MONUMENTO NATURAL
Cerro del Hierro

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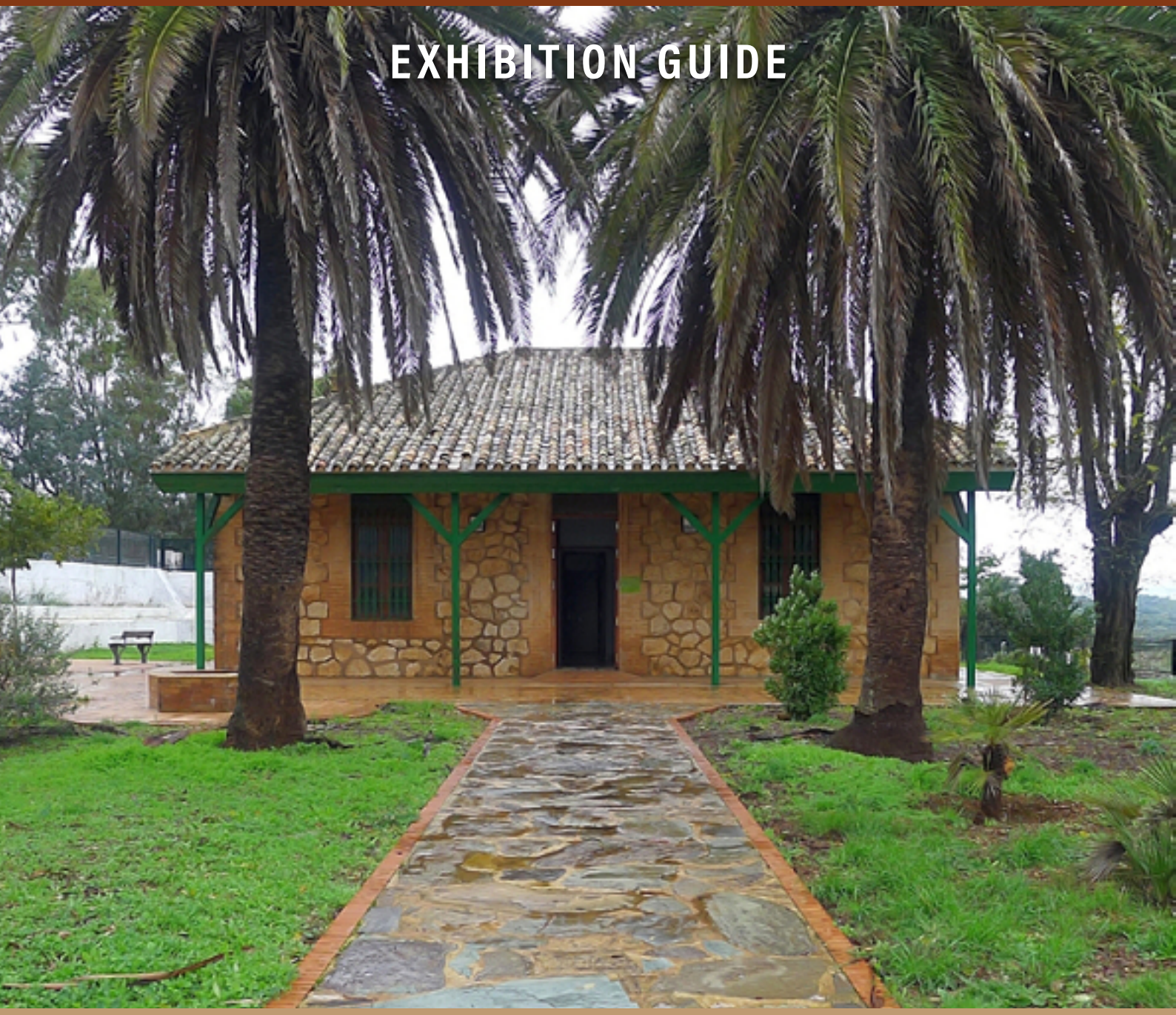
Cerro del Hierro

INFORMATION POINT



EXHIBITION GUIDE

Junta de Andalucía
Consejería de Sostenibilidad y Medio Ambiente

Geodiversity of Cerro del Hierro

The Karst

Cerro del Hierro is a spectacular and unique example of karst relief.

But what is Karst?

A karst or karst modelling is a landscape characterised by structures created by the dissolution of carbonate rocks, gypsum or salts, by the action of rainwater slightly acidified by its contact with the atmosphere.

Cerro del Hierro is the tale of two karsts; a very ancient one, known as paleokarst, and a more modern one, which is still carving the rock today.

The existence of this paleokarst is one more of the "rarities" that make this monument of nature a great one.

Fossil footprint from 570 million years ago

This paleokarst began to form in the Cambrian, and was subsequently preserved by layers of sediment that sealed it, leaving the climatic conditions that existed at that time preserved forever more.

The importance of the paleokarst, from a human point of view, is that it has been the habitat or container of a "rich" resource. That is to say, within all the structures that were formed at that time (cavities, chasms, galleries and hollows), mineral resources were deposited that have been exploited over the past centuries.

Detail of Paleokarst

Karst Cerro del Hierro

The treasure caves

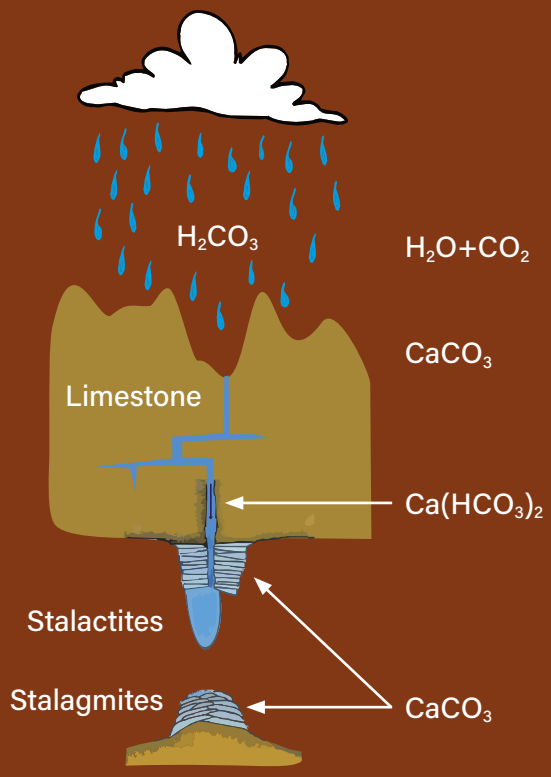
The karst structures or forms that can be found in Cerro del Hierro have been created by the dissolution of limestone rock or by the precipitation of calcium carbonate, according to the following reactions:

$H_2O+CO_2=H_2CO_3$
(Acidification)

$CaCO_3+H_2CO_3=Ca(HCO_3)_2$
(Dissolution)

$Ca(HCO_3)_2=CaCO_3+H_2O+CO_2$
(Precipitation)

Depending on whether they dissolve or precipitate and where they are found, we can distinguish the following karst structures present in Cerro del Hierro:



Did you know...?
The word "Karst" comes from the German name for the Slovenian Karst region along the Adriatic coast.

Exokarstic structures

PINNACLE:
Conical relief with flat top: typical of tropical climates.

ALLEY:
Forms of fluvial erosion taking advantage of fissures and fractures in the rock surface.

SIMA:
Vertical conduits connecting the surface to the interior as a well or sinkhole.

LAPIAZ:
Grooves in the rock surface created by the dissolution of carbonates.

Endokarst structures

CAVERN:
Underground chamber created by the dissolution of the rock, taking advantage of discontinuities and fissures in the massif.

GALLERY:
Underground conduit created by the dissolution of the rock, linking different parts of the karst system.

SPELEOTHEMS:
Deposits created by the precipitation of calcium carbonate. Stalactites, stalagmites, curtains and columns.

FILLS:
Deposits of sediments or organic debris in the different conduits of the karst system.

Minerals and fossils

"... Cerro del Hierro translates as "hill of iron". When the mineral is mixed with another substance, it becomes a white, chalky, crystalline stone, which, far from being an inconvenience, facilitates smelting. Cerro del Hierro is a unique for the quantity and the beautiful quality of its ore, which can supply all the iron necessary for the largest industry".

Dr. Ferdinand Röemer
Geologist and Advisor to the Polish Department of Mines

ANKERITE (Carbonates)

It is a secondary iron ore, although it is normally very exploited, it acquires great importance in Cerro del Hierro because it appears filling fissures in the Paleokarst.

CALCITE (Carbonates)

Among the calcium carbonates, it is the most stable mineral and is very common throughout the world. It is used in the manufacture of cements and mortars, lime, ornamental rocks, construction rocks, agricultural fertilisers, glass manufacture when the limestone is molten and even as an anti-caking agent (E-170) in the manufacture of bread.

MALACHITE (Carbonates)

This is a copper ore. It has been used as an inorganic dye (mountain green), but is now used as a semi-precious stone and as an ornamental rock. It usually occurs together with hematite, limonite and azurite.

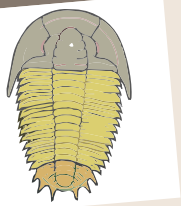
GOETHITE (Hydroxide)

Alteration of this mineral by water or humic acids leads to the formation of limonite. This is very present in Cerro del Hierro. It is one of the most widely used iron ores and, although no longer used today, limonite was once in great demand as a paint pigment.

SIDERITE (Carbonates)

One of the main iron ores, siderite is often accompanied by iron oxides such as haematite, and iron hydroxides such as goethite.

TRILOBITES (Fossils)



These organisms are a class of arthropods that became extinct 250 million years ago. Their importance lies in the fact that they are a "fossil-guide" for the entire Palaeozoic period, spanning approximately 320 million years of our planet's geological history.

Most of them lived on the fine-grained seabed. As they moved, they filtered the materials from which they obtained their food. The fossilised footprints that it left behind when it moved are known as "crucians"

They have a flattened oval-shaped skeleton which is divided into three lobes differentiated into cephalon, thorax and pygidium. The soft part of the organism that does not fossilise would be underneath the hard body. They used to measure between 30 and 70 mm, although there are some fossil specimens measuring up to 650 mm.

ARCHAEOCIATOS (Fossils)

These are the remains of benthic and filter-feeding marine organisms with a conical or cylindrical calcareous skeleton, rich in calcite and magnesium carbonate. They have an average adult size of 10-25 mm in diameter and 40-45 mm in height, although they can be up to 10 times bigger than average. This is a truly unique and special feature, as these organisms only existed in the Lower Cambrian (541 -509 million years ago). This exclusivity makes them a "guide fossil" for this period all over the planet, and they are in fact one of the shallow reef formers of that time.

At present they have no representatives, hence their classification in the fossil record has been complicated throughout history.

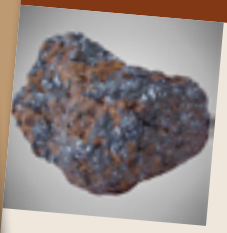
STROMATOLITES (Fossils)

The Cerro del Hierro stromatolites are laminated structures of calcium carbonate that grow vertically, attached to the ground, making for striking structures. They were created by the microbial activity of cyanobacteria that precipitated calcium carbonate during photosynthesis.

They are panchronic organisms. They are present throughout the fossil record, so their age had been dated from the earliest times on Earth to the present day.

Another feature is that they form reefs, as they are oxygenating organisms that create their own ecosystems that serve as shelter and food for other organisms.

HEMATITES (OR OLYGIST) (Oxides)



There is a variety of reddish colour and earthy appearance, very present in Cerro del Hierro, known as terroso. It is the main iron ore. Used as a pigment in paint (red ochre) and as a polishing powder.

PYROLUSITE (Oxides)

It is the main source of manganese. It is used in various metal alloys, chlorine manufacture, disinfectant, green glass bleach, violet dyes in ceramics and glass and as a green dye in fabrics.

BARITE (Sulphates)

Barium sulphate is the main barium ore. It has been used as a heavy mud in oil and gas drilling, as a mineral filler in paints, as a white pigment in the paper industry, for the production of hydrogen peroxide as a coating in X-ray rooms or as a slurry in medical radiology.

Mohs scale

Did you know...?
The Mohs scale is used to classify minerals according to their hardness.

The origin of Cerro del Hierro

This spectacular landscape is the result of various events, both natural and man-made.

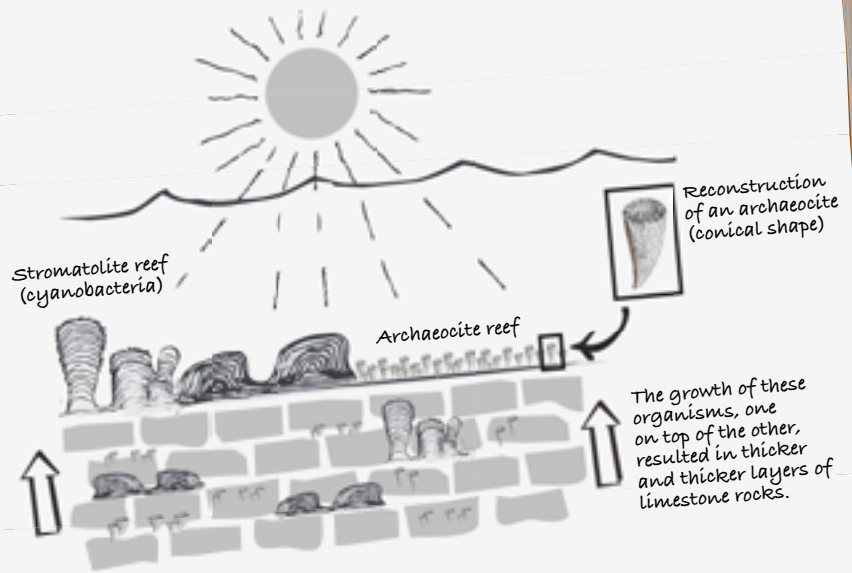
We invite you to discover the exciting geological history of Cerro del Hierro.

Monumento Natural Cerro del Hierro

1 The origin: a tropical coast

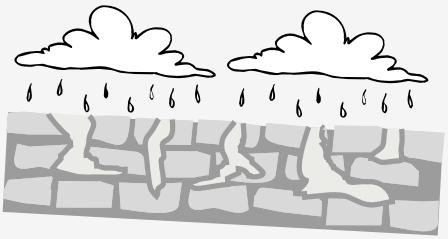
About 150 million years ago, in the Lower Cambrian, the limestone that appears today at Cerro del Hierro formed on a shallow marine platform with warm water and abundant nutrients.

This well oxygenated and luminous sea was favourable for the existence of marine organisms, such as archaeocynates or stromatolites, facilitating chemical precipitation in the form of calcium carbonate on fine-grained terrigenous material.



2 Paleokarst formation

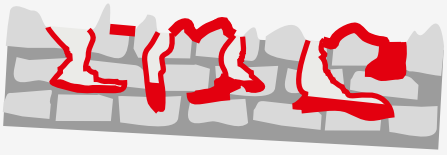
The first relevant event after the deposition of the limestone was the uplift and emersion of the terrain. This caused the exposure of the previously submerged limestone layers to the existing atmosphere, and they began to erode and the first karst formations began to appear.



Erosion of limestone and exposure to weathering agents

Erosion and formation of underground cavities (chasms and caves)

This initial karst was gradually filled in its cavities and hollows with iron-rich sediments from the impurities of the limestone, which were covered by a moderately developed ferruginous soil.



Filling of cavities and formation of a ferruginous soil.

Did you know...?
Today, this karst and deposited soil are called paleokarst and paleosol, as they are the "fossil footprints" of geological processes that took place in the Cambrian.

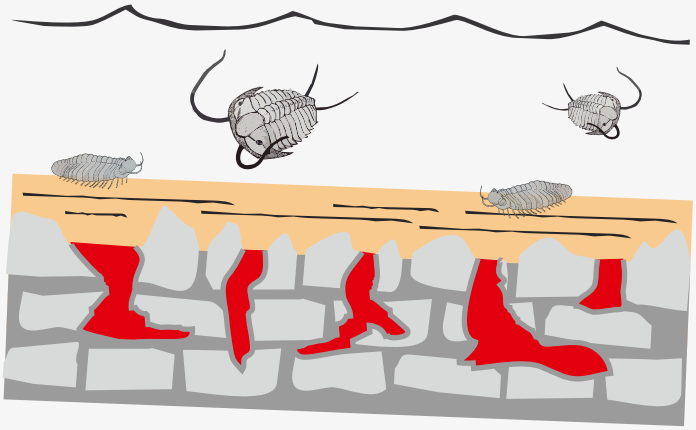
3 And the sea came once again

After the formation of the paleokarst, the relief created is submerged again. Terrigenous sedimentation occurs above the limestone, giving rise to the great thickness of slate that we know today.

It is at this point that one of the most curious inhabitants of Cerro del Hierro appears, the trilobites.

Trilobite fossil

At the end of the Cambrian (500 million years ago) a mass extinction took place where most of the species existing at that time disappeared, including many species of trilobites.



Did you know...?
Trilobites were the most characteristic living creatures of the Palaeozoic, which spanned from 540 million years ago up to 250 million years ago. The diversity of trilobite species is used by geologists to date rocks.

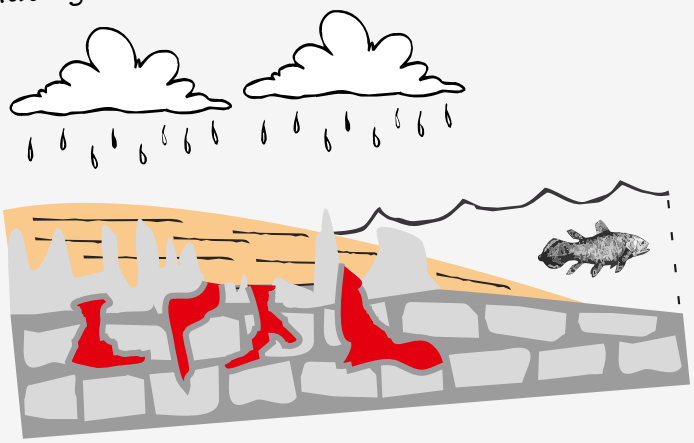
4 important new changes

300 million years ago, the movement of the planet's tectonic plates formed the supercontinent of Pangaea. It was at this time that Cerro del Hierro underwent three important events in its evolution:

1) MINERALISATION
The action of metamorphism circulated hydrothermal fluids through the existing materials causing chemical transformations in the limestone, recrystallisation in the iron oxide sediments of the paleokarst and concentration of barite.

2) DEFORMATION
The existing rocks were deformed, forming folds and fractures

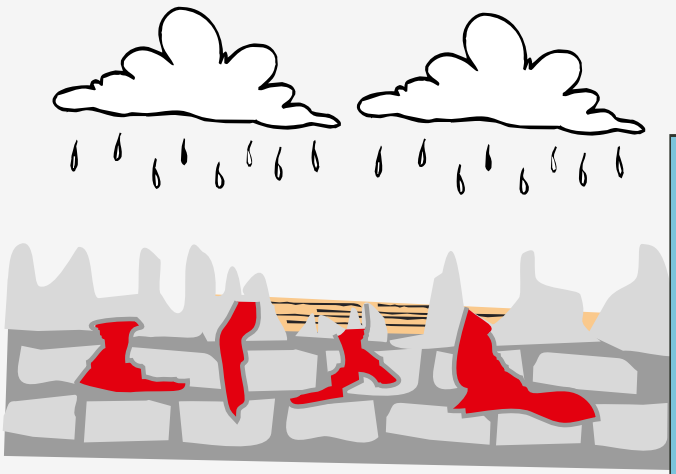
3) NEW EMERSION AND EROSION
The new emersion caused the erosion of the upper materials leaving the ancient paleokarst exposed. This meant that the climatic agents began again to sculpt the limestone rock.



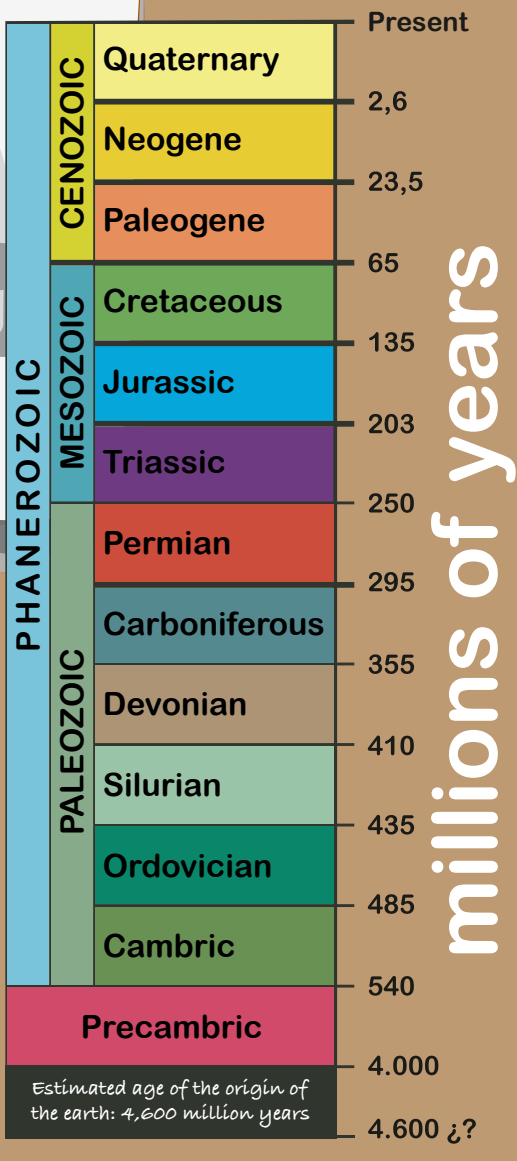
5 El Cerro to the present day

The most recent stage of karstification at Cerro del Hierro occurred from about 50 million years ago (in the Palaeocene) to the present day.

During this period, the Alpine mountain ranges were uplifted (Alpine Orogeny). The prevailing climate was the precursor of the main current forms due to the intense action of erosive agents that accentuated the existing karstification.



Geological Time Table



The Natural Monument of Cerro del Hierro

Monumento Natural Cerro del Hierro

In 2003, the Cerro del Hierro was declared a Natural Monument (Decree 250/2003, of 9 September, of the Junta de Andalucía), as its beauty and geological, biological and ethnographic uniqueness needed to be protected and preserved for the enjoyment of all.

This Natural Monument, the largest in Andalusia, is considered to be the area of maximum protection, with a great variety of environmental units and processes that make it unique. Despite this maximum protection, visitors can carry out sporting and ecotourism activities in the places authorised for this purpose. All of this is included within another higher level of protection, such as the Sierra Morena de Sevilla Natural Park.

Geodiversity

The Natural Monument, spread over an extension of 121 hectares, has specific characteristics that make it unique compared to other Natural Monuments in Andalusia. One of the main characterstics for which Cerro del Hierro was declared a Natural Monument is its geodiversity. In fact, the Inventory of Georesources of Andalusia establishes it as an area of great scientific, didactic and tourist value.

Cerro del Hierro is a geological complex dating back to the Cambrian (between 500 and 540 million years ago), formed by the intercalation of slate and carbonate rocks (Campoallá Layers), in its lower part, and by slates with trilobites (Alanís Layers), in the upper part.

Biodiversity

This peculiar landscape of pinnacles, alleys and hollows constitutes a very singular ecosystem where plant and animal species of rupicolous habitat develop, such as the dairy swallow, the solitary rock thrush or the rock thrush.

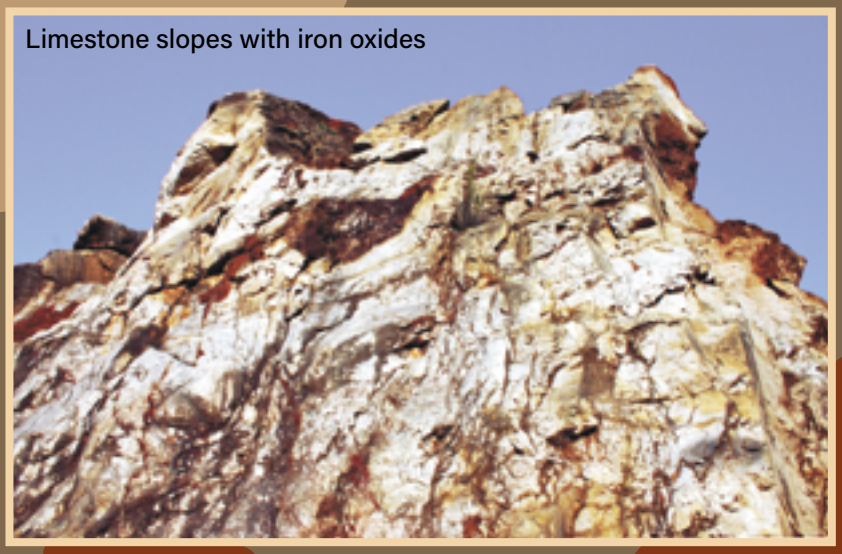
The area is also home to some emblematic species such as the black stork, which returns every year to nest.

Among the plant species, ferns stand out, with various species cohabiting in the humid and shady areas of the alleys.

The hidden treasure

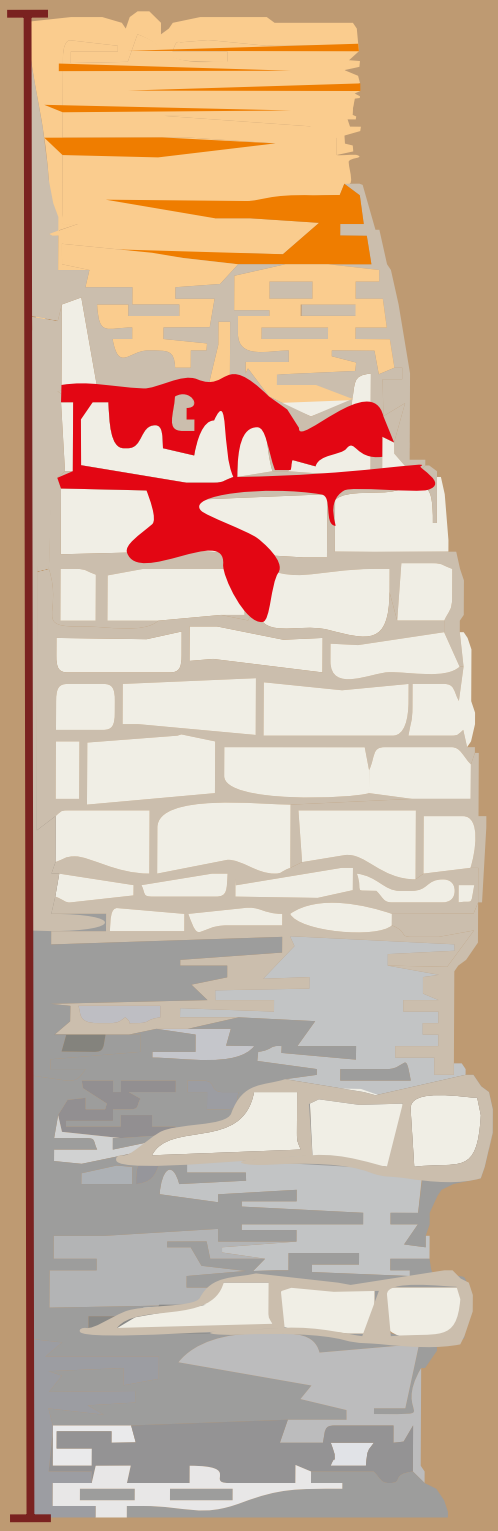
The limestone of Cerro del Hiero are like a "chest". Within them we can find "geological treasures" used by humans since ancient times, such as iron oxide minerals, or barite.

These minerals were deposited by different geological processes in the cavities, galleries and hollows of limestone rock, and for millions of years they were hidden in the bowels of the earth until discovered by man.


Limestone slopes with iron oxides


Detail of mineralisations

Statigraphic column



Lower Cambrian
(540 to 520 million years ago)

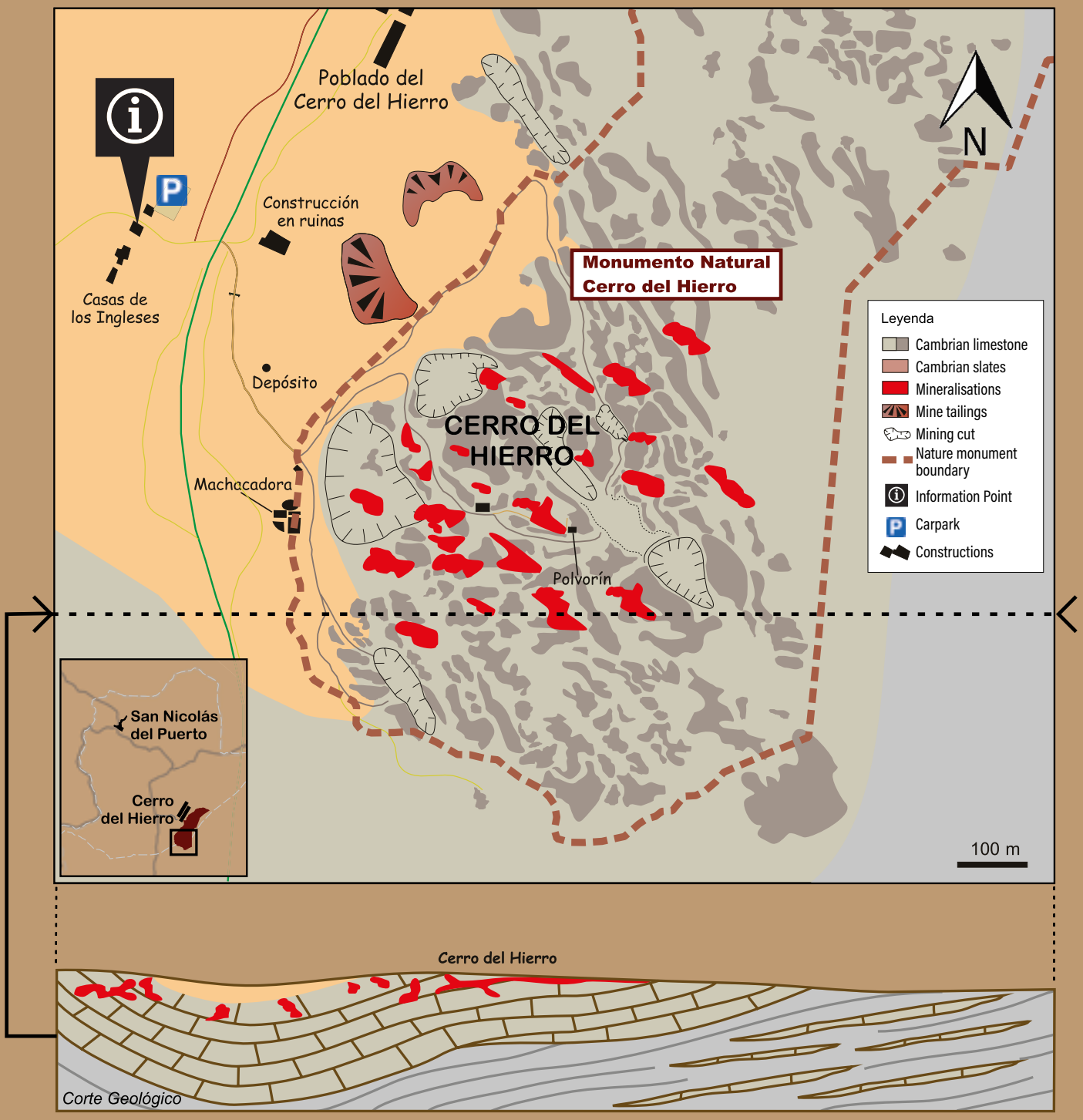
Slates and sandstones

Paleokarst (Karst fills and mineralisations)

Limestone

Slate and limestone

Map and geological cross-section



Mine´s heritage. A geological jewel

Cerro del Hierro has a variety of minerals that have made mining, along with agriculture and livestock farming, one of the driving forces behind the region's development.

These processes were the cause of the landscape transformations that have resulted in the current image.

The mining activity has left, in addition to a rich architectural heritage, a unique landscape "gem".

General view of the miner's landscape

Ore crusher

Tunnel

A sculpture on the time

If there is one thing that initially strikes the visitor to Cerro del Hierro, it is its breathtaking and magical landscape.

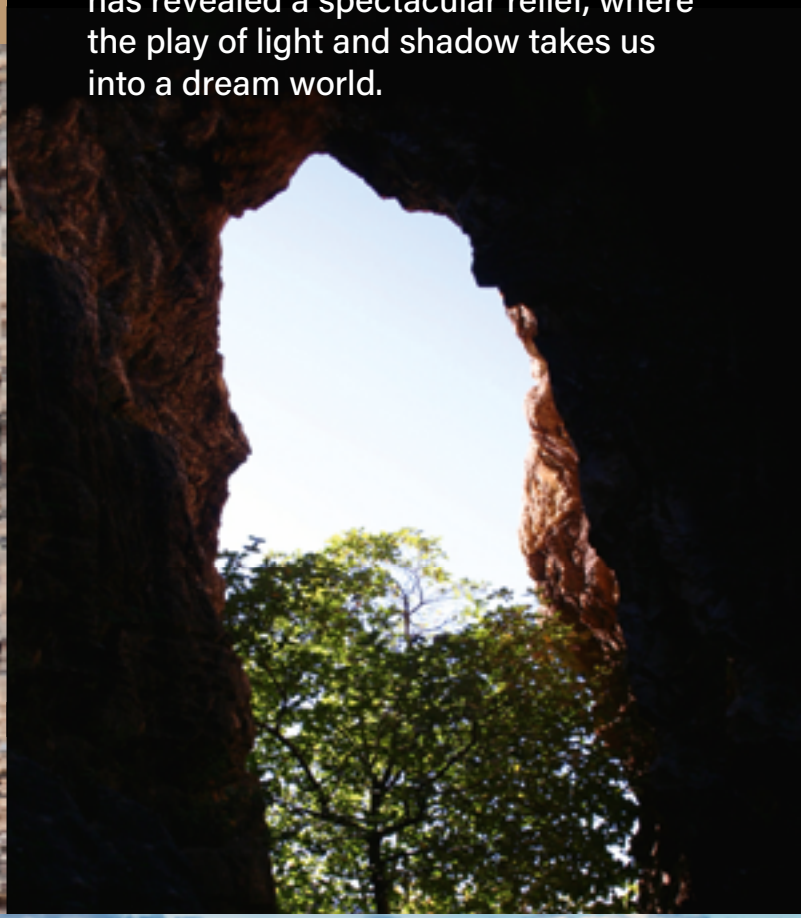
Monumento Natural Cerro del Hierro

This is one of the first works of art sculpted by nature.

This "famous sculptress" decided to start her work more than 540 million years ago, and she still continues to hone her craft.

The current view of this Natural Monument cannot be explained without talking about human action, since mining exhumed the buried paleokarst.

Therefore, this karst cathedral is the result of ancient mining activity, which has revealed a spectacular relief, where the play of light and shadow takes us into a dream world.



Landscape without anthropogenic action

Landscape after mining activity

To enjoy your visit there is only one thing to do... give free rein to your senses:

... listen to the silence broken by the wind in the alleys.
... smell the aroma left by the plants.
... touch the wet rock and the striking ologistus.
... but most of all, witness and contemplate the power of nature.

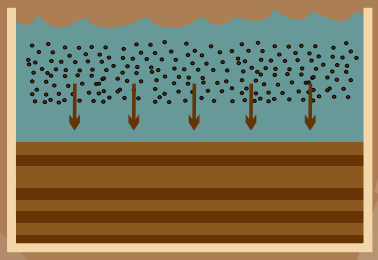
Nature has given us a heritage of incalculable value and beauty, so we have a responsibility to preserve our Cerro del Hierro Natural Museum.

The El Rebollar trail allows visitors to discover the different landscapes of Cerro del Hierro

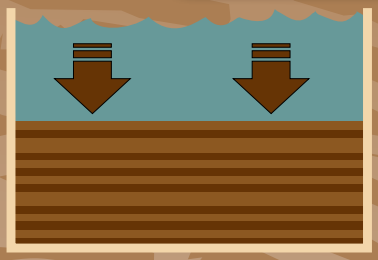
How some of the minerals and rocks of the Cerro are formed:

Slate

Did you know that...?
The set of physical and mineralogical transformations that sediments undergo to become rock is known as "Lithification"



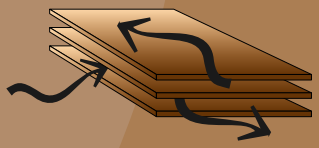
Deposit of fine sediments on a seabed



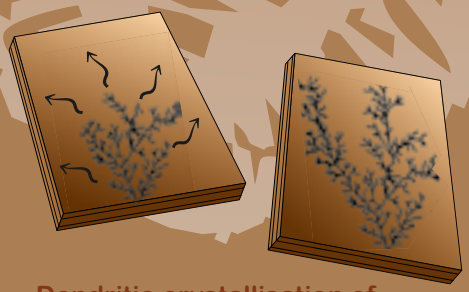
Compacting of sediments due to weight gain

Formation of slate

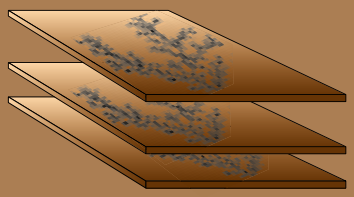
Pyrolusite dendrites



Circulation of fluids containing manganese oxides through slate layers and fractures



Dendritic crystallisation of manganese oxides

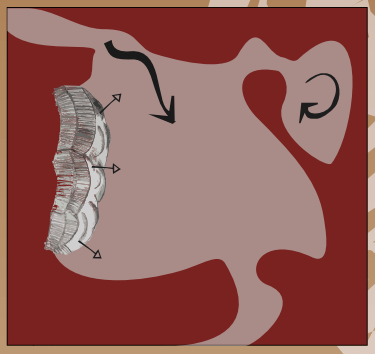


Slate with dendrites between its fractures and layers

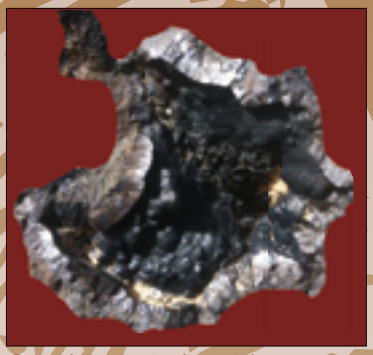
Remember that these are not fossils, but minerals that have been crystallised in a very unique way.

Goethite

Circulation of iron oxide fluids through fractures and cavities in limestone



Beginning of Goethite crystallisation in botroidal form on cavity walls



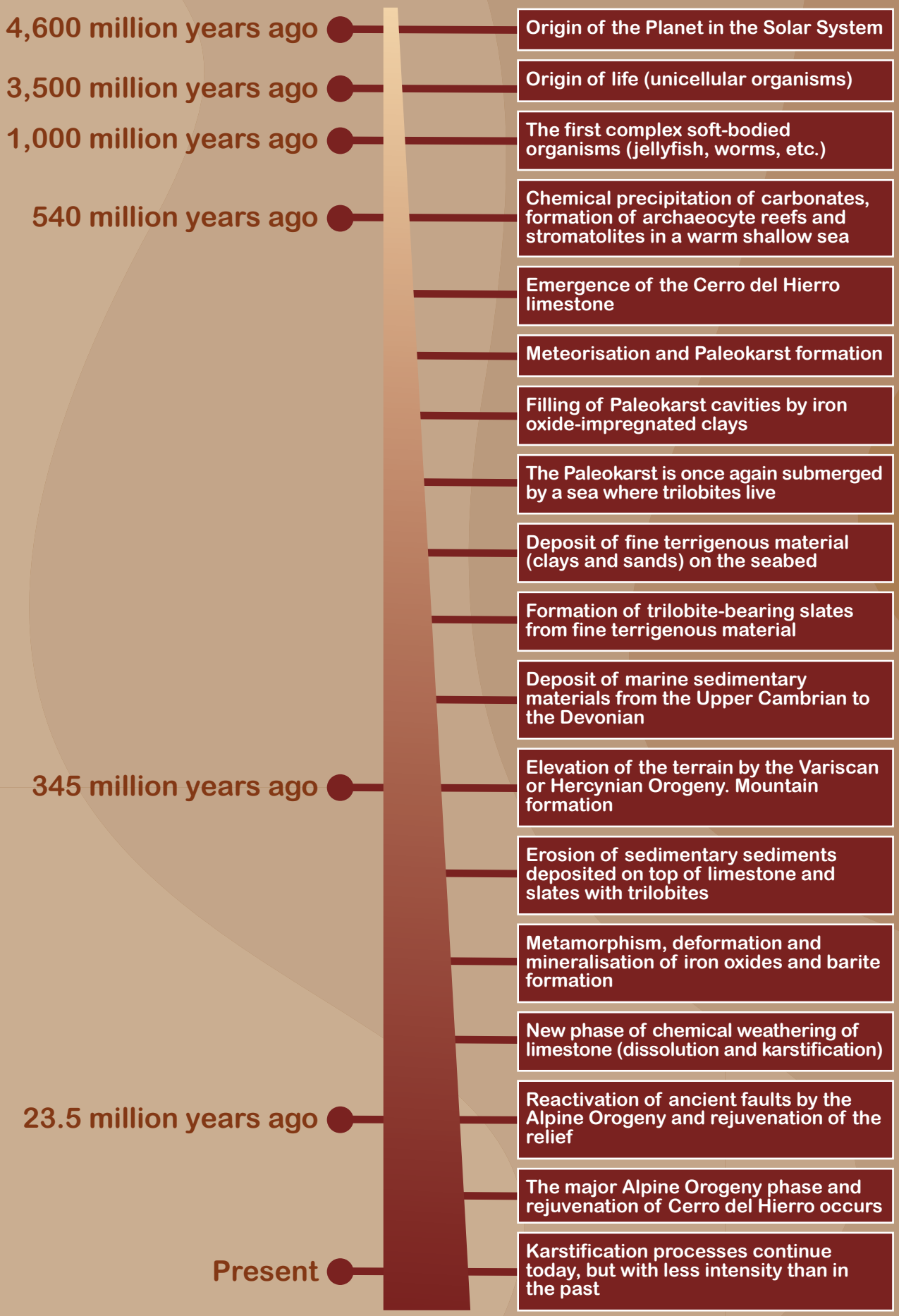
Goethite geode with botroidal habit

COLLECTION OF MINERALS AND ROCKS

OBSERVE THE DIFFERENT CHARACTERISTICS OF THE ROCKS AND MINERALS THAT WE SHOW YOU IN THIS COLLECTION, SUCH AS THEIR SHINE, COLOUR, TOUCH AND FORM OF CRYSTALLISATION.

A LITTLE GEOLOGICAL HISTORY

of the Cerro del Hierro



Geoparks

European Geoparks Network

The European Geoparks Network, founded in 2000, aims to protect geodiversity to promote geological heritage to the general public, and to support sustainable economic development of the territories, mainly through the development of geological tourism.

In addition to the geological heritage, Geoparks must have an archaeological, ecological, historical and cultural interest.

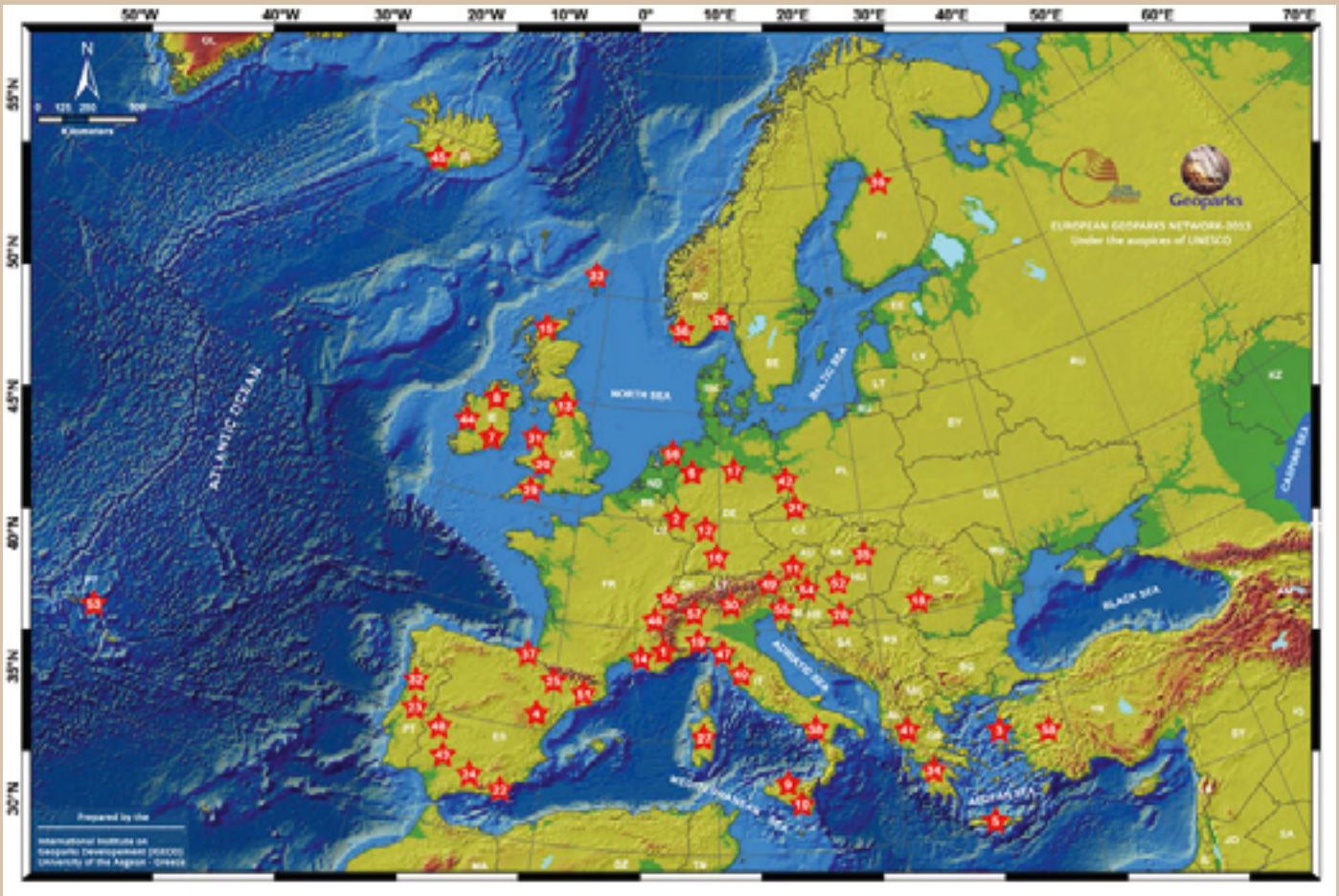
The Declaration of Madonie was signed in October 2005, under agreement with UNESCO, in which the European Geoparks Network was recognized as the European Division of the Global Geoparks Network.

“The incorporation as a membership of the European Geoparks Network ensures automatically be member of the Global Geoparks Network”.

"An European Geopark is also a Global Geopark"

"A GEOPARK IS A TERRITORY WITH A GREAT GEOLOGICAL HERITAGE AND A SUSTAINABLE DEVELOPMENT STRATEGY BASED ON GEOTOURISM, GEARED TOWARDS DRIVING LOCAL ECONOMIC DEVELOPMENT THROUGH THE ENHANCEMENT OF ITS GEOLOGICAL, NATURAL AND CULTURAL HERITAGE"

Information of European Geoparks Network



WHAT SITES MAKE UP THE EUROPEAN NETWORK OF GEOPARKS?

1	Reserve Geologique de Haute-	Francia	21	Bohemian Paradise	República Checa	41	Vikos – Aoos Geopark	Grecia
2	Vulkaneifel Geopark	Alemania	22	Parque Natural Cabo de Gata – Níjar	España	42	Muskau Arch Geopark	Alemania-Polonia
3	Lesvos Geopark	Grecia	23	Naturtejo Geopark	Portugal	43	Parque Natural Sierra Norte de Sevilla	España
4	Parque Cultural del Maestrazgo	España	24	Geoparque Subbéticas	España	44	Burren and Cliffs of Moher	Irlanda
5	Psiloritis Natural Park	Grecia	25	Geoparque Sobrarbe	España	45	Katla Geopark	Islandia
6	Geo and Naturepark TERRA.vita	Alemania	26	Gea Norvegica Geopark	Noruega	46	Massif des Bauges Geopark	Francia
7	Copper Coast Geopark	Irlanda	27	Geological, Mining Park of	Italia	47	Apuan Alps	Italia
8	Marble Arch Caves Global	Irlanda	28	Papuk Geopark	Croacia	48	Geoparque Villuercas-Ibores-Jara	España
9	Madonie Geopark	Italia	29	English Riviera Geopark	Reino Unido	49	Carnic Alps Geopark	Austria
10	Rocca di Cerere Geopark	Italia	30	Parco Naturale Adamello Brenta	Italia	50	Chablais Geopark	Francia
11	Nature Park Steirische	Austria	31	GeoMôn GeoPark	Gales-Reino	51	Geoparque Cataluña Central	España
12	Bergstrasse-Odenwald Geopark	Alemania	32	Arouca Geopark	Portugal	52	Bakony-Balaton Geopark	Hungría
13	North Pennines AONB European	Reino Unido	33	Geopark Shetland	Escocia-Reino	53	Azores Geopark	Portugal
14	Luberon, Parc Naturel Regional	Francia	34	Chelmos – Vouraikos Geopark	Grecia	54	Karavanke/Karawanken	Eslovenia - Austria
15	North West Highlands Geopark	Escocia-Reino	35	Novohrad – Nograd Geopark	Hungría-	55	Idrija Geopark	Eslovenia
16	Swabian Albs Geopark	Alemania	36	Magma Geopark	Noruega	56	Hondsrug Geopark	Países Bajos
17	Geopark Harz . Braunschweiger	Alemania	37	Geoparque Costa Vasca	España	57	Sesia - Val Grande Geopark	Italia
18	Hateg Country Dinosaurs	Rumanía	38	Parco Nazionale del Cilento e	Italia	58	Kula Geopark	Turquía
19	Parco Del Beigua	Italia	39	Rokua Geopark	Finlandia	59	Comarca Molina Alto -Tajo	España
20	Fforest Fawr Geopark	Reino Unido	40	Tuscan Mining Park	Italia			

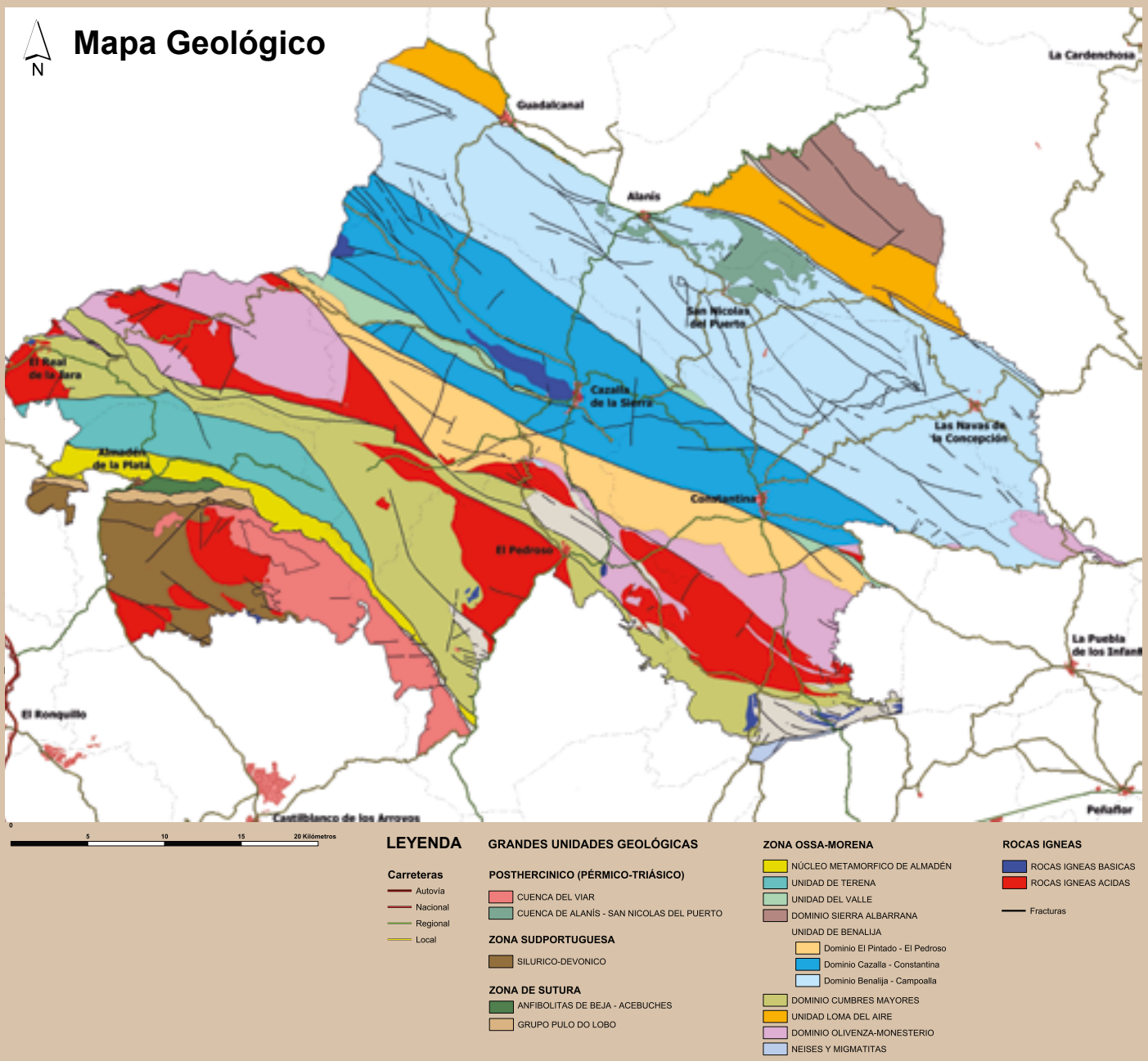
The Sierra Morena de Sevilla Geopark

The Sierra Morena de Sevilla, first declared a Natural Park by the Andalusian Parliament in 1989, became part of the Geoparks Network in September 2011.

The Sierra Morena de Sevilla Geopark is located in the mountainous alignments of the central region of Sierra Morena, between the Ossa-Morena and South Portuguese geological zones of the Orógeno Varisco Ibérico (or Hesperian Massif).

Most of the rocks are from the Proteozoic (between 1,000 and 540 million years ago) and Paleozoic (between 540 and 250 million years ago) periods, and in some sectors possibly from the Triassic period (between 250 and 200 million years ago), except in the south-eastern part of the park, where there are some outcrops of sedimentary rocks from the Miocene (between 25 and 5 million years ago), belonging to the sedimentary basin of the Guadalquivir River.

The dimensions of the geopark and its geological, archaeological and mining richness, include interesting Sites of Geological Interest and short to medium Geotourist Trails, for visitors to discover the main highlights of the Sierra Morena de Sevilla Geopark and the Sierra Morena de Sevilla Natural Park.



Do you Know other Spanish Geoparks?

1 Parque Cultural del Maestrazgo
2 Cabo de Gata-Níjar
3 Sierras Subbéticas
4 Sobrarbe
5 Geoparkea Costa Vasca
6 Villuercas-Ibores-Jara
7 Cataluña Central
8 Comarca de Molina-Alto Tajo

The mining legacy


Underground mineral loader

INDUSTRIAL MINING INSTALLATIONS

Today, many remnants of mining facilities are still present in the landscape.


Old railway station

Immersed in the mine itself, we can see various installations such as the "el polvorín" where the dynamite was stored under custody, different deposits or the remains of the "machacadora" or crusher where the ore was crushed before being loaded onto the railway.

The ore was extracted from inside the mine with wagons pulled by animal traction and cables, using the many "tunnels" that linked the different alleys and corridors of Cerro del Hierro.

In the area surrounding the pit, there are countless ruins of buildings, which were used to store working materials.

CASA DE LOS INGLESES

One of the legacies of the mining period are the so-called “casas de los ingleses” or English houses. These are three British colonial style houses where the mine director, two engineers and their respective families lived.

The houses had two unique features. Firstly, they had integrated toilets, which was unusual in other houses, and, secondly, the kitchens were separate from the other rooms of the house, which was an unmistakable symbol of social class.

One such house was restored to house the Information Point which is where you are right now.

MINING VILLAGE

The company “The Baird's Mining Co. Ltd." began construction on the mining village at the end of the 19th century and it was completed in 1914. The urban structures followed the established trends of the time, similar to other British-style mining villages that were built on the Iberian Peninsula. The village was provided with a series of services such as a school, a football pitch, a church and even a commissary so that the workers could make up for the lack of provisions.

Date: 1929

Did you know...?
The current population of the village of Cerro del Hierro is just over 100, but in 1929 it had more than 1,700 inhabitants.

The family of the Cerro

"Monte de Hierro" Mining

Group of teenagers with bicycles from the period

Parents, teachers and school children (1960)

Group of schoolchildren from Cerro del Hierro

Electrician workers

Cable factory workers

Construction of the Morris cable factory (1966)

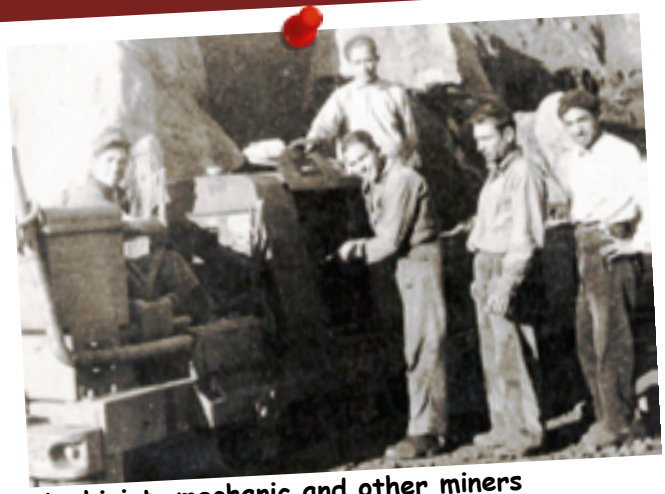
Schoolchildren doing gymnastics

Football team

Procession of Santa Bárbara

Several neighbours of the Cerro

Group of women neighbours of the Cerro



Machinist, mechanic and other miners

Antonio Jiménez (año 2014)

Example of mechanical and animal traction

Antonio Jiménez and other miners in a waggonette of the time

Lower area crusher 1970

Animal-drawn wagons (1964)

Company store coins preserved by Antonio Jiménez

Manuel Guzmán y Eladia Navarro (año 2014)

Manuel Guzmán working in the mine with other colleagues

Manuel Guzmán with the remains of the extracted ore (año 2014)

A group of miners with various tools

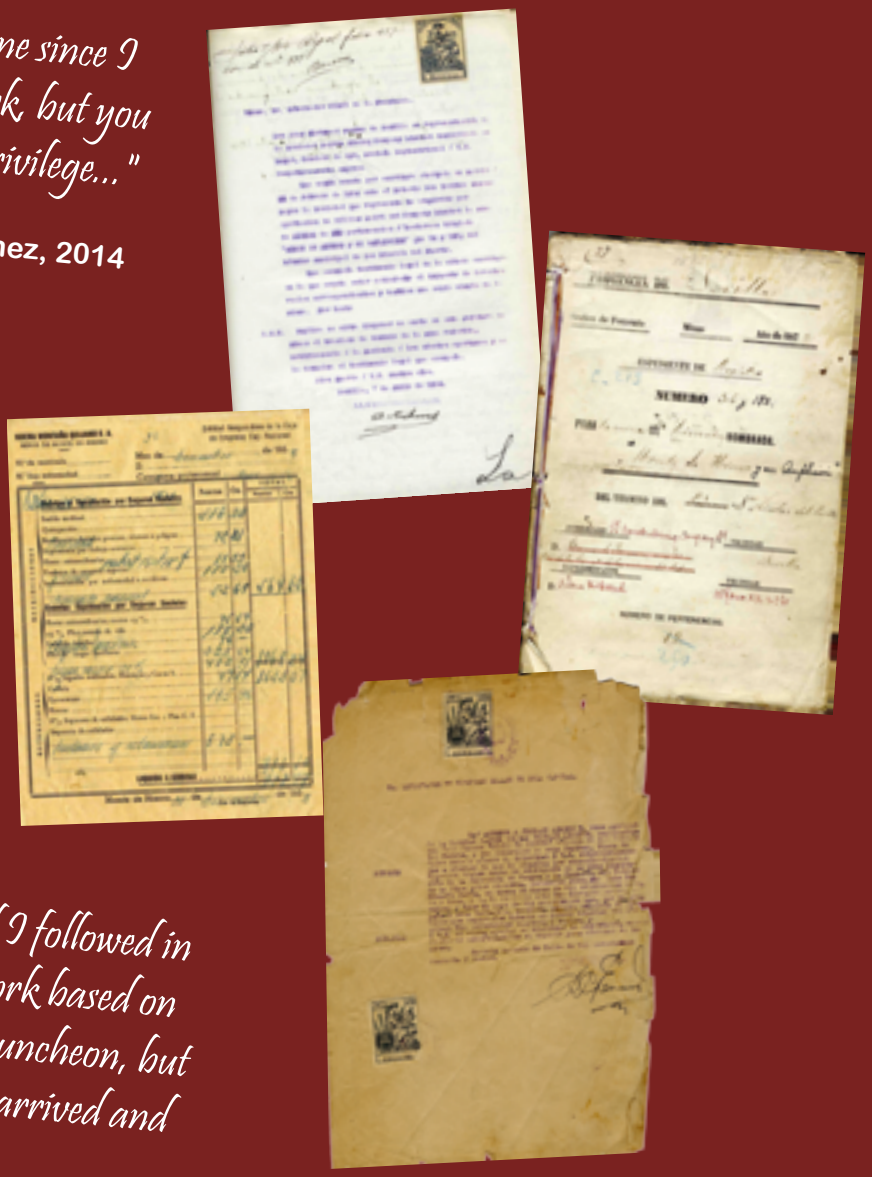
Old railway station bridge

Diesel-powered locomotive used in the mine

Mine administrative staff

"...I have been working in the mine since I was 14 years old. It was hard work, but you had a day's pay and that was a privilege..."

Antonio Jiménez, 2014



Mining documents

"...my father was a miner and I followed in his footsteps. It was manual work based on strength, shovel, pickaxe and truncheon, but in the 1970s machinery finally arrived and everything became easier..."

Manuel Guzmán, 2014

Did you know...?
The use of a currency minted by the mining company itself was established within the village, as the company paid part of the payroll with it.

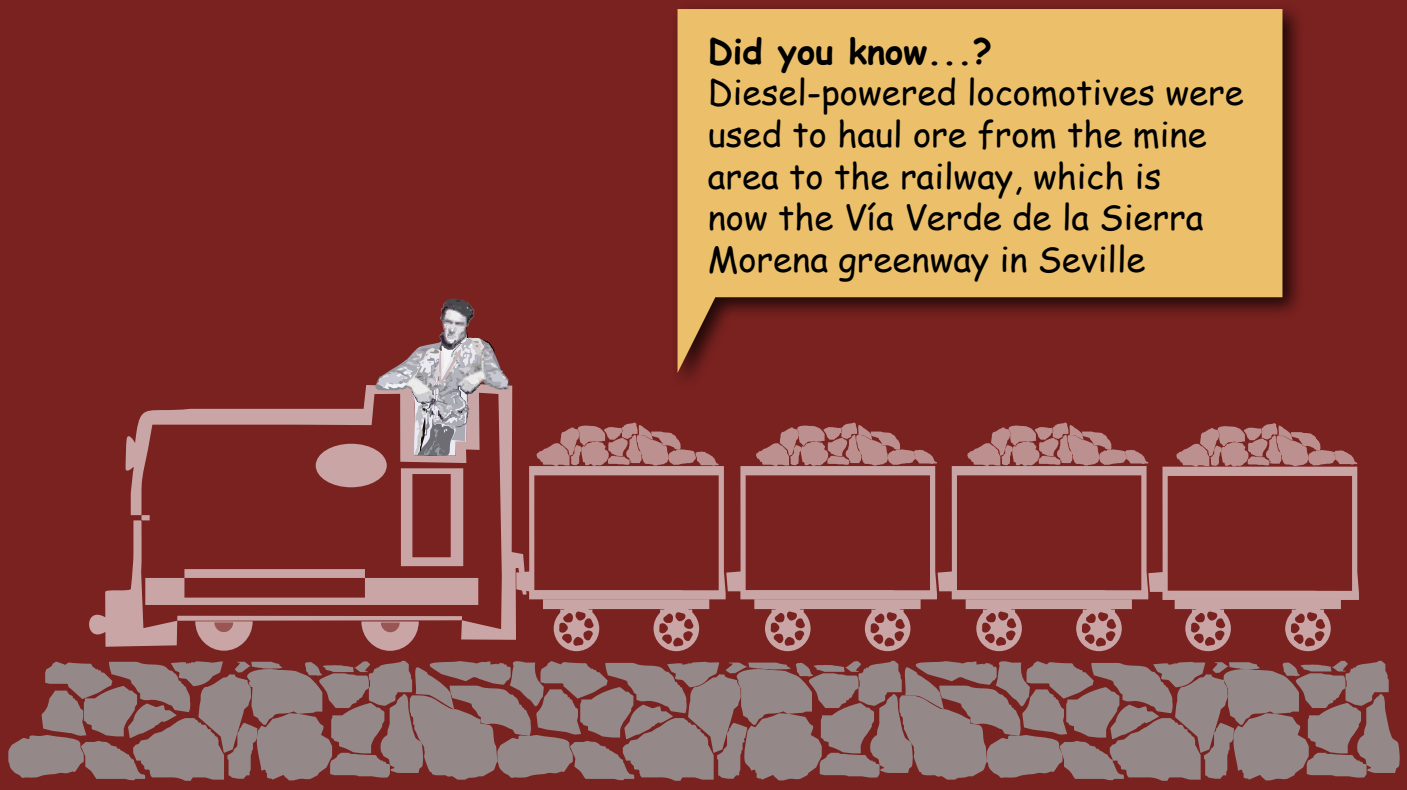
The railroad tracks of life

The railway is one of the most important mining legacies that the Cerro del Hierro mine has left for posterity, helping the economic and social development of the area.

Its arrival in 1985 meant its connection with the railway line linking Seville to Mérida, via a 15 km long branch line. From this point on, the previously unprofitable ore could be mined.

The route along this line has gentle gradient. The landscape is sinuous and mountainous from Los Prados to San Nicolás del Puerto, and flat meadowland up to Cerro del Hierro. The ore was transported by four locomotives, each pulling 23 wagons, carrying 4,000 tonnes a day to the port of Seville, where the ore was loaded onto ships.

Today, the old "Los Prados-Cerro del Hierro" railway line has been transformed into the greenway of Vía Verde Sierra Morena de Sevilla, which you can access just a few metres from these facilities.



Ethnography of Cerro del Hierro

FUTURE

2011 — The Sierra Morena de Sevilla Natural Park is declared a Geopark and joins the European Geoparks Network.

2003 — Cerro del Hierro is declared a Natural Monument for its natural, cultural and ethnographic values.

2000 — The Junta de Andalucía acquires the land of Cerro del Hierro.

1989 — The Sierra Morena de Sevilla Natural Park is declared a Natural Park.

1980 — The Cerro del Hierro Mining Cooperative is formed by the miners themselves who decide to continue the exploitation of the mine. Approximately 50,000 MT of baryte are extracted until it is closed in 1985.

1970 — The mine is transferred to the company Cerro del Hierro S.A. 2 million metric tonnes are extracted until it is closed in 1978 due to low profitability on the market.

1946 — The mine is bought by the Santander company Sociedad Nueva Montaña Quijano. Around 2 million tonnes are extracted and transported to the company's blast furnaces in Cantabria.

1895 — When the railway branch to "Los Prados", near the station of Cazalla, is completed, the exploitation of the mine begins. The lessee company is renamed The Baird's Mining Co. Ltd. for its activities in Spain. During the period of operation, 7.63 million METRIC tonnes of ore were extracted and transported by train to the port of Seville, where the company had its own wharf.

1893 — The Scottish company "William Baird Mining and Co. Ltd" leases the "Cerro de Hierro" mine and begins to build the first installations and the railway branch to connect to the Seville-Mérida line.

1874 — Construction of the railway line between Seville and Mérida is completed.

1872 — The company of El Pedroso becomes the owner of the Cerro del Hierro-San Nicolás mine. Over the following years, this company carries out several studies and explorations at Cerro del Hierro, without exploiting it.

1817 — The Compañía de Minas de Hierros del Pedroso y Agregados is founded, the owner of several iron mines in El Pedroso and of an iron foundry.

XIII CENTURY — The Castilians used the different mineral resources of the sierra. Dehesas are introduced as an agricultural and livestock resource.

VIII CENTURY — The Andalusians continue mining for centuries. They brought the cultivation of cereal crops, which represented a new model for the region.

2000 YEARS AGO — The Romans promote mining for the extraction of iron. First transformations of the landscape.

6000 YEARS AGO — Remains of early metallurgical activities in the Sierra Morena of Seville.

Life goes one: the current use

The Cerro del Hierro is one of the most developed sites for sustainable public use in Andalusia.

Even with a high degree of protection, it is home to many geo-tourism activities; tourism that sustains and enhances the identity of a territory, taking into account its geology, environment, culture, aesthetics, heritage and the well-being of residents.

GEOTOURISM

Trekking

There are 2 official trails provided by the Junta de Andalucía:

- The Cerro del Hierro Trail takes us into the breathtaking landscape of the karst, one of the most popular trails in Andalusia.
- El Rebollar Trail where we can observe a forest formed by cork oaks (*Quercus suber*), gall oaks (*Quercus faginea*) and Pyrenean oak (*Quercus pyrenaica*).

Climbing

Cerro del Hierro is one of the best places in the province of Seville for this sport.

It began in the 1960s, but the last 25 years have seen a boom in this sport in this area.

There are 119 climbing routes and 14 well-defined sectors in the high karst area. Since it was declared a Natural Monument, climbing has been a regulated activity.

Environmental education

Cerro del Hierro is a natural resource widely used within the formal and informal education system. Many schools and colleges, companies and associations use the environment around us as a centre of operations for raising awareness, conservation and education.

This area is an open book of nature where the geological processes, the different ecosystems or the use of natural resources can be seen in the flesh.

Cycle touring

The 15 km long former railway line has been converted into a greenway, with the Cerro del Hierro as its final stage. It stands out for its accessibility, and can be covered on foot, roller skates, mountain bike or wheelchair. This route has established itself as an excellent route for ecotourism activities, where the natural monuments of Cerro del Hierro and Cascadas del Huesna, as well as the source of the Rivera del Huéznar, can be seen within a few kilometres. The route is full of geological curiosities, rich biological diversity and points of great cultural interest.

Caving

There are several dated points of speleological interest, among chasms and galleries, such as the Sima del Hierro, with a drop of almost 60 metres. Inside, we find geological structures such as stalactites and stalagmites, and it is also a refuge for colonies of bats. This fact is the main reason why their entry is regulated as a preventive measure.

Scientific research and dissemination

Cerro del Hierro is a unique geological complex that includes many elements of scientific importance: milestones of geological history, minerals, fossils, karst forms, etc. The Sierra Morena de Sevilla Geopark promotes scientific research in collaboration with universities and research institutes, fostering the advancement of knowledge about the Natural Monument.

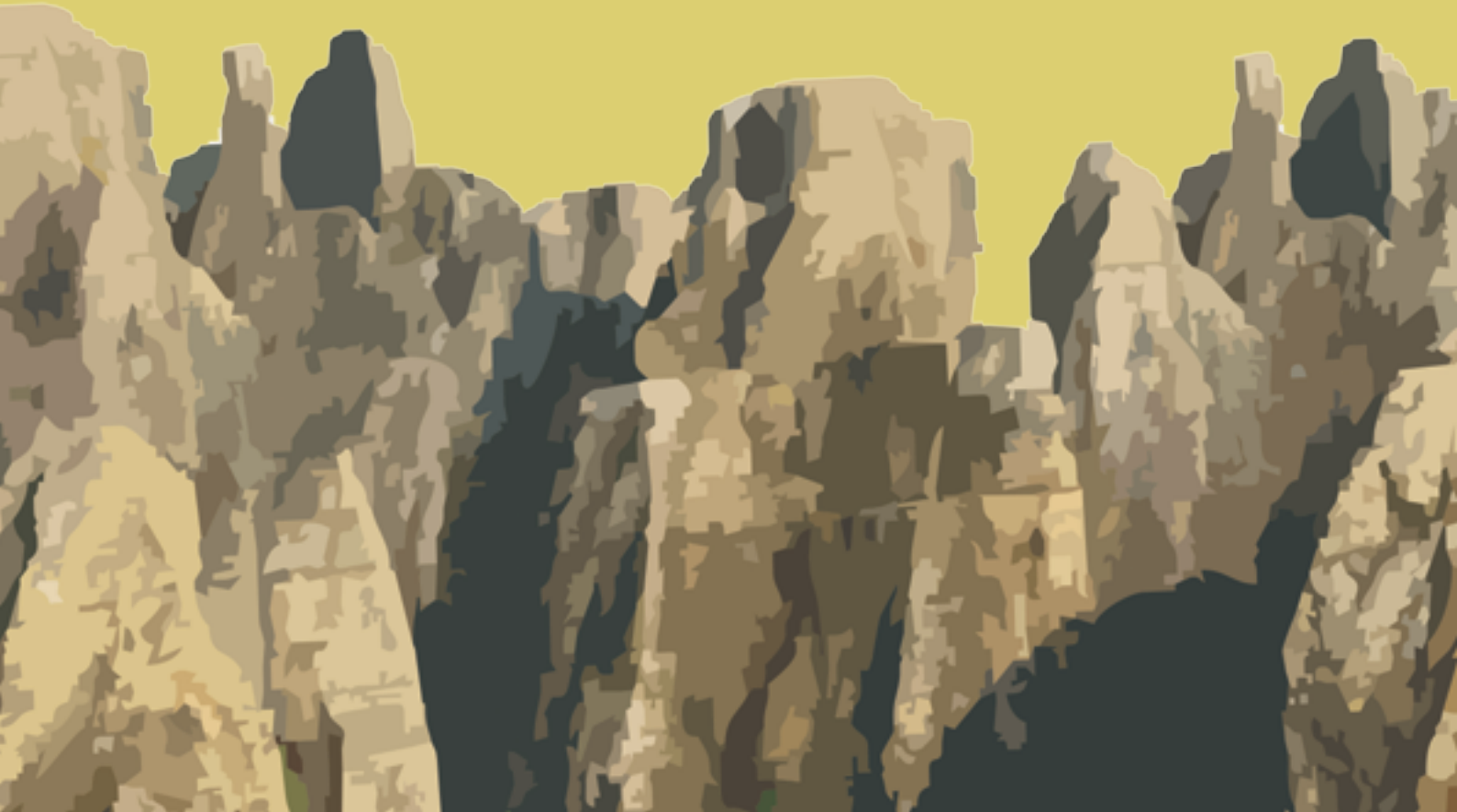
Cerro del Hierro is also an ideal place to develop activities to disseminate and promote this significant element of geological heritage among society, and to highlight the importance of protecting this legacy of the Earth's history.

Biodiversity of Cerro del Hierro

Residents of mine

The Cerro del Hierro area was once a landscape similar to that we can see from the El Rebollar Trail: a Mediterranean forest, populated by holm oaks, cork oaks, oaks, kermes oaks, rockrose, strawberry trees, etc. But the intense mining activity of the 19th and 20th centuries changed the environment to what we know today.

There is evidence of the existence of waterfowl in the washing ponds, and rooks that took advantage of the scraps of food left behind by miners. However, it was the cessation of the mining activity that made possible the colonisation of a "new" space, full of hollows, alleys, crevices and rocky areas. Where there was some soil left and there was enough light, fig trees, cherry trees, mastic trees, etc. emerged, all of which were brought, for the most part, by animals and birds through their excrement, plumage, hair or legs (zoochory). In some crevices and alleys, ferns and plants took root, having arrived mainly by aerial dispersion. This new "oasis" allowed the establishment of a fauna typical of rocky areas, such as the rock plane, the solitary rock thrush and the dáurid swallow, among others. We can also observe specimens of black storks, who take advantage of the many nooks and crannies to nest.



The black stork (*Ciconia nigra*)

Black stork: an emblematic bird

The black stork (*Ciconia nigra*) is generally a solitary bird, avoiding any human presence. As it is a migratory bird, it can be seen from March to September, nesting in the limestone crags of the Cerro.

It uses quiet stretches of streams and rivers, as well as ponds, to feed on invertebrates, amphibians and fish.

It is classified as "Vulnerable" in Spain, as it is very sensitive to disturbances around the nest.

Full-scale profile and flight silhouette of the black stork

Black stork tracks

The flying mammals

The limestone nature of the terrain, together with the local mining history has favoured the formation of chasms and galleries, and in short, shelters used by different species of cave bats to establish their colonies.

All species of bats living in our country are protected by law, playing a beneficial role as insect consumers.

Among the different species that can be identified in Cerro del Hierro, we can mention the following: Cave bats (*Miniopterus schreibersii*), buzzard bats (*Myotis* sp.), or horseshoe bats (*Rhinolophus* sp.)

Orchid paradise

There is also a great diversity of orchids on the Cerro. Although they all compete in beauty, the "yellow orchid" (*Dactylorhiza sulphurea*), which can be found in and around the karst itself, is particularly noteworthy.

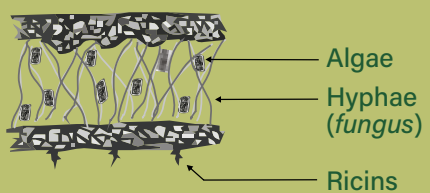
Although this is not the only place in Sierra Morena de Sevilla where it appears, as its population extends in the central and eastern area of the Natural Park, this species is included in the Andalusian Red List (Junta de Andalucia, 2005) of endangered species, so we take great care to do no harm to any we see.

Lichens: bioindicators of air quality

Lichens are organisms resulting from the union between a fungus and an algae, establishing a mutually beneficial relationship. In reality, it is a "cohabitation marriage" that lasts as long as the lighting and humidity conditions are favourable. Lichens, therefore, are not plants and in addition to providing food and shelter for numerous living beings, they are bio-indicators, since their presence or absence in ecosystems provides us with information on the atmospheric pollution of the area.

On the Cerro del Hierro they can be found both on the bark of trees and bushes in the form of fluff and on the surface of rocks.

STRUCTURE OF A LICHEN



TYPES OF LICHENS

Trees and skrubs that you will find only here

In the areas on the periphery of the karstic core, among cork oaks, gall oaks, laurestine, black oaks, prickly rockrose and brambles, there are some species that can only be found in very few places in the province of Seville:

The Pyrenean oak (*Quercus pyrenaica*) is a close relative of holm oaks, cork oaks and gall oaks, and stands out as one of the only species of oak found in the province of Seville.

If you look at its leaves you can easily identify it because of its lobed edge and its velvety feel, especially on the underside.

The steppe rockrose (*Cistus laurifolius*) is considered a rarity, as it is the only existing population in the Sierra Morena de Sevilla Natural Park. It has flowers with delicate white petals, leaves reminiscent of laurel and a trunk that looks as if it has been stripped of its bark.

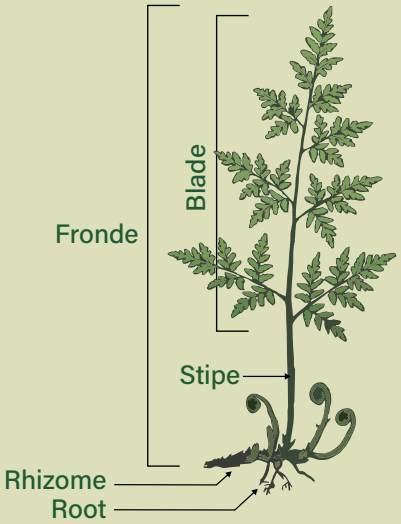
The Pyrenean oak

The steppe rockrose

Ferns: a very ancient family of plants

Within the karst and confined to live in the damp, rocky alleys, we find this group of plants that still retain very primitive characteristics, such as the absence of flowers and seeds and the use of spores as the plant's dispersal strategy.

The existence of these living beings takes us back to a very distant past, more than 400 million years ago, even before the existence of dinosaurs Earth.



Deer tongue
It is so called because of the shape of its elongated, silky glossy leaves with linear sori.

False male fern
Dryopteris affinis subsp. suffinis
The "False male fern" is found in only seven locations in Andalusia, Cerro del Hierro being one of them. Currently listed as VULNERABLE (Red List, 2005)

Natural diversity: warranty of future

Biodiversity

To understand the biodiversity of a territory is to understand that throughout our lives we are accompanied by a multitude of very different living beings, inseparable travelling companions.

The Sierra Morena Natural Park in Seville is a territory where the conservation of natural resources and biodiversity are reconciled. It is precisely for this reason that it has been recognised as a Biosphere Reserve.

The landscape of this region is a veritable jigsaw puzzle of different habitats, ranging from dehesas to riverside woodlands, broadleaved woodland formations, agricultural crops and scrubland. Furthermore, from north to south the natural park is traversed by the rivers Viar and Huesna, the main drainage basins of this area.

All this adds up to a great variety of environments and the capacity to host different species of living beings.

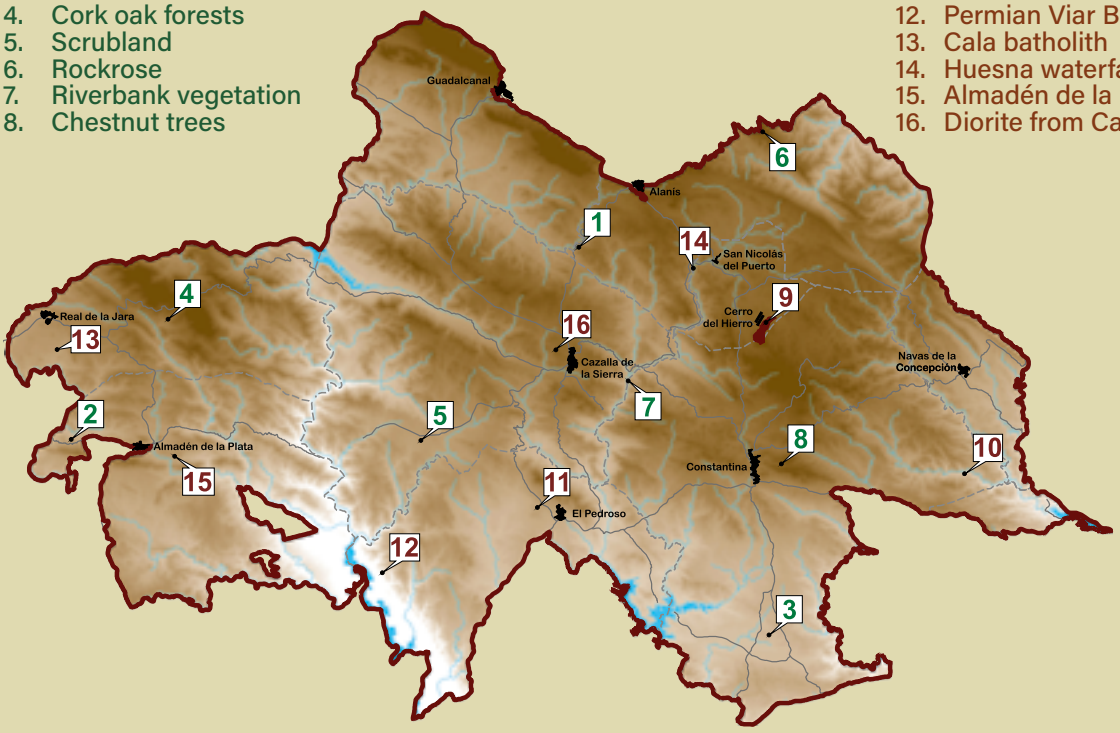
"Life expresses itself in multiple forms and precisely this plurality is biological diversity, it is biodiversity". Miguel Delibes de Castro, Vida.

Some habitats of Community Interest:

1. Dehesas
2. Holm oak forests
3. Pastures
4. Cork oak forests
5. Scrubland
6. Rockrose
7. Riverbank vegetation
8. Chestnut trees

Some Geodiversity hotspots:

9. Cerro del Hierro Karst and Mine
10. Jellyfish tracks
11. El Pedroso batholith
12. Permian Viar Basin
13. Cala batholith
14. Huesna waterfalls
15. Almadén de la Plata oceanic amphibolites
16. Diorite from Cazalla de la Sierra



Geodiversity

To walk through the natural park is to walk through the oldest rocky materials in the province of Seville, dating back to the Primary period.

The diversity of rock substrates (acidic Palaeozoic rocks, basic carbonate rocks, granitic rocks and volcanic rocks) gives rise to a wide variety of soil types, resulting in a greater diversity of plant species colonising the area.

Since 2011, the Sierra Morena Natural Park in Seville has been a member of the European Geoparks Network in recognition of its exceptional geological heritage, boosting geo-tourism and strengthening the economy of the area.

There are currently 17 geo-resources in the Natural Park (Andalusian Inventory of Georesources, 2011) and 32 Sites of Geological-Geotourist Interest (2012).

"As part of our natural and cultural heritage, geological heritage must be another resource for the sustainable development of Andalusia". Andalusian Declaration on the Conservation of Geodiversity.

Biodiversity and geodiversity together make up the planet's natural diversity. The interactions between the two, and with the atmosphere, underpin the ecosystemic relationships of the Earth's different habitats.

Net of life: source of natural resources

We propose that you observe the landscape and stop to read the signals, beyond a simple gaze.

All living beings on the planet live in constant relationships with each other, relationships on which we depend.

Most of the time our eyes are able to perceive it. The natural resources that we will get from our environment come from this NETWORK OF LIFE.

The beautiful landscapes offered by the Sierra Morena de Sevilla are undoubtedly one more resource for sustainable development, due to its tourist attraction, making the landscape a "natural resource" that must be conserved.

But of all the landscapes, one of them stands out for its great value as a source of resources for agriculture and livestock, the dehesa, with cork oaks and holm oaks being the main protagonists.

This is why this territory is part of the Dehesas de Sierra Morena Biosphere Reserve.

BLOSSOM HONEY

Beekeeping is an important activity, which, in addition to obtaining honey, supports the population of bees that are of vital importance to ensure the pollination of the flowers of many plants.

CISTUS LADANIFER

Labdanum or ladanon is a resinous substance with a pleasant and persistent aroma obtained from the prickly rockrose. This natural product is widely used in cosmetics and perfumery, especially as a fixing agent. Spain is one of the main producers worldwide.

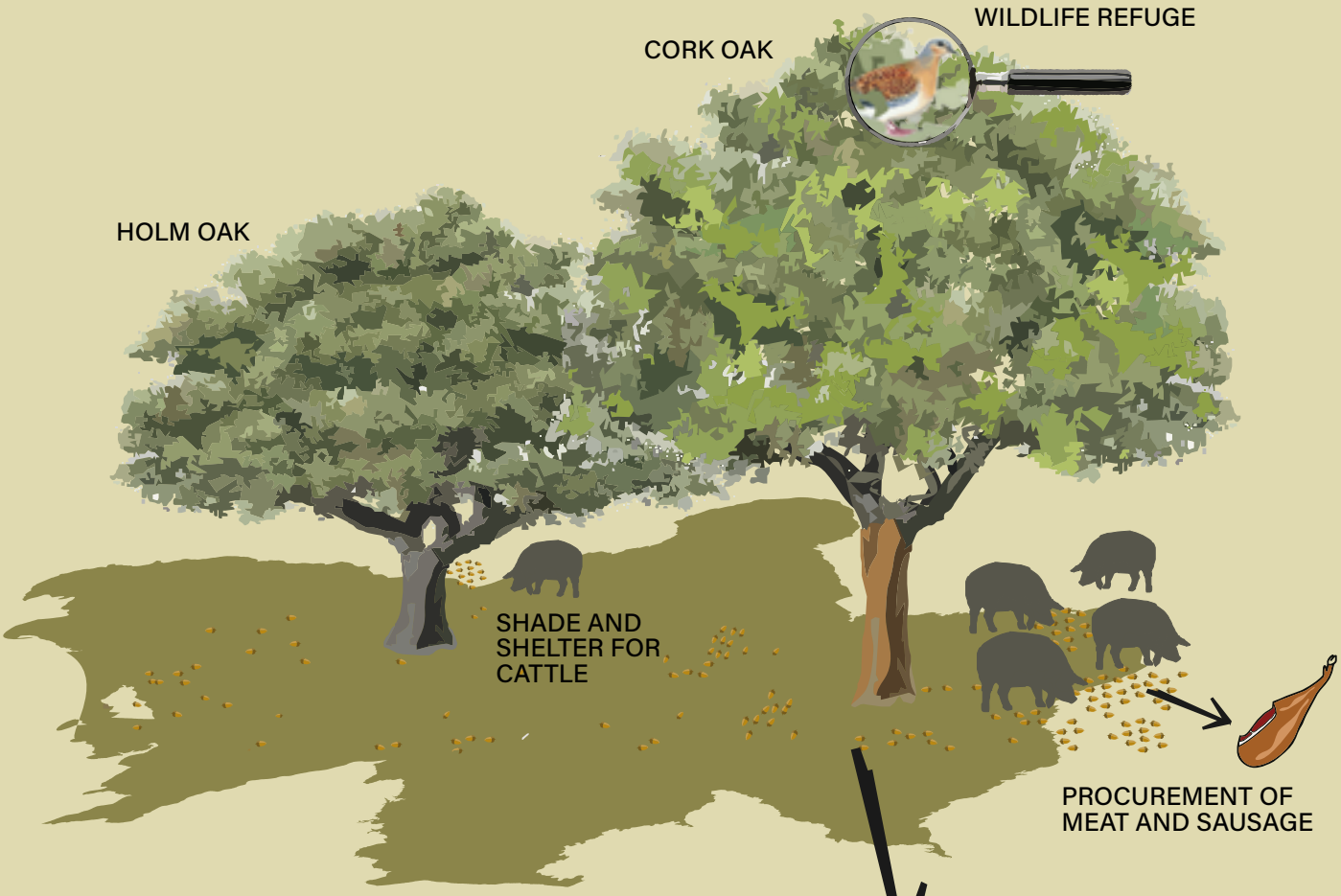
Shepherding: there are still shepherds in our sierras, who continue to look keep cattle, sheep and goats for milk, wool and meat.

PROCUREMENT OF DAIRIES AND DERIVATIVES

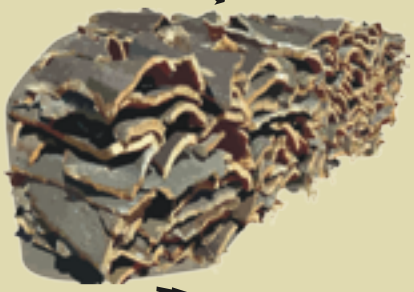
PROCUREMENT OF WOOL TEXTILE

Shearing: around the month of May, shearing takes place to obtain sheep's wool, from which some of the clothes you wear to keep you warm are made.

Acorns: Quality feed for pigs. In November, the holm oaks are still being thinned in some areas, to help the fruit fall to the ground and serve mainly as feed for pigs.

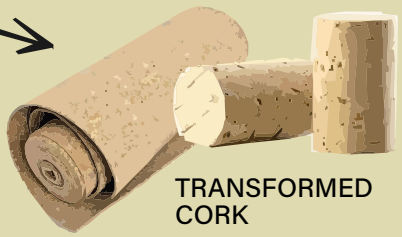


Uncorking: Every 9 years, in the summer months, the cork oak trees are stripped of their protective bark, the cork, by hand. Today there are specialised industries that use cork as a raw material.



PICKING MUSHROOMS
AND ASPARAGUS

OLD BEEHIVE OF CORK



TRANSFORMED
CORK

In contrast to the Sierra de Aracena y Picos de Aroche Natural Park, here the chestnut tree is used to obtain chestnut sticks, which are used to “varear” olive trees, holm oaks and cork oaks, striking and shaking them so their fruit falls to the ground for harvesting.

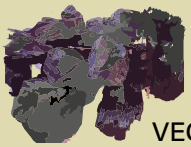
CHESTNUTS

CHESTNUT

CHARCOAL AS FUEL

In April we use the finest branches to make the cisco or picón, firewood for stoves.

In September, the thickest branches and dry trunks are used to prepare charcoal.



VEGETAL COAL

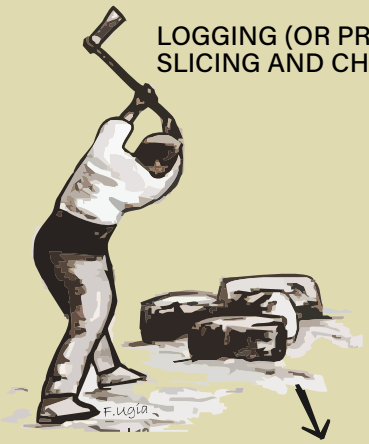
OLIVES

ROD OF CHESTNUT

OLIVE OIL

BUILDING A COAL FURNACE

LOGGING (OR PRUNING), SLICING AND CHOPPING



Pruning, called “tala” locally, is carried out in February, to clean up the tops of the trees when their fruit has already fallen. We also obtain firewood that will be used to heat homes, as well as the raw material for making cisco or picón and charcoal.

FUELWOOD

LIME FURNACE

Fotografía: J.H. Gallardo

Junta de Andalucía

Consejería de Sostenibilidad y Medio Ambiente