Addresses of interest

Los Yesares Visitor´s Centre
C/ Terraplén s/n.
04270 Sorbas (Almería)
Tel. 950 36 45 63

Administrative Office
Natural Park Cabo
de Gata-Níjar Office
C/ Fundición s/n.
04115 Rodalquilar - Níjar (Almería)
Tel. 950 389 742 - 950 389 744
Fax 950 389 754

Sorbas Tourism Centre
C/ Terraplen, 9
04270 Sorbas (Almería)
Tel. 950 36 44 76

Sorbas Town Hall
Plaza de la Constitución, 1
04270 Sorbas (Almería)
Tel. 950 364 109
Fax 950 364 001

Regional Ministry of Environment in Almería
C/ Reyes Católicos, 43
04071 Almería
Tel. 950 012 800 - 950 011 150
Fax 950 012 847

Geology Museum and Learning Centre of the Sorbas Basin
Pedanía Los Alías
04270 Sorbas
NATURSPORT. Sorbas S.L.
Tel. 950 364 481

JUNTA DE ANDALUCIA

Diseño y composición TECNA

REGIONAL MINISTRY OF ENVIRONMENT

JUNTA DE ANDALUCIA

VISITOR´S CENTER

Los Yesares

Sorbas Gypsum Karst Nature Reserve

NATURE RESERVE

Sorbas Gypsum Karst

We are in the Tabernas-Sorbas subdesert in the province of Almería, the most arid region of Europe. The harsh climatic conditions of this environment have forced the plants and animals inhabiting the area to evolve in order to adapt; the result is a biological enclave that is not only rich and diverse, but also unique in Europe for its ecological importance.

The easternmost end of this desert belt cradles, beneath an apparently barren and arid landscape, one of the most beautiful natural sights in Andalusia- the Sorbas Gypsum Karst, protected by decree of the Andalusian Parliament as a Nature Reserve. The site covers a total area of 2,375 hectares, all within the municipality of Sorbas.

It is an undergound world sculpted over thousands of years by the action of rainwater on a thick bed of gypsum rock. There are more than 1000 caves, most interconnected, and a spectacular universe of crystalline formations (speleothems: stalactites, stalagmites, columns, corals, etc.). This gypsum karst landscape is one of the most important in the world due to the impressive size, amount, variety, and quality of karst forms contained therein, to its enormous educational and scientific value, to the caving opportunities, and to speleological investigation.

To all these attributes must be added great ecological value of the world aboveground as well. The arid steppe of the karst is home to plants unique (endemic) to this landscape, such as the ephemeral Sorbas narcissus, the toadflax (Linaria), and the Sorbas sunrose (Helianthemum). Famous as well are the spur-thighed tortoise (Testudo graeca graeca; endangered), the Eurasian eagle owl, Bonelli's eagle, the peregrine falcon, the common kestrel, and predators that are ever more at risk such as the fox, the genet, the badger, and the weasel.

In contrast with this subdesert, towards the valley, along the channel of the Aguas River, the Molinos karst springs create a true oasis. In this humid ecosystem, aquatic fauna such as the Mediterranean pond turtle and the crake dwell surrounded by the extreme arid conditions of the steppe.

This, in summary, is a rich and diverse site that we shall enter to discover more.

Name:	Sorbas Gypsum Karst
Protection:	Nature Reserve
Legislation:	Law 2/1989 (Inventory of Protected Sites of Andalusia), BOJA 60, 27/7/1989
Administered by:	Ministry for the Environment
Surface area:	2,357 hectares
Altitude:	Maximum 467 m.a.s.l., minimum 300
Location:	77° 6' N - 2° 5' W
Municipality:	Sorbas
Population:	residente 326, municipio 3.009
Public facilities:	Visitor's Centre, Museum and Learning Centre of Geology of the Sorbas Basin, scenic routes and marked hiking trails, viewpoints, Tourism Office, private guides for spelunking and hiking tours
Best time of year to visit:	All year round

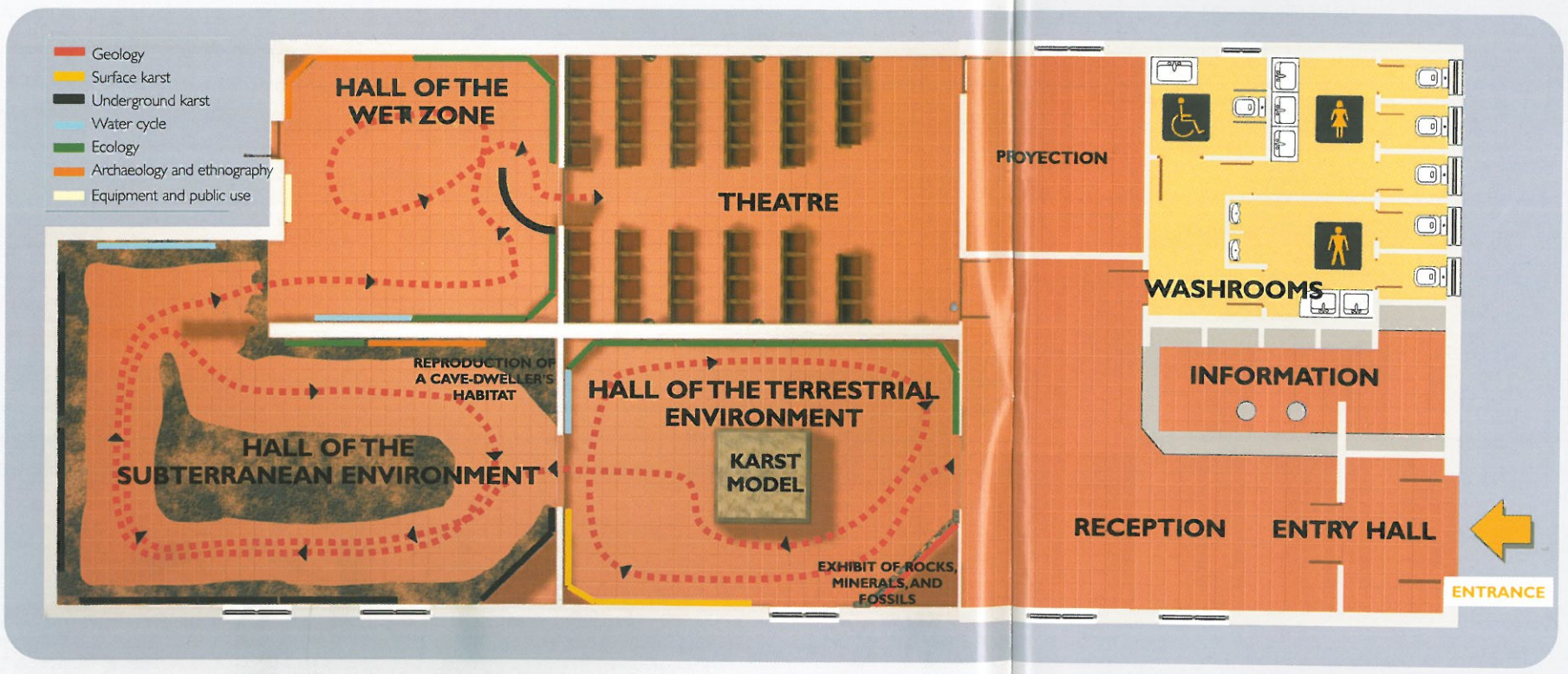
VISITOR'S CENTRE

Layout and tour of the exhibit

The centre's interpretive exhibit is divided into three halls, each dedicated to one of the environments of the area: the world above ground, the underground world, and the wet zone. The visit is completed in the following order, like an actual and complete tour of the site: first we tour the arid steppe; next we descend via any of the 1,000 or more vertical cave entrances to the caverns; last we return aboveground through one of the karst springs that give rise to the wet zone.

HALL OF THE TERRESTRIAL ENVIRONMENT

This hall contains 12 large display panels arranged around a karst model. Each display panel illustrates aspects of this landscape, from the physical environment (the origin of the gypsum, the climate, and the surface karst) to the remarkable universe of the adaptations of living beings to the desert and the karst- the flora and fauna unique to this world.



Six million years ago, this land was covered by a shallow, warm sea in which thick gypsum beds were deposited. Despite the current scarcity of water, the slow, prolonged action of rainwater has yet managed to fashion a very peculiar landscape out of the gypsum. A close look must be taken to fully appreciate the landforms thus generated, however. The surface manifestations of the karst include such forms as dolines and karren.

The permeability of the gypsum allows the rapid infiltration of rainwater into the subsoil. Consequently, the surface landscape is extremely arid. Species (both fauna and flora) have had to develop some original and complex mechanisms of adaptation in order to survive both the desert and the special chemical composition of the substrate, the gypsum. Many forms of life are therefore exclusive to this outcrop of gypsum, which makes it particularly valuable from both a biological and an ecological viewpoint.

HALL OF THE SUBTERRANEAN ENVIRONMENT

The structure of the hall itself is of interest as it is a replica of a gypsum cave, representing any one of the more than 1,000 caves currently identified in the Sorbas karst. Within the hall are 10 display panels providing a tour through the underground world of the Sorbas karst.

The undergound movement of water that initially infiltrated through the gypsum causes a slow dissolution of the rock, thus generating one of the most spectacular underground sights in the world: vertical shafts, pits, halls, galleries, and multiformed recrystallisations. A fantastic universe open to our senses.

The underground karst, though, is not only landforms, but also life-a very special life adapted (or in the process of adapting) to the darkness of a cave. The most well known of these inhabitants are bats, harmless and extraordinarily beneficial animals. The caverns were also home and shelter for our ancestors some 6,000 years ago, in the Age of Bronze. But how did they live?

HALL OF THE WET ZONE

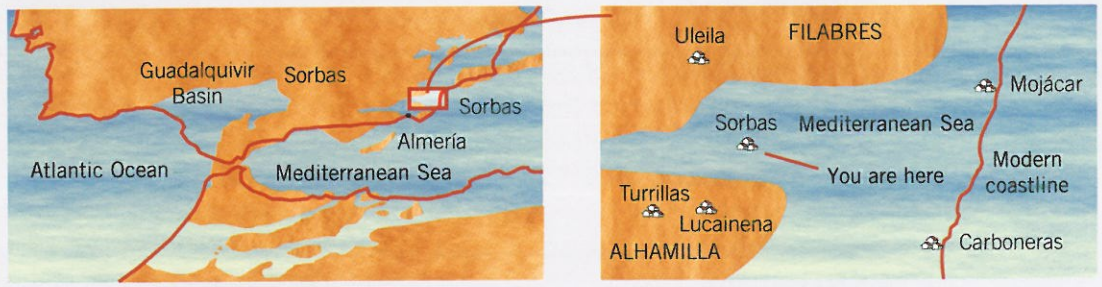
The Wet Zone Hall has 11 display panels on the Aguas River wet zone. The journey of rainwater into the underground world and from thence to the outside world via the karst springs originates a water-rich environment in the valley that has allowed the appearance of a biological diversity in riverbank vegetation and aquatic fauna that is in sharp contrast to the surrounding aridity. In effect, it is an oasis in a subdesert environment. These wet zones associated with the karst are also of great environmental value due to their rarity in this territory.

THEATRE

A film documentary shows the main aspects of interest at this site and summarises the most important information from the previous halls. The only remaining step is to visit the area in person. Be sure to use a guide if visiting the caves.

TERRESTRIAL ENVIRONMENT

The geological origin of the gypsum

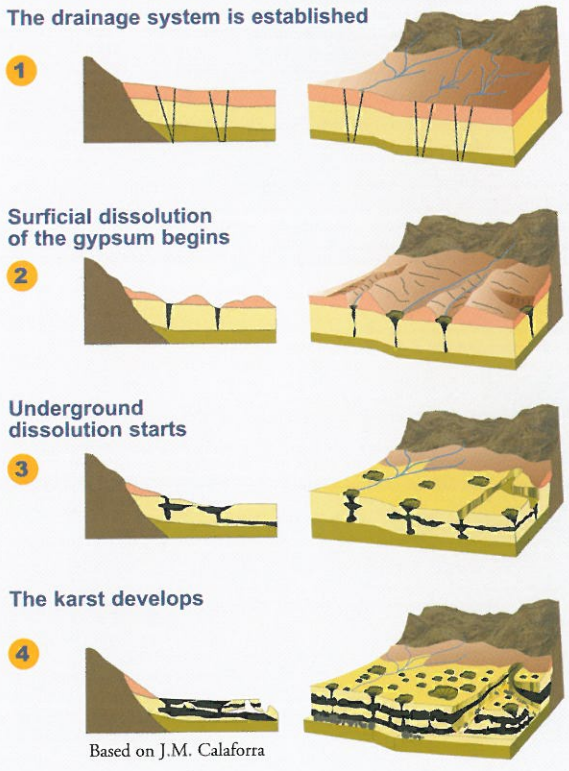


Based on J.C. Braga and J.M. Martín

The distribution of land and sea 6 million years ago.

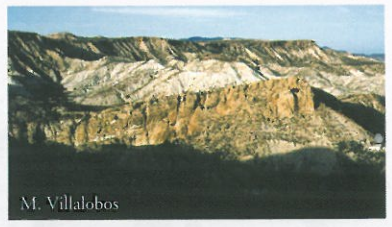
Six million years ago, the Mediterranean Sea invaded the region of Sorbas. Along the coastline grew coral reefs (now fossilized) and on the seafloor there accumulated sediments rich in marine fossils.

Evolution of the Sorbas Karst



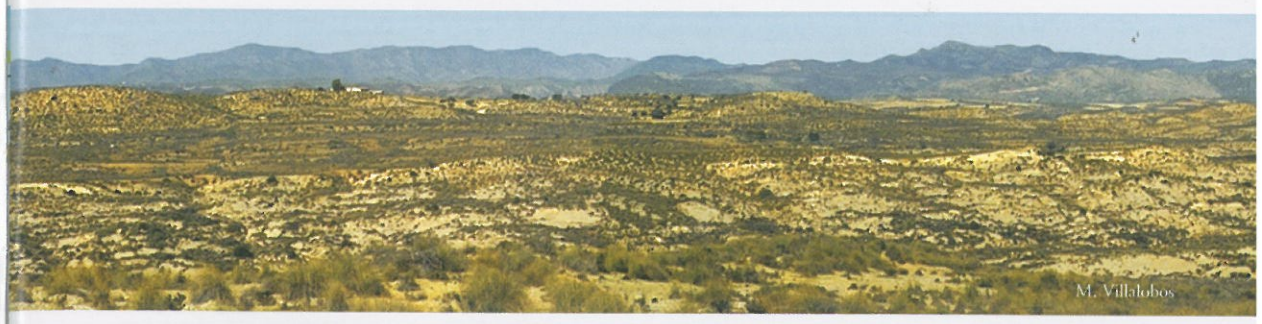
Based on J.M. Calaforra

The sea became very shallow and was subject to intense evaporation, triggering the precipitation of more than 100 metres of gypsum on the seafloor, later covered by other marine sediments.



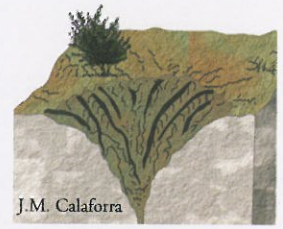
Two million years ago, the sea permanently withdrew from the area, leaving the gypsum and other sediments emerged and exposed to dissolution by rainwater. Thus began the development of the karst.

The landscape and the surface landforms

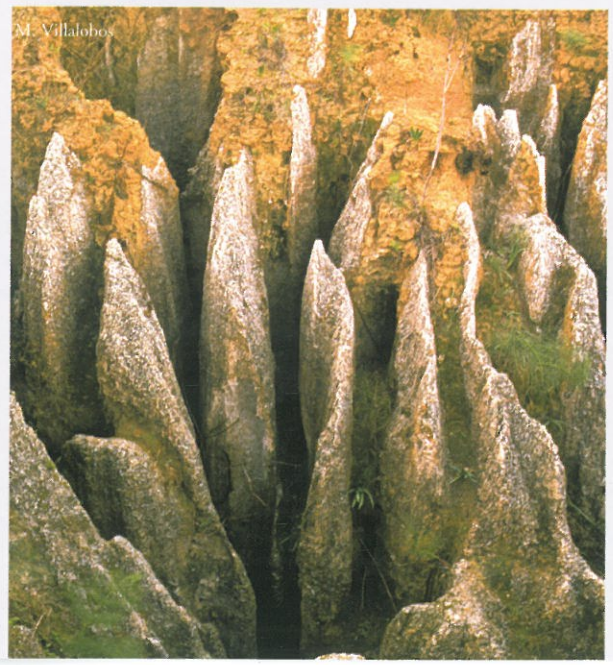


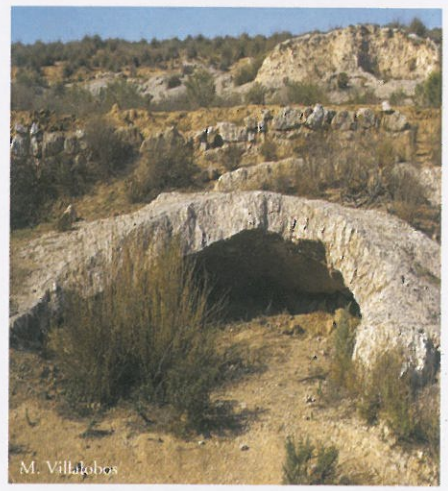
At first sight there is little to indicate we find ourselves before one of the best-developed gypsum karsts in the world. There is an extensive plain, a steep cliff, and the valley comprising the most notable elements of the landscape. Nothing more revealing than that. And the karst? Let us focus our attention on the plain, for instance. Note it is heavily peppered with curious landforms. These forms are due to dissolution of the most superficial gypsum bed. These are the first traces of the karst.

The most noteworthy landforms are a multitude of small, circular depressions studding the plain. These are dolines, the windows of the karst. Most of the dolines have formed due to dissolution or sinking of surficial gypsum layers.



Other evocative landforms are the karren. These shapes are produced as the gypsum is slowly dissolved and small troughs and rills are separated by sharp crests.





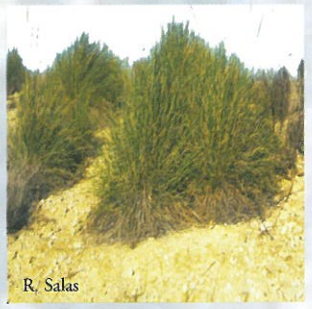
Karst tumuluses are a peculiar form exclusive to the Sorbas karst. They are formed when the superficial layers of gypsum expand outward in a "blister". These blisters form when the crystals increase in volume as they absorb water and swell.

Steppe vegetation

With the arrival of spring, the gypsum shrubland offers the opportunity of enjoying botanical gems unique to this location. Examples include the toadflax (Linaria), a fast-growing annual that produces enormous flowers in relation to its size in order to ensure pollinization.

This zone, the Almerian subdesert belt, is the most arid area of Europe. Climatically, this region is closer to North Africa than to the rest of Europe; it rains only sporadically and very little, scarcely 250 mm/year.

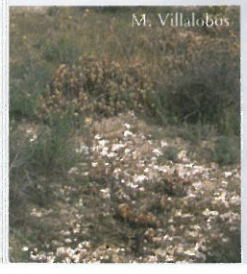
Plant communities have therefore had to adapt to the difficult conditions and some have developed ingenious strategies to search for and store water.



Clumps of broom, esparto or needle grass, gorse, and thyme clearly dominate the scenery in the arid plain and on the dry valley slopes.

The Sorbas sunrose, whose yellow flowers enliven the shrubland of the steppe in the spring, is an extremely vulnerable species also restricted to this area.

The beauty of the Sorbas narcissus, which can only be appreciated a few days a year, is also endemic (exclusive) to this region and is at risk of extinction.



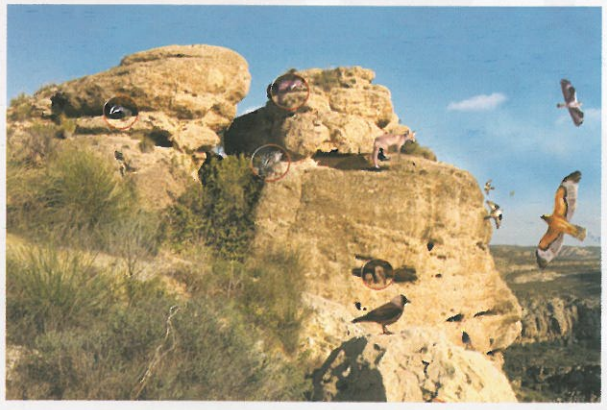
Directly on the gypsum is an obscure world, that of the lichens. These organisms form flat colonies and are visible as variously coloured stains on the rock. Some of these forms of symbiotic life have remained unchanged for the last 200 million years.

Animals of the steppe and the rocky outcrops

Although not abundant in fauna, the steppe contains a high diversity of animals.

The arid Mediterranean climate and the sparse clumps of thyme and esparto grass comprise the ideal habitat for one of the most emblematic species of the southeastern Iberian peninsula, the spur-thighed tortoise. This species is on the verge of extinction. The last remnants of its population are found in enclaves of Murcia and Almería, one of them being the Sorbas Gypsum Karst.

The rocky cliffs and slopes also offer the ideal refuge for other birds and mammals.



The rocky outcrops are the habitat of such birds as Bonelli's eagle, the peregrine falcon, and the common kestrel.

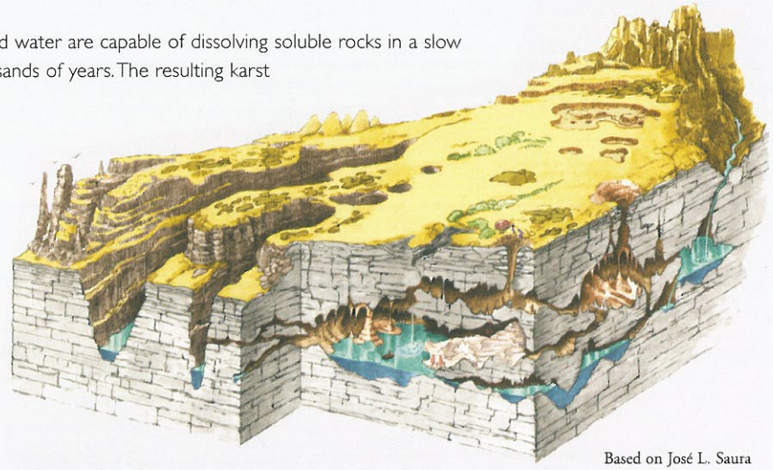
Ever scarcer numbers of predators such as the fox, the badger, the weasel, and the genet also find shelter among the crevices between the huge blocks of gypsum.

THE UNDERGROUND WORLD

A unique subterranean land

Rainwater and underground water are capable of dissolving soluble rocks in a slow process that may last thousands of years. The resulting karst landscape is quite unique.

It is characterised by abundant depressions on the surface (dolines, vertical shafts, etc.) and a complex system of underground networks (caves).



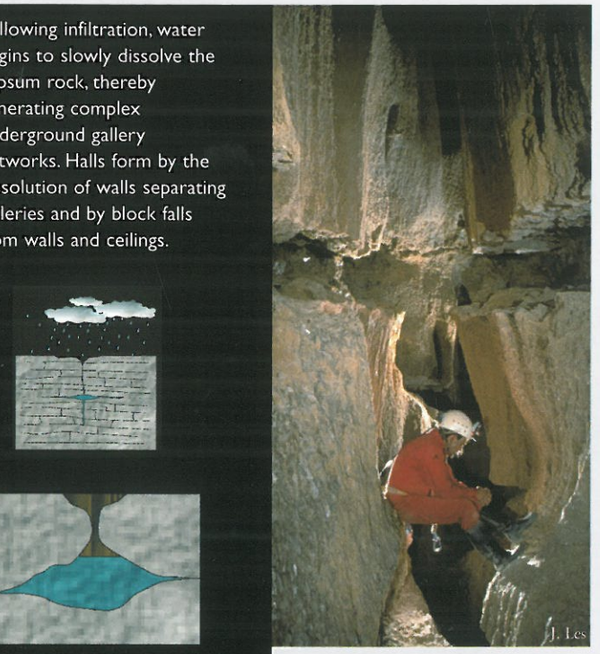
Based on José L. Saura

Gypsum karstification is an uncommon phenomenon in nature, as most of the known karsts are limestones. The Sorbas Gypsum Karst is the most important of its type in Spain and also one of the best-known examples in Europe. It also has an extremely high educational and scientific value in a worldwide context.

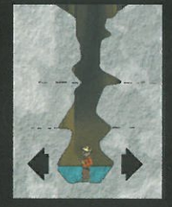
Location of the most important European gypsum karsts

Dissolution shapes, halls and galleries

Following infiltration, water begins to slowly dissolve the gypsum rock, thereby generating complex underground gallery networks. Halls form by the dissolution of walls separating galleries and by block falls from walls and ceilings.

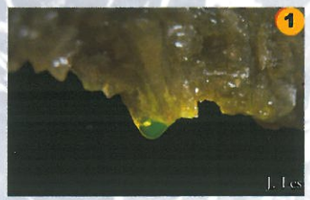


The Cueva del Agua (Water Cave) system has nearly 8,500 metres of passages, making it the largest gypsum cave system in Spain. As elsewhere in Sorbas, this system contains a broad sampling of galleries and halls, extremely varied in shape and type of origin.



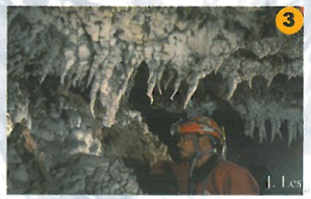
Cave exploration is a very complex undertaking that requires considerable technical training. It is very dangerous to enter the underground world lacking in experience. It is well worth your while to visit this subterranean universe, but make sure you are accompanied by qualified tour guides.

Growth forms: speleothems



Water infiltrates and circulates through the incipient galleries and halls, dissolving the gypsum rock.

In this slow process, the water becomes saturated with gypsum, which then precipitates out as small crystals.



Ceilings, walls, and floors of halls and galleries are covered with a multitude of gypsum crystals in whimsical shapes and colours.

The infiltrated water dissolves the gypsum, becomes saturated, and then crystallizes as extremely fragile forms-speleothems, the most colourful and attractive aspect of the underground universe.

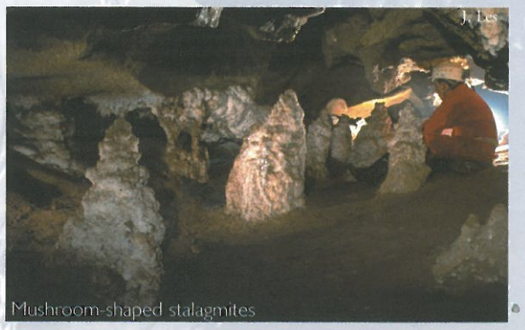
Thousands, sometimes millions, of years have been necessary for nature to shape these unique crystal forms. Respect them, never touch them, and be careful not to damage them accidentally. Their value is inestimable, but only in their original site, as outside that world they lose all value.

Gypsums balls

Pallisades

Gypsum corals

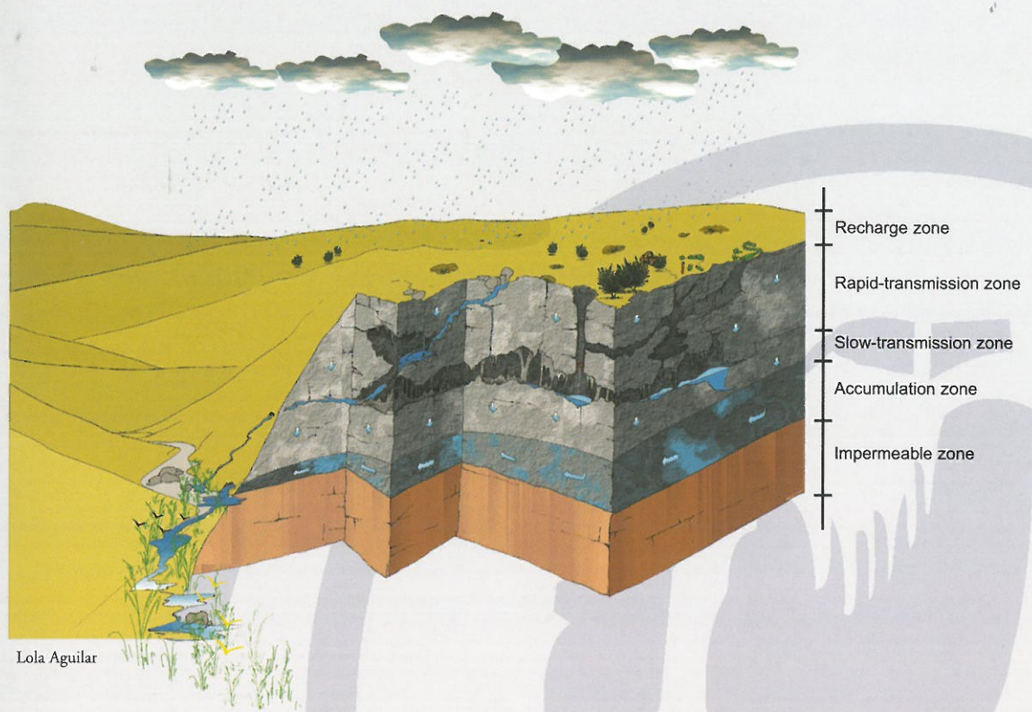
Gypsum rings



Mushroom-shaped stalagmites

Stalagmites

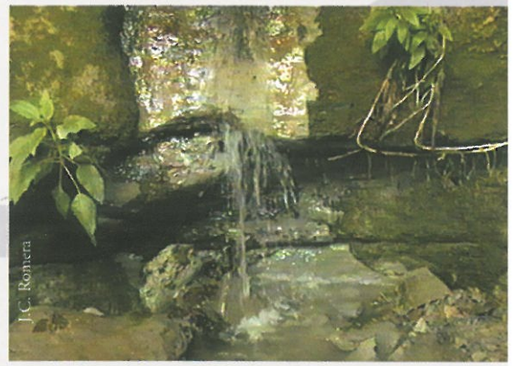
The Karst: a source of water and life



Lola Aguilar

The karst functions like a huge sponge, gathering and storing all the rainwater, then later expelling it through springs. These karst springs are a source of water, fertility, and life itself. This is especially true in a subdesert environment such as that of Sorbas.

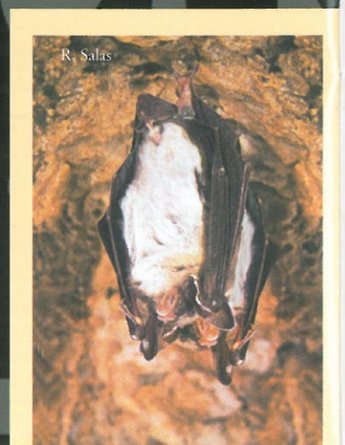
Supply galleries in the springs of the Molinos del Río Aguas.



Cueva del Agua (Water Cave) spring.

Cave-dwelling fauna

Caves are home to very special animals adapted to life without light. The most noteworthy are undoubtedly bats, which have developed a system for transmitting and receiving soundwaves to fly and locate their prey. All bat species are protected.



BATS FLY WITH THEIR ARMS AND SEE WITH THEIR EARS. THEY ARE INOFFENSIVE AND VERY BENEFICIAL. PROTECT THEM.

The prehistoric humans of the Sorbas caves

The early inhabitants of the Sorbas caves left visible traces of their presence: food, tools and weapons, graves, funerary goods, and so on. Thanks to these remains, we can know them a little better. These caves were used as a refuge during the Neolithic, in the Age of Bronze, a period known for the discovery of metal-working. But how did these ancestors live?

They worked metals such as copper, transforming it at high temperatures within a clay or stone mould. In this fashion they made weapons, tools, farming utensils, and personal adornments.

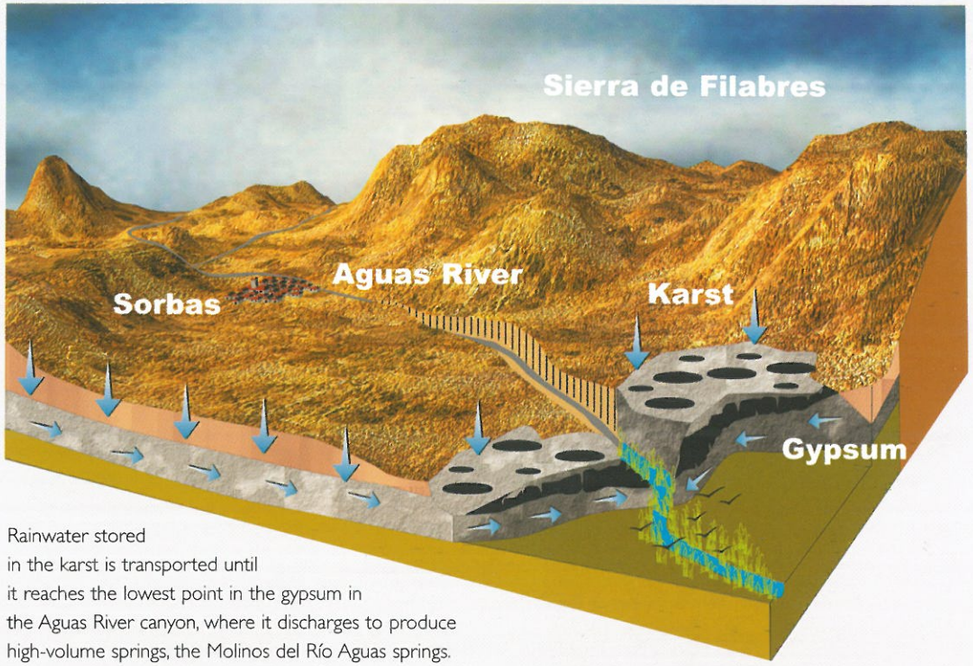
They used the caves as dwelling and shelter, but these populations already farmed and kept domesticated herds as well as hunting and gathering.

The most inaccessible parts of the caves were used as improvised burial sites. In these collective graves, funerary goods were placed next to the bodies.

Drawings based on: Gabinete Pedagógico de Bellas Artes de Granada

WET ZONE HALL

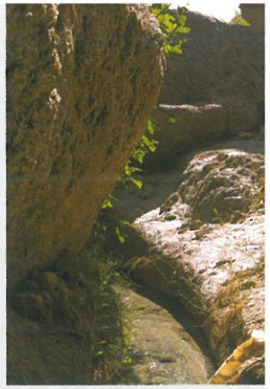
Molinos spring: the origin of the wet zone



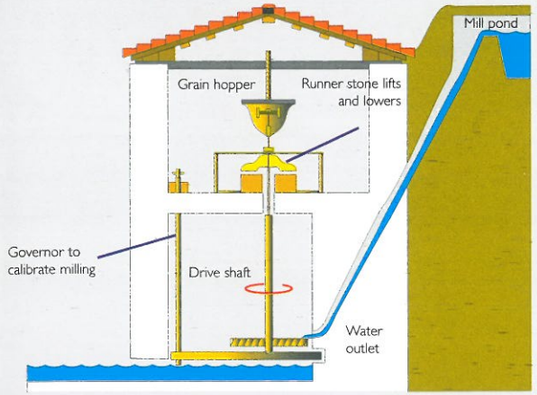
Rainwater stored
in the karst is transported until
it reaches the lowest point in the gypsum in
the Aguas River canyon, where it discharges to produce
high-volume springs, the Molinos del Río Aguas springs.

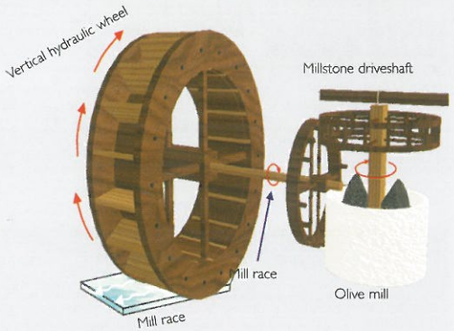
The constant presence of water in this arid environment produces an 'oasis effect' and generates an extremely important ecological wet zone.

The water and its uses



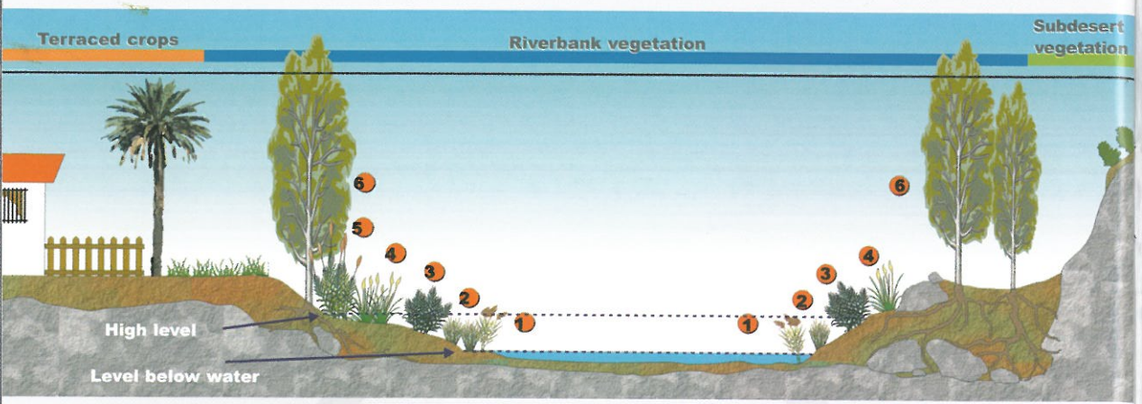
The Molinos del Río Aguas takes its name from the abandoned water-driven flour mills at the bottom of the ravine, directly below the springs. Here, from as long ago as the Arab period, crops of olives, cereals, and grains were milled for the county.



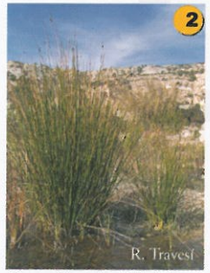


The Arabs, who were expert hydraulic engineers, improved water flow from the springs by excavating tunnels or galleries in the compact gypsum rock. These continued in a system of races that conducted the water to the water mill and from thence to the orchards on the fertile terraces along the river.

Vegetation in the wet zone



The Common Reed (Phragmites australis)



Round-headed Club Rush (Scirpus holoschoenus)

Oleander (Nerium oleander)

Ravenna Grass (Saccharum ravennae)

Giant Reed (Arundo donax)

Past the canyon, the valley widens and the water runs faster. On the banks, sediments are deposited, making the soil thicker here. Larger plant communities grow here: riverbank woodlands. They are distributed in parallel bands alongside the river.

White Poplar (Populus alba)

Aquatic life

Crake

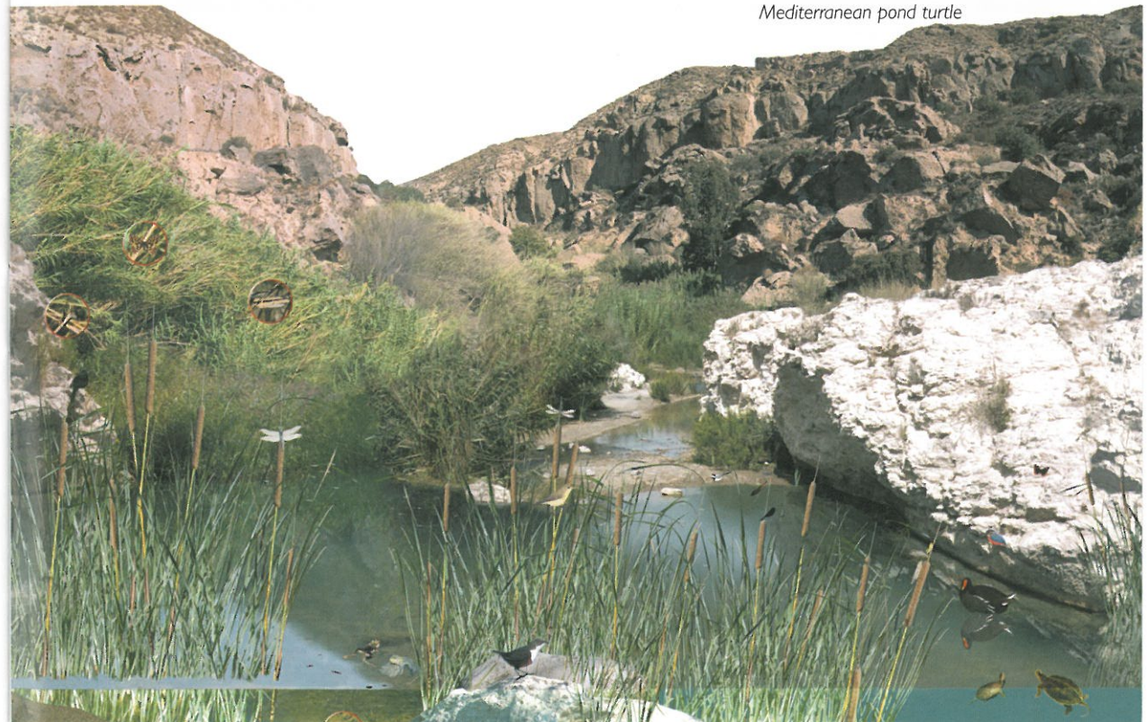
The flora and fauna of the wet zone contrast sharply with the steppe-like landscape of the karst plain and its arid surroundings. The luxuriant growth and high variety of aquatic organisms are, of course, quite different from those on the steppe and provide the Nature Reserve with a great ecological value due to the extremely high biological diversity found in the two contrasting environments.

Freshwater molluscs to varied aquatic insects nourish a healthy colony of aquatic birds that includes reed-warblers, coal tits, common kingfishers, and crakes. An amazingly exotic fauna for a subdesert land.

Viperine snake

In the perennial pools of water, under the secure shelter of the fallen blocks of gypsum, can be found the viperine snake, the Iberian green frog, and an aquatic predator-the Mediterranean pond turtle.

Mediterranean pond turtle



CUSTOMS AND TRADITIONS

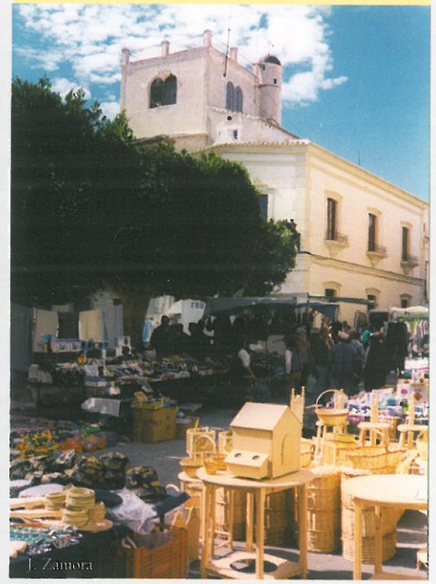
The village of Sorbas is a scant two kilometres from the Nature Reserve. It was built on a small plain cut by the current ravine of the Aguas River and an abandoned meander.

This unusual topography has resulted in the characteristic location of its houses overhanging the ravine surrounding the village.

The traditional craftswork of Sorbas has survived for centuries. In the "Barrio de la Alfarería" (Pottery Quarter) there are still some Arabic wood-fuelled kilns where clay pots of a high quality are fired.

The urban layout is also typically Arabic, with winding hills and white lanes.

Some of the traditional festivities that are well worth seeing include Carnival, Ash Wednesday, Easter Week, The Crosses of May (May 1), Our Lady of Fatima (May 13), The Procession of Saint Isidro (May 15), and the patron saint festivities of Saint Roque (August 14-17).

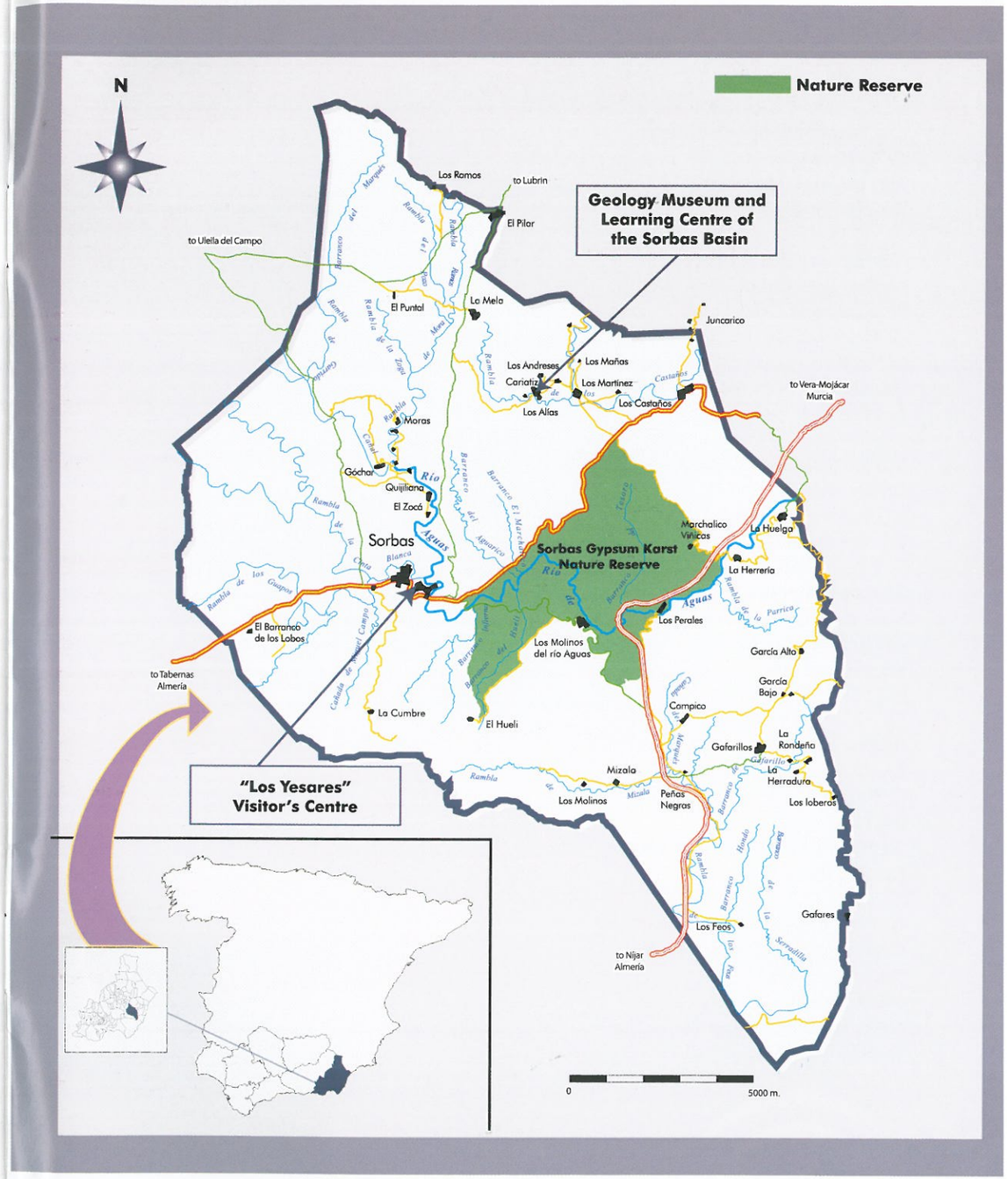


Thanks to El Rincón Restaurant

Local cuisine is rich and varied and encompasses such dishes as migas (fried breadcrumbs with garlic), gachas or gurullos (flour cooked with bacon or liver, olive oil, and water), ajipán or ajo colorao (a potato stew with paprika that may contain chorizo), cocido de trigo (meat stew, often rabbit, with wheat). Desserts typical to the region will also delight the visitor.

LOCATIONS OF PUBLIC INTEREST

1. Tourism centre
2. Plaza de la Constitución
3. Town Hall
4. Church
5. Las Cruces viewpoint
6. Porche viewpoint
7. Mirador Street
8. Castle viewpoint
9. House of the Marqués de Carpio
10. Huerta viewpoint
11. Torreta viewpoint
12. Villaespesa Theatre
13. House of the Duque de Alba
14. Caños Fountain
15. Pottery studios
16. Park
17. Plaza de Abastos
18. San Roquillo Chapel
19. Municipal pool
20. Health centre
21. Red Cross
22. Gas Pump
23. Los Yesares visitor's centre



Translation: Christine Laurin