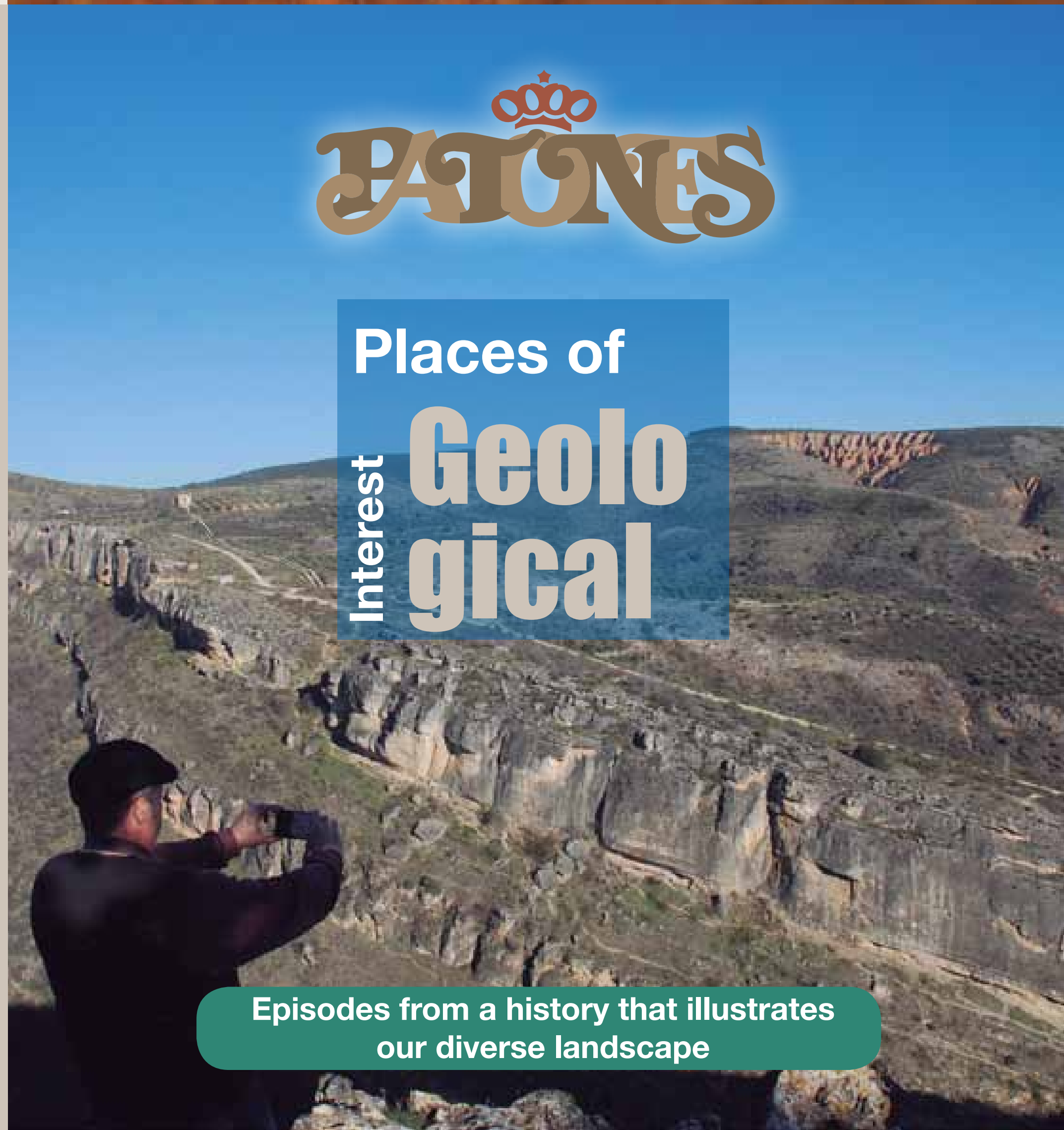


Places of Interest Geological

Episodes from a history that illustrates our diverse landscape

Patones, places of geological interest

The memories preserved in the land mean we can understand how it was in the past by looking at the landscape today. This journey back in time will transport us to seabeds, tropical beaches and savannahs, but also to a history that reveals curious facts about our cultural heritage and explains the singularity of the local architecture.

Patones, located at the confluence of the Lozoya and Jarama rivers, is characterised by its exceptional geodiversity, and is home to a wide variety of rocks with different origins, formations and structures.

The story told by the special geology of this area began unfolding millions of years ago, and over the millennia has given rise to the reliefs, rocks and active geological processes we see today. Our landscape and land uses are to a large extent the result of this geological legacy.

There is a QR code with more information for each place of geological interest.
Also available in audio

1.Barranco de Patones gorge

The current landscape is the result of the never-ending action of the water

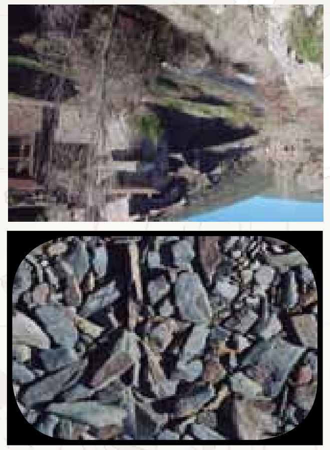
This typical mountainside ravine, known as Las Calerizas, is an example of various materials and processes associated to water. On the way down from Patones de Arriba, we see the erosion of the slate in the river bed, its transport down the drainage channel in the ravine itself, and the sedimentation that forms the alluvial fan once it reaches the river plain.

The oldest materials can be seen in the upper part, in the typical black slate on the houses in Patones de Arriba.

In the ravine, caves and other karstic forms have been carved out by the water seeping into crevices in the limestone.

The end of the ravine in Patones de Abajo is the site of deposits of mainly slate fragments, producing the alluvial fan on which olive groves and vineyards grow today.

2. Silted dam



Our traditional architecture is the result of our geology

The characteristic rocks of Patones de Arriba are the remnants of a seabed where very fine clay was deposited over the ages, before being transformed by pressure and temperature into the metamorphic rocks known as slate.

The passage of millions of years has caused the dramatic erosion of the slate, as is evidenced by this silted dam.

This is an ideal place to observe the nature of these blackish Palaeozoic rocks arranged in layers and covered with sparse vegetation, basically cistus scrubland.

Slate is closely associated with the origins of Patones, whose typical architecture harks back to the pre-Roman cattle-farming settlements with their characteristic cattle shelters which have evolved into the current tile-roofed two-storey dwellings built after the 18th century.

3. Contact between materials in the cemetery of Patones de Arriba

There are places where we can see the connection between the different moments of our geological history

Following the path in the area around the cemetery there is clear evidence of this contact between materials: we see the Palaeozoic slate formed from clay buried at great depths, changing its composition and orientation; and the Cretaceous marine-origin limestone typical of the hillsides of Las Calerizas.

On the path itself, below the limestone sand created over the passage of time, we can still see highly altered slate with an ironstone crust that has been practically transformed into kaolin clay.

Very nearby stands the old Patones de Arriba tile works which once produced curved roof tiles.

4. Arroyo de Las Cuevas gorge

This is an exceptional place for learning more about the geological events taken place over a period of 65 million years

From the path we can see clearly defined layers of limestone. For geologists, these strata are like the pages of an open book, as they offer the most complete sedimentary record of the Cretaceous period in Madrid.

These strata, now tilted at an angle of 30-40° SE, were formed 65 million years ago in a shallow marine area. Rudist fossils can be found in the limestone, and they take us back in time to a tropical climate that encouraged the formation of reefs in the Tethys Sea, the forerunner of the Mediterranean.

At the end of the Cretaceous era came a period of intense geological activity that thrust up a mountain range as high as Mount Everest, and tilted the limestones.

Geological history of Patones

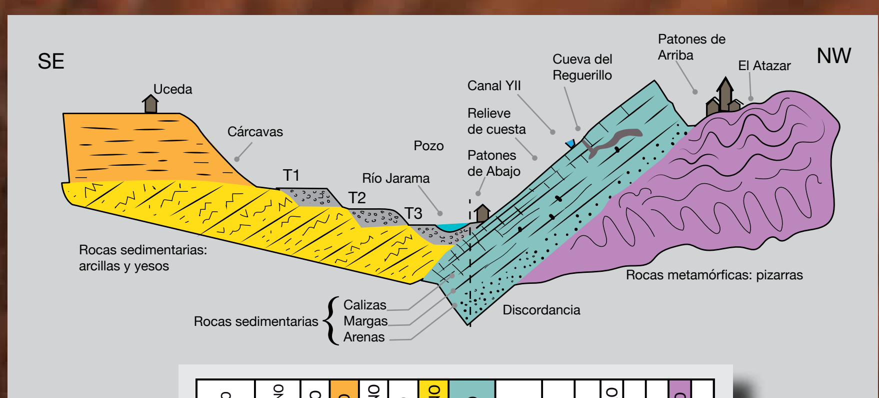
The rocks in the area around Patones tell the story of the four periods into which geologists divide the history of the Earth.

The slate we see in the north are rocks that were buried at a great depth and only became visible due to the upthrust of the Sistema Central mountain range. They offer a glimpse of ancient landscapes dating from around 500 million years ago (Palaeozoic).

The slopes that mark the separation between the mountains and the river plain are formed by limestone, limonite and dolomite, which contain rocks and fossils that recall the tropical climates and warm seas and beaches of approximately 65 million years ago (Mesozoic).

Near the river towards the south we find a series of very useful rocks such as gypsum, sandstone and clay, the result of climates and episodes occurring over 25 million years ago (Tertiary).

The river and stream deposits are indications of more recent climate changes occurring in the last two million years (Quaternary).



HOLOCENO	PLEISTOCENO	PLIOCENO	MIOCENO	OLIGOCENO	EOCENO	PALEOCENO	CRETÁCICO	JURÁSICO	TRIÁSICO	PÉRMICO	CARBONÍFERO	DEVÓNICO	SILÚRICO	ORDOVÍCICO	CÁMBRICO
CUATERNARIO		TERCIARIO													
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CENOZOICO							MESOZOICO			PALEOZOICO					

* MILLONES DE AÑOS

Discover Patones through guided visits at the tourist office:

- Patones de Arriba
- Dramatised routes
- Geological classroom
- Themed walks
- Guided visits for school groups and organised groups

Prior reservation is required for all these activities at the tourist office or in the Town Hall:

Tourist office (CITECO)
Plaza del Llano nº 2.
28189 Patones, Madrid
91 843 29 06
(Saturday, Sunday and public holidays)

Town Hall:
Plaza de la Constitución nº 1.
28189 Patones, Madrid
91 843 20 26
(Monday to Friday)

E-mail: turismo@patones.net
Web: turismo.patones.net

Comunidad de Madrid

Ayuntamiento de Patones

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4 Arroyo de Las Cuevas gorge
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6 Cerro de la Oliva, eroded landforms, cutting through the Lozoya River
7 Abandoned meander
8 Presa de El Atazar dam

Access on foot

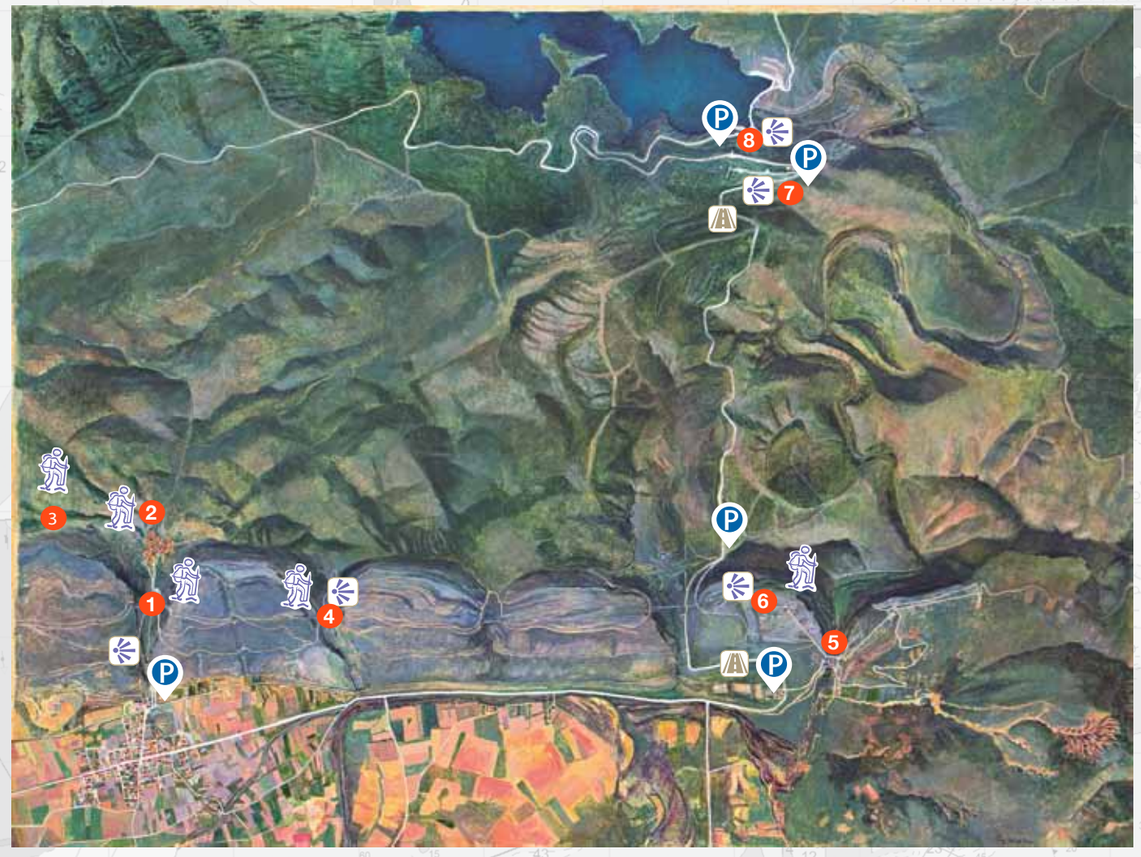
Parking

Access by road

Viewing point

Recommendations

- Make sure to wear comfortable footwear and suitable clothing for each season of the year.
- Don't forget to take water with you.
- Show respect for nature and make sure you leave no traces or signs of your presence in the landscape. It is everybody's responsibility to safeguard and conserve our natural heritage.
- Don't disturb the tranquillity of this natural space. It is forbidden to kill, harm, disturb or upset any animal species. In the nesting period from March to July, please show the utmost consideration for birds. If you find a wounded animal, call the Wild Animal Recovery Centre (Centro de Recuperación de Animales Silvestres) at 912760626.
- It is not permitted to tear off, cut, uproot or pick any part of any plant specimen, including branches, flowers, fruits and seeds
- It is not permitted to remove, destroy or alter anything



5. Pontón de la Oliva, Reguerillo Cave

The characteristics of limestone have led to a series of natural and historic events

In less than two million years on its way across the limestone hillsides of the Pontón de la Oliva, the Lozoya River has carved out a gorge over 160 metres deep. During the Pleistocene era, this gorge was home to hippopotamuses, macaques and a type of hyena, making it the oldest Quaternary site in Madrid.

As the river became embedded, it uncovered various cavities like the Reguerillo Cave. The limestone found here is at an advanced stage of karstification, which has produced up to three distinct levels and over eight kilometres of galleries.

Abundant fossil remains have been found in the cave, along with the bones of cave bears and rock etchings.

This point at which the Lozoya River cuts through the limestone must have looked like the ideal place to make a dam. So the oldest dam in Madrid, the Pontón de la Oliva, was built here between 1851 and 1858, in the reign of Isabella II. This project was destined for failure as it was built on a karst system with conduits and caves, causing constant leaks.

6. Cerro de la Oliva, eroded landforms, cutting through the Lozoya River

A look back at our past

The Cerro de la Oliva hill above the Reguerillo Cave is in a strategic position near the confluence of the Lozoya and Jarama Rivers, and has been inhabited for thousands of years. There is archaeological testimony of hunters from the Upper Palaeolithic; farmers from the Neolithic, and the earliest metalworkers from the Bronze Age. The upper part of the site is a Roman city, on top of which was built a Visigothic necropolis.

Different sites of geological interest can be seen in this strategic location. If we look out over the Lozoya River we can see the vast vertical walls of the limestone canyon, which is popular with climbers.

Looking towards the north-east we can catch a glimpse of the erosional rock formations known as "cárcavas". Their orange colour is due to the clay deposited on an alluvial gypsum formed in a warmer drier climate, typical of the Tertiary era. The rainwater creates gullies that carve through these terrains, and as the harder materials are more resistant to erosion, it produces formations in the shape of towers or pyramids, known as fairy chimneys.

7. Abandoned meander

A small goldmine for students of geology

From this viewpoint we can clearly make out the winding course of the Lozoya River as it flows between the slate. The curves formed by the riverbed are known as meanders and are produced by erosion and the deposit of sediment due to the unceasing action of the water.

Hidden in the landscape we find an abandoned meander, which is formed when the erosion dynamic causes the water to deviate from its previous course and to begin to flow along another shorter route. In this abandoned riverbed we can see small half-moon shaped lakes that may seasonally fill with water.

Geology is continually evolving, and although it cannot be perceived on the human scale, possibly another meander will be formed in another few thousand years, and the river will alter its course once again.

From this interesting vantage point for the study of geology, if we look towards the south-east we can also see the sloping limestone reliefs supported on slate above the eroded formations of the "cárcavas" formed from the clays and gypsums of the Tertiary era.

8. Presa de El Atazar dam

Geology in an imposing hydraulic construction

The dam was built in 1972, and stands 134 m high with a crest of 484 m. It is a double-curvature arch construction with an extensive network of over 8 km of inspection galleries on its interior. It holds 45% of the total water in the region (425 hm3).

The black slate surrounding the dam is evidence of a sea dating back almost 500 million years ago. The fine clay sediments on the seabed were compressed and subjected to high temperatures until they were transformed into homogeneous slate with a high degree of foliation. These slates are formed by microcrystals of mica and quartz.

These geological characteristics led to complications on both banks during the building of the dam.

On the right, the parallel foliation of the slate was found to be unstable against the thrust of the dam, and had to be strengthened with nine reinforced concrete beams with anchors 230 mt and 50 m long. On the left bank, the presence of a practically vertical fault running parallel to the floor of the dam had to be resolved by draining through four excavated galleries.