber and Febres 2000, CVG-Edelca 2004a).

The highway Tumeremo – El Dorado – Santa Elena de Uairén, also known as Troncal 10, crosses the Great Savannah from north to south and it is the principal access route. The Military Engineering Service within the Armed Forces built it between 1965 and 1972; originally it was a dirt road. Between 1985 and 1989 it was paved in an attempt to improve transit in the entire southeastern portion of Bolívar State and to increase tourism. The closest airport is outside of the park in Santa Elena de Uairén, and within the Eastern Sector, there are landing strips in Luepa, Kavanayén, Wonkén and Kumarakapai. Mostly the Corporación Venezolana de Guiana (CVG) staff and other private airplane companies who provide transportation for tourists use these landing strips. North of the protected area, economic activities are related to forestry and mining in the Imataca Forestry Reserve and adjacent zones. In the south, minging is the primary industry (Huber and Febres 2000, CVG-Edelca 2004a).

CVG-Edelca built four hydroelectric microcenters that utilize hydropower from small waterfalls to generate electricity, which is provided to isolated indigenous communities in the Caroní River Basin (CVG-Edelca 2004a).

Between 1997 and 2000, a 200 KW electrical line was built to provide power to Brazil. This caused controversy and many Pemón indigenous communities and environmental groups opposed it, forming a coalition against the electrical lines. Despite the strong criticism and demonstrations against the project, the lines were built and damaged the Great Savannah's spectacular landscape and vistas.

Tourism

Tourism started to become an important activity in the Great Savannah in 1989 when Troncal 10 was paved (to the community of Santa Elena de Uairén). Along this highway route, there are many tourist attractions visited during vacations. Some of them include La Piedra de la Virgen (The Virgin's Stone), El Danto Waterfall, Soldado Pionero Monument, INPARQUES Visitor's Center, Kamoirán Rapids, Kamá Waterfall (Kamá-merú), El Oso Lookout (where

one can appreciate the Eastern Chain of Tepuyes), Arapán-merú Creek (Pacheco), Suruape Creek and Kako-parú Creek (aka Jaspe Creek) (Huber and Febres 2000).



Jaspe Creek is one of the most visited tourist attractions (photo © Rodolfo Castillo)

This road has two branches, the first starts at Luepa and heads towards Kavanayén; the principal attractions along this branch include Torón Waterfall (Torón-merú), Aponwao Waterfall (Chinak-merú) and the Capuchin Mission building Kavanayén. The second branch begins at Kumarakapai and heads towards Paraitepui de Roraima; hilly, high plateaus with open savannahs and imposing tepuyes such as Roraima and Kukenán are along this route.

Excursions to climb Cerro Roraima (2,810 m) leave from the park guard station Paraitepui; Roraima is the only tepui where visitors are permitted. Every year, 3,000 visitors climb this tepui (Pérez 2003). Most arrive during August, December and Saint's Week. In order to minimize the tourists' impact, the maximum carrying capacity (at any one time) is 50 people. There is no entrance fee, but hikers must contract guides to climb this tepui. The guides are typically of the Pemón community.

The rest of the recreational activities involve enjoying and contemplating the natural surroundings; tourists can travel in their vehicles and visit the attractions close to the road, stay in accommodations or camp. One of the most visited sites is Jaspe Creek (Kako-parú), whose bed includes outcroppings of volcanic-origin jasper rocks; they are so beautiful that when people observe them, they want to take them. There is a park guard station here that registers visitors. They have registered more than 3,000 people during Saint's Week. As in all other areas in the Eastern Sector, there are no entrance fees.



Groups of visitors frequent recreation areas close to the road (photo © Rodolfo Castillo)

Recently CVG-Edelca (the company responsible for the electrical lines crossing the Great Savannah and Canaima National Park) reconditioned the recreation area of Jaspe Creek. The company also reconditioned the recreation area of Suruape (Saro-wapo) and the El Oso lookout, which is the place where one can appreciate the Eastern Chain of Tepuyes without the electrical lines blocking the landscape.

There are accommodations within the park, like the Chivatón Campgrounds, Mantopai Campgrounds and the Kavanayén Mission, located along the way to Kavanayén. On Troncal 10, there is a hostel in Kama-merú and in the Rápidos de Kamoirán, where there is also a gas station. There are other accommodations available, including options offered by the inhabitants of the indigenous communities.

Tourist operators offer various tours and packages for visitors, including the Ruta Salvaje, Akanan Travel & Adventure, Backpacker Tour, Biotrek and Petoí Tours among others. These operators are registered with the National Institute of Tourism Promotion and Training (Inatur) and the Tourism Chamber of Commerce in Bolívar State, but they are not registered with INPARQUES. The airlines Rutaca and Avior serve the area with regular flights to Santa de Elena de Uairén. In cooperation with other businesses, these planes can be privately contracted and land on the landing strips within the park.



There are tourist operators offering different excursions and routes (photo © Rodolfo Castillo)

INPARQUES is coordinating working groups to discuss elaborating a Tourism Management Plan for Troncal 10. Various stakeholders, such as different governmental entities, tourist companies and indigenous communities, are involved. Basically, the objective is to coordinate actions in an attempt to regulate tourism development in harmony with the park's conservation, and to register and certify tourism operators and guides working in the park.

Conservation and research

Canaima National Park has been of interest to many researchers in different disciplines for years because its unique species populations. There have been 135 research projects conducted in the area (Carlsen 1999); Huber's research on Pantepui's flora is among the most important.

The Parupa Scientific Station is located in the park, off of the highway branch going towards Kavanayén. The station's objectives include promoting research in the upper Caroní River Basin, training local people, and disseminating information to lay the bases needed to assure natural resource conservation and sustainable use. There have been many research projects with the station's support since 1995. Ten projects have been completed and the results obtained, and there are currently another ten projects. The research deals with several issues, including restoration of degraded areas using Mycorrhizae, characterization of savannah-forest vegetation, auto-ecology of vegetative species, fire behavior and vegetation dynamics and atmosphere-biosphere interactions (Autoridad Gran Sabana 2004).



The laboratories at Parupa Scientific Station (photo © Rodolfo Castillo)

Because of its applicability within the protected area, one of the most important research topics is the use of Mycorrhizae to restore degraded areas, mostly those affected by the construction of the first road during the 1960s. In these areas, soils are still devoid of vegetation and need restoration. Studies by the Instituto Venezolano de Investigaciones Científicas (IVIC) have proven the importance of these fungi to facilitate colonization in degraded soils. Another important project carried out by diverse researchers at the Universidad Simón Bolívar is related to wildfire effects on floral permanence and composition (Autoridad Gran Sabana 2004).

There are also several conservation projects. INPARQUES coordinates one with technical support from the NGO [Vitalis](#), called “Improving our Heritage” (*Mejorando nuestra herencia*). This project is supported by UNESCO and IUCN, and receives funding from the United Nations in order to effectively manage and conserve this World Heritage Site. The

objective is to consolidate actions put forth by INPARQUES to strengthen planning and management by establishing a monitoring program and an evaluation of the state of conservation, in addition to training the directors and technicians in follow-up and evaluation methodologies.

The NGO [Provita](#), in partnership with Conservation International, has a project focused on designing Tourist Eco-stops along Highway Troncal 10, from kilometer 88 to Santa Elena de Uairén (which includes some areas outside of the park). They are considering including a social-environmental component by training indigenous communities. The Indigenous Federation and the Bolívar State Government also participate in the project.

EcoNatura and The Nature Conservancy have a project that 1) trains members of the Pemón community as ecotourism guides, 2) provides a conflict resolution program with the park authorities and community members, 3) is evaluating the tourism impact in the area, and 4) is documenting the oral traditions and culture of the Pemón indigenous people.

Threats

Canaima National Park includes many intact ecosystems that have been changed very little by human action. It has exceptionally beautiful landscapes and unique flora and fauna. There is great potential for research, recreation and environmental education within the park. Its administrative strengths include a small, but dedicated workforce, and a complete management and use regulations plan. In addition, several organizations and institutions have supported its management, and co-management models are being developed. Nonetheless, there is a series of threats endangering its biological diversity and protection in the medium-term. The most serious threats include:

- Unregulated tourism
- Wildfires
- Population growth
- Infrastructure incompatible with the landscape and cultural values
- Insufficient staff and lack of management infrastructure
- Hydroelectric developments
- Management conflicts with indigenous communities



Construction of electrical lines heading towards Brazil has caused an impact on the environment and on the communities (photo © Rodolfo Castillo)

Unregulated tourism

Troncal 10 provides access to Canaima's Eastern Sector. Visitors, park inhabitants and nearby residents all use the highway. Tourism flow is usually greatest during August, December and Saint's Week (the week before Easter), although the exact number of people is hard to determine since not every recreation site has visitor registries and there are no entrance fees. In places like Paraitepui de Roraima, the Luepa Visitor's Center and Jaspe Creek, there are visitor registries. Roraima receives 3,000 people per year, and Jaspe Creek receives up to 4,000 just during Saint's Week. During the tourism season, as the number of visitors increases so too does the amount of solid waste; it increases so much that it exceeds the capacity of the Great Savannah's Municipal Waste Collection.

In Roraima Tepui's case, constant hiker presence has damaged tepui vegetation. This problem is critical in the area surrounding the place called "Hoteles," which is where hikers camp. There is also garbage accumulation in the most visited places on the tepui (Los Hoteles, El Carro, La Ventana, Los Jacuzzis) and along the trail. In addition, use of soaps, detergents and shampoo degrades water and soil quality (Pérez 2003). These reasons forced INPARQUES to restrict access to the tepui during 1995 and 1996 in order to let Roraima's high tepui ecosystems recover. However, this measure was not well received by some inhabitants of neighboring Kumarakapai, who are, for the most part, dependent on income from tourism. They burned the park guard station located on the highway and the entrance to Paraitepui de Roraima.

Visitors also create problems because they use roads or drive in unauthorized areas. Off-road, 4x4 vehicles are the main culprits. People drive off-road, creating new tracks in the savannah, because the principal road is full of mud, they want to reach a certain destination quickly and easily or they want to test their off-road vehicles and have fun (called "rustiquear"). As a result, vegetation is lost, the soil erodes and the landscape is degraded



Opening of unauthorized roads is a constant problem (photo © Rodolfo Castillo)

Another problem associated with tourists is unauthorized extraction of certain minerals found along different recreation areas or hiking trails. For example, on Roraima’s summit, at a place called the “Crystal Valley,” quartz extraction has been excessive. Despite the rigorous existing controls, some tourists take part of the quartz as a souvenir. The rock pieces are confiscated when hiking groups are routinely searched after their hike. Tourists also try to extract from the volcanic rock outcropping in Jaspe Creek.

Wild fires

During the dry season, human-caused wildfires are common. Mostly, they originate from Pemóns who burn to prepare their land for cultivation, to hunt, to clear trails and roads, to scare away dangerous animals, to communicate and to clear and maintain the savannahs in order to avoid future large and devastating wildfires (Rodríguez 2004).



*Presence of dead, standing trees is evidence of the effect of the wildfires on Canaima's forests
(photo © Viviana Salas)*

The first recorded large wildfire, called the “great cloud of smoke,” dates back to 1926. In 1940, another wildfire of similar proportions occurred and in 1979 another large wildfire affected the sectors of Luepa, Parupa and Kavanayén. Since CVG-Edelca's implementation of the Upper Caroní River Basin Wildfire Control Program, the wildfires have diminished in frequency and extension. In 2004, only 1,985.5 hectares were affected: 1,594.25 hectares of savannah and 5.25 hectares of primary forest (CVG – Edelca 2004b).

Population growth

In 1982, the total indigenous population in Canaima National Park was 5,537 inhabitants; in 1992, it was 8,094 (OCEI 1994) and unofficial data estimate that the current population is 11,836 inhabitants (Medina personal communication 2004). Resource use within the park by inhabitants includes agricultural activities (using slash and burn style methods), fishing, hunting and collecting. Increased population growth and changes in the settlement patterns have increased pressure on a variety of natural resources over the years.

One consequence of the concentrations of indigenous people in several larger communities is that their agricultural plots are also concentrated in the nearby areas. In the community of Kavanayén, where agriculture is concentrated in Pakairao Valley, the soils have lost fertility and the farmers have had to move to cultivate other areas.

It is estimated that there are 1,080 km² of small farms within the upper Caroní River Basin, including areas that are outside of Canaima (CVG – Edelca 2004a). Normally, each small farm is about _ hectare and the main crop is yucca, of which cassava, manioc and fermented

drinks like “cachiri” and “parakari” are made. Other crops include chilli, mapuey (tropical herb), yautia, sweet potato, bananas, pineapple and plantain.



Rural farmers occupy previously forested areas (photo © Rodolfo Castillo)

Fish is the main source of animal protein, and people fish for 24 species. There is some hunting, although to a lesser degree than fishing because large animals are not that common. Preferred species include paca (*Agouti paca*), peccaries (*Tayassu tajacu* and *Tayassu pecari*) and tapir (*Tapirus terrestris*). There is no scientific evidence that proves that hunting/ fishing is affecting fauna populations; nonetheless, the indigenous people claim that they have observed a reduction in the number of hunted species since it is harder for them to catch their prey.

The indigenous communities also use non-timber forest products. One particularly important resource is moriche palm fronds (*Mauritia flexuosa*) that they use to make roofs. Population growth has increased demand for this resource, and now certain moriche groves have been negatively impacted by overharvest.

Tourism has also increased the demand for certain resources used in indigenous crafts, such as the jasper volcanic rock and kaolin, a type of very white, pure clay.

Infrastructure incompatible with the landscape and cultural values

For many years, the National Parks Institute has had a consistent policy that any building within the national park should be in harmony with the environment. In the case of Canaima National Park, this is true for INPARQUES’ infrastructure and the indigenous communities’ constructions. In most cases, recent constructions still follow the typical and traditional Pemón construction style, where the home is built with wattle and daub walls (or of tree bark) and palm roofs (mostly moriche palms). In the case of the Kavanayén community, this same style is common except that they use stones, a method introduced by the missionaries years ago.



*New buildings have introduced elements of foreign architecture
(photo © Rodolfo Castillo)*

Despite INPARQUES' policy, buildings with foreign-influenced architecture, structures not harmonious with the environment, buildings that have a negative visual impact or those that use non-natural materials like timber and zinc have been introduced into the recreation areas. While these buildings have merit because they provide facilities and services for visitors or housing for inhabitants, it is important to adjust certain architectural regulations so that the buildings are in harmony with the landscape and so that they preserve Pemón cultural values.

The biggest assault against the landscape was the construction of the electrical lines (200 KW) to Brazil, which pass through the Great Savannah from north to south and affect sectors located in the areas closest to the park's borders, especially in the area bordering the Chain of Eastern Tepuyes Natural Monument. These lines also affect other nearby areas under special administrative regime, such as the Imataca Forestry Reserve to the north and the Protected Zone of Southern Bolívar State towards the south. The environmental community as well as the indigenous people protested—the indigenous people felt that their ancestral and traditional lands had been violated by the project. However, the protests were not enough, and the electrical lines were built. Not only do the lines damage the landscape view, another argument against the lines is that they will favor legal and/ or illegal gold mining south of the national park, especially along the Icabarú River and north of Santa Elena de Uairén, along the Kukenán River. Environmentalists believe the new electrical lines could provide electricity to many towns or even to mining settlements, which would help these settlements become permanent.



*The Great Savannah's landscape is affected by electrical lines
(photo © Rodolfo Castillo)*

Insufficient staff and lack of management infrastructure

As was mentioned previously, the Eastern Sector of Canaima has two technicians (a sector director and an assistant) and five park guards, who are responsible for carrying out many functions to administer and manage an area of 1,086,250 hectares. The park guards are distributed such that they can patrol and control the most visited sites, like Paraitepui de Roraima, Jaspe Creek (has two park guards), Iboribó and Pacheco Creek. Actually, the Pacheco Creek Park Guard Station is not functioning because the Kumarakapai community (which is located a few kilometers away from the Pacheco Station) claims that the property is theirs and that they will destroy the building if it is not transferred to them. As a result, the park guards stationed there were transferred to the offices at San Ignacio de Yuruaní.

The Apongua Administrative Center in Luepa, as well as the offices located in San Ignacio de Yuruaní are in good conditions, but in the case of Jaspe Creek, the visitor's center was destroyed by rain. The park guard stations are smaller buildings, and in the case of the one located at Paraitepui de Roraima, it may need to be enlarged. The Iboribó recreation area has staff but no infrastructure and the building that was located at the entrance of Kumarakapai (within this community) was burned by community members and is no longer in operation.

Future threats

Hydroelectric developments

There are proposals for new dam construction along the Caroní River that together would have the potential to produce 6,100 MW. Identified possible sites include Tayucay, Aripichí and Eutobarima (CVG-Edelca 2004a), which are within the western and central borders of Canaima National Park. These new hydroelectric plants should be stopped because their impact on the environment will be great: they will cause loss of vegetative cover due to the creation of reservoirs, and habitat loss forcing fauna to search for new territories, among other impacts. Therefore, measures to prevent their construction or to mitigate their effects must be

sought, as was done when the Guri and Caruachi dams were built in the lower Caroní and fauna were rescued and reintroduced to different areas and then monitored.

Management conflicts with indigenous communities

With the approval of the new Bolivariana Republic's Constitution (*Constitución de la República Bolivariana de Venezuela*) (República Bolivariana de Venezuela 1999) collective property rights were granted in territories where indigenous communities have traditionally resided. This started a process of land demarcation, and it is actually occurring in Canaima National Park with the Pemón. The communities perceive this demarcation as a problem that requires an immediate solution, but they also recognize that the property could have later consequences when it comes to the protected area's management. The main problem is related to indigenous rights to information and the right to be consulted before any governmental resource use project on their lands begins. This could create land tenancy and management conflicts because any type of INPARQUES project would first need the communities' approval, or for example, the communities could demand to receive economic benefits from any use or activity.

The communities are asking to receive the income from entrance fees (if they are reestablished someday) and they want full rights to administer those funds. In other cases, there have been disputes over the property rights of one of the buildings located at the Pacheco Creek; both INPARQUES and the Kumarakapai community claim it to be their own.



The INPARQUES building that the Kumarakapai claims property rights to (photo © Rodolfo Castillo)

This demonstrates that the indigenous communities not only want to participate more in the park's administration or co-management, but that they also want vindication, because these lands are traditionally theirs and they want the right to decide their destiny. Nonetheless, the Constitución de la República Bolivariana de Venezuela also gives special importance to the protection of the national parks.

Proposed solutions

Unregulated tourism

The Tourism Management Plan for Troncal 10 currently being elaborated will contribute a lot to establishing basic guidelines for tourism management in a way that is in agreement with the park's conservation objectives. The plan should include instructions or definitions regarding the carrying capacity of each recreation area, mechanisms for INPARQUES and tourism operators to manage visitors, and it should include the requirements for infrastructure and services.



Visitor management includes good sign postings and marking of authorized routes (photo © Rodolfo Castillo)

Regarding the deficiency of visitor services and facilities, up until this point, several strong alliances had been created with other institutions like the state electrical company CVG – Edelca and Bolívar's state government, which have helped recondition recreation areas such as Suruape and Jaspe Creek. This same strategy, seeking alliances and partnerships, should be applied in order to improve facilities in other recreation areas. Currently, Provita and Conservation International have a proposal to develop tourist eco-stops along Troncal 10 and The Natural Conservancy has a proposal to create a visitors' center in Paraitepui de Roraima.

Entrance fees should be charged to access recreation areas and the income generated should be reinvested in Canaima instead of going to some general park fund in Caracas. In addition, a percentage of the earnings should be earmarked for the indigenous communities, as long as that percentage is reinvested in works that complement or contribute to reaching the park's objectives and as long as there is sufficient accountability and responsibility. This idea has also been discussed, as well as a suggestion that the recreation areas should be co-managed with the indigenous communities and organized as cooperatives, as a mechanism to manage the economic benefits from tourism.

Population growth

As the trend indicates, the indigenous communities' population is growing. Increased population will thereby increase the demand for the park's natural resources; therefore initiatives that harmonize biodiversity conservation and sustainable natural resource use are needed. CVG-Edelca is developing a program called, "Programa Mayú" in the upper Caroní and Cuyuní River Basins, which includes all of Canaima National Park (CVG-Edelca 2004a). The program's general objective is to join forces and financial resources of competent institutions in the area to strengthen local indigenous capacity by promoting design and implementation of projects aimed at improving the quality of life in the area and incorporating sustainable natural resource management strategies. Among the program's diverse components, the natural resource management component stands out. It should be noted that this program is the result of experiences that the indigenous communities and NGOs have accumulated over the years.

In the case of agroforestry systems, the project combines local indigenous knowledge with modern agroforestry techniques. One aspect that should be added to this program is restoration of degraded forested areas using native species in order to support the natural succession process.

In the case of aquaculture, the project has promoted use of a hybrid fish—cachamoto—which is a cross between the black pacu (*Colossoma macropomum*) and silver pacu (*Colossoma brachypomus*). These species are very common in the Llanos Region, north of Orinoco River. The hybrid is sterile; therefore it cannot reproduce in the Great Savannah's rivers. The cachamoto can reach 500 g or 1 kg, is very meaty and tasty, and it has been commercialized in several communities within Canaima's Eastern Sector.

Other aspects related to population growth and increased natural resource demand that need to be tackled include:

- Hunting: Hunting impact must be evaluated in order to establish management guidelines and avoid overhunting. In the case of threatened species, such as the tapir, hunting should be entirely prohibited.
- Moriche palm extraction: Regulations should be created regarding the number of fronds that must be left on the palm. An evaluation is needed regarding possible reforestation activities, either by direct planting or establishing plantations to be used for frond harvesting instead of the wild moriche palms.
- Mineral extraction for making crafts: An evaluation of jasper and kaolin extraction is needed in order to establish management measures or in order to justify prohibition if need be.

Wild fires

Since the 1981-1982 dry season, CVG-Edelca assumed the responsibility of preventing, detecting and controlling wildfires in the upper Carona River basin, because it is the principal source for the Guri Hydroelectrical Complex. They created the *Upper Caroni River Basin Wildfire Control Program* that has four operation centers and all the necessary equipment, with air support and five observation towers throughout the Great Savannah. From these towers, they are able to detect which of the controlled burns conducted by the Pemóns have gotten out of control. There is also a consulting program with the indigenous community for conducting prescribed and controlled burns (CVG-Edelca 2004a). INPARQUES also has fire-fighting equipment and is part of the Unified Command to Combat Wildfires, an organization that coordinates actions of diverse institutions for effective wildfire fighting.



*Center of Operations of CVG-Edelca's wildfire control program
(photo © Rodolfo Castillo)*

Insufficient staff and lack of management infrastructure

Park authorities have already proposed increasing the number of staff and reassigning staff members or responsibilities in the different zones. First, two additional technicians are needed to divide the park into four patrol and control zones (instead of the current three); each technician would be responsible for one zone. Two park guards, one radio operator, an environmental education assistant and two maintenance people to attend to the installations and green spaces are needed for the Aponwao Administrative Center. Ideally, each park guard station would have three people for rotations: one could stay at the station, one could be out patrolling and one could be on break.

Just as other institutions and organizations have helped recondition certain recreation areas, new partnerships or alliances could be sought to build required park guard stations in areas so that the Iboribó Recreation Area has the required installations.

The park guards need incentives and stimulants, everything from additional training to receiving their back pay, including vacation pay and overtime (evenings and weekends).

Infrastructure incompatible with the landscape and cultural values, and hydroelectric developments

The management plan should reinforce the regulations regarding the type of constructions permitted in the park. Any construction project should be supervised to verify compliance. The typical Pemón construction is in itself a tourist attraction and it should be rescued and protected as a cultural element.

Constructions like electrical lines generate an unchangeable scenic and geographic impact. Other suggestions at the time of construction, such as subterranean lines or an alternative design following the course of the Caroní River (where CVG-Edelca has planned additional hydroelectrical developments) were rejected. Any new hydroelectric developments must first be subjected to environmental impact studies in order to determine the effects such developments will have on the ecosystems.

Management conflicts with indigenous communities

An interinstitutional commission is leading the indigenous lands demarcating process; the Ministry of Environment and Natural Resources is the commission's technical secretary. The following institutions make up the commission: the Departments of Indigenous Affairs, the Ministry of Education and Sports, the Ministry of Defense, the Ministry of Exterior Relations, the Ministry of Production and Business, the Ministry of Interior and Justice, the Geographic Institute of Venezuela (Simón Bolívar), the National Parks Institute and Indigenous Representatives.

The demarcation of the Pemón indigenous lands should serve as an example for future processes to avoid creating possible land tenancy problems. Collective indigenous property and protection of the national parks are two of the constitution's principal concerns. They could complement one another, considering that up until now the national park has protected the habitat and indigenous territory.

Conclusions



View of savannas close to the Paraitepui de Roraima community (photo © Rodolfo Castillo)

The Eastern Sector of Canaima National Park harbors exceptionally beautiful landscapes and unique biodiversity with numerous endemic species. The protected area is currently well conserved and it is also territory of the Pemón indigenous community. Nonetheless, certain threats endanger its protection and biological diversity in the medium-term including unregulated tourism, wildfires, population growth, insufficient staff and lack of infrastructure. Therefore the park is considered **vulnerable**. Conservation priorities include completing the Tourism Management Plan for Troncal 10 (currently under discussion), maintaining the wildfire control program, consolidating the assistance programs for the Pemón community and increasing the number of park guards and guard stations to increase and improve vigilance and monitoring efforts.



Cerro Budare also known as Sororopán-tepui (photo © Rodolfo Castillo)

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