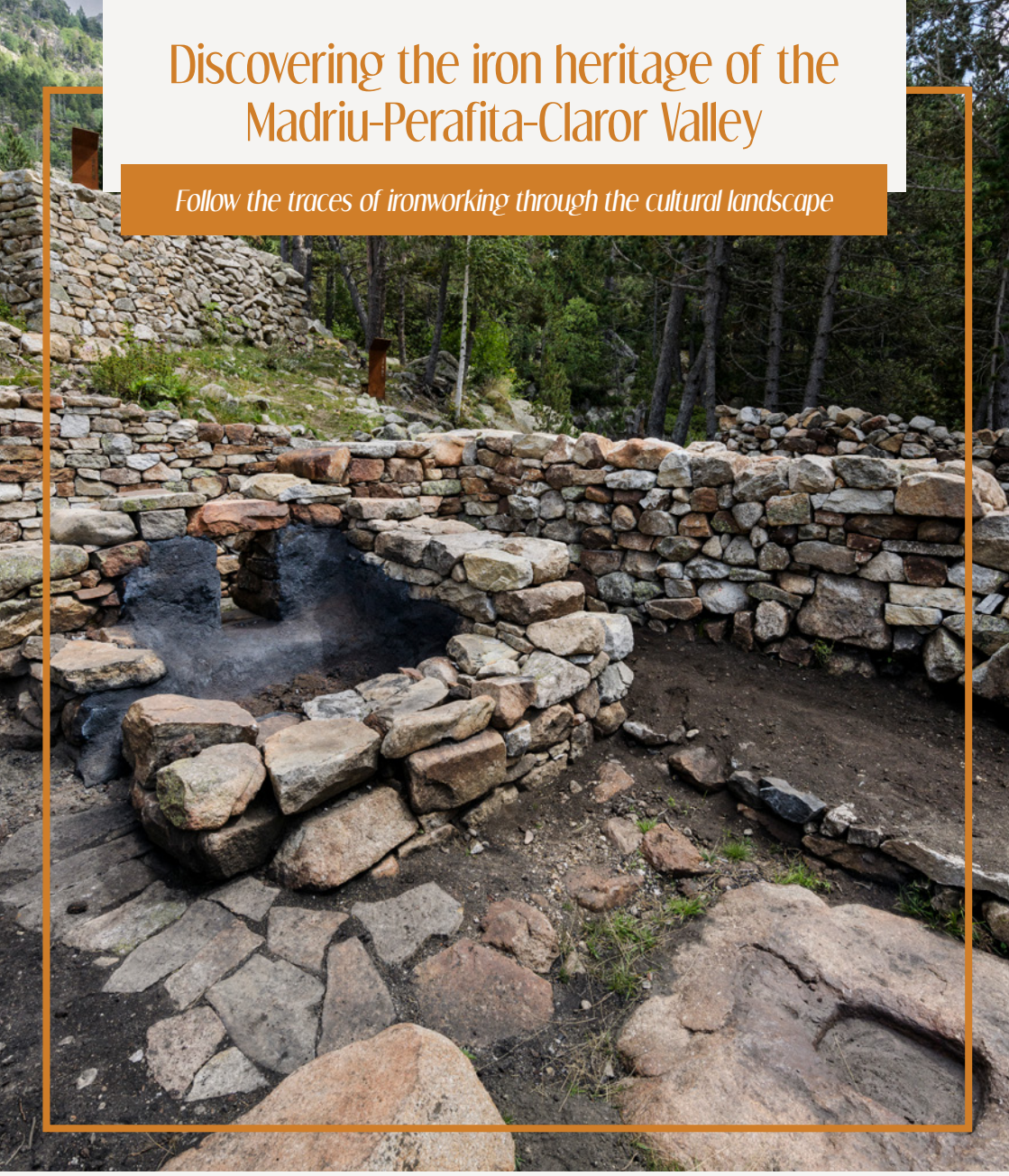
Discovering the iron heritage of the Madriu-Perafita-Claror Valley

Follow the traces of ironworking through the cultural landscape



Vall del Madriu-Perafita-Claror

unesco
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Pirinioetako **Burdinaren Bidea**
Ruta del Hierro en los Pirineos
Route du Fer dans les Pyrénées
Iron Route in the Pyrenees
Ruta del Ferro als Pirineus

Cultural route
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Itinéraire culturel
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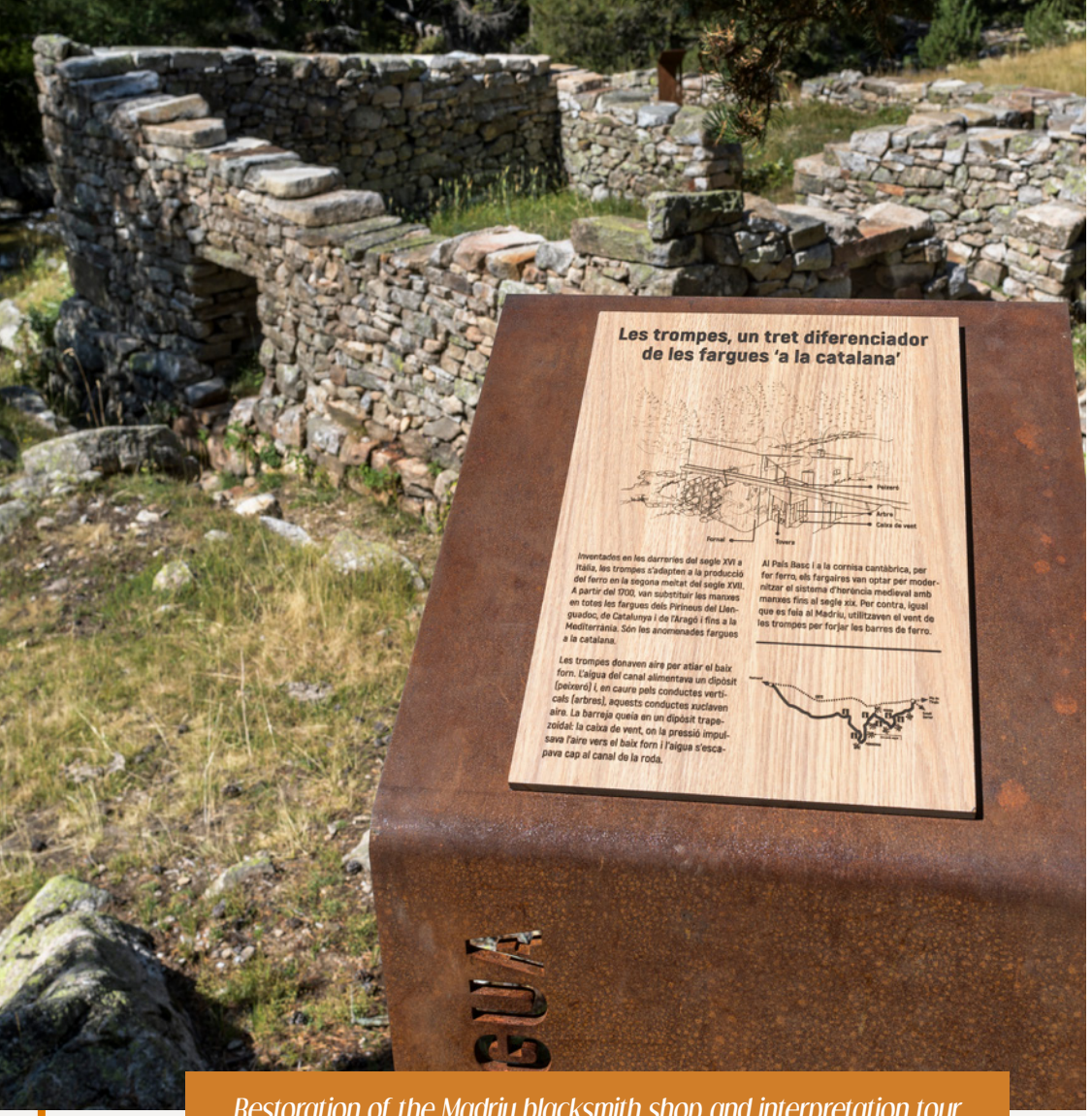

Restoration of the Madriu blacksmith shop and interpretation tour

D.L. AND.278-2025
ISBN: 978-99920-82-21-8

Texts: O. Codina Vialette (Patrimoni Cultural)
Images: Àlex Tena (MIRA audiovisual) and Patrimoni Cultural d'Andorra

Follow the traces of ironworking through the cultural landscape

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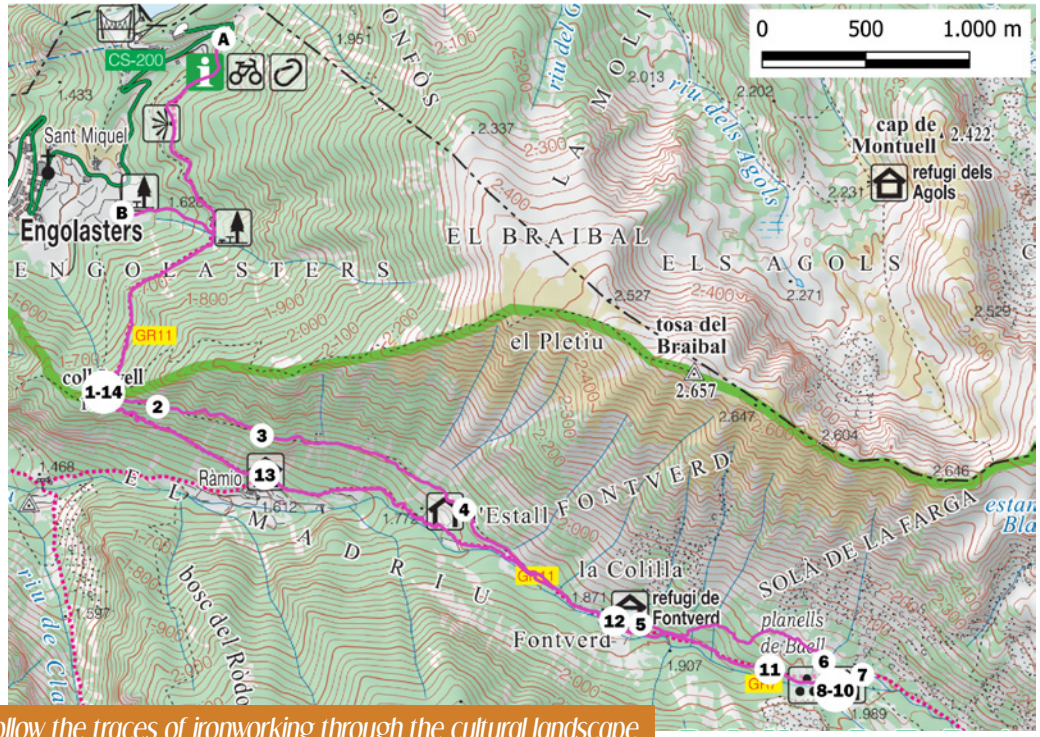
Abbreviated Glossary

Circular interpretive itinerary from Coll Jovell

following various paths of the valley. Two departure points are proposed:

Start A: from the Engolasters plain to the Closa spring (alt. 1.520 m / coord. 537042.667,24439.014 EPSG:27563 / 42°31'02"N 1°34'18"E EPSG:4326).

Start B: from the Fonts trail parking (alt. 1.630 m / coord. 536549.444,23608.109 EPSG:27563 / 42°30'34"N 1°33'53"E EPSG:4326).



Follow the traces of ironworking through the cultural landscape

We climb to Coll Jovell

Elevation gain / Length: + 157 m / 1.535 m and + 265 m / 2.255 m

Discovering the iron heritage of the Madriu-Perafita-Claror Valley (VMPC)

Durant la pujada, a l'obac d'Engolasters i al solanet de Ràmio, travessarem els darrers espais On the way up, in the shaded area of Engolasters and the sunny slope of Ràmio, we will cross the last charcoal production sites used by the forge. We will see traces of some of the platforms* where wood was turned into charcoal. On the opposite slope, across the river, from the head of the Madriu to the upper part of Perafita-Claror and Astrell pass, lie the other forests that once fed the forge, later used by sawmills to supply construction timber to the country.

Further up, beyond the Baell meadows, nearly 2,000 meters above sea level, we will be in the center of the production area, where the forge site that produced raw iron and the hammer mill that processed the metal into ingots are located. From there, on the way back, we will follow a variant of the route used to transport the metal distributed in Catalonia. At Infern pass and Fontverd, among other places, the accumulation and variety of archaeological structures visible in one location will show us how charcoal burners, shepherds, farmers, and woodcutters coexisted and shaped the VMPC landscape.

GENERAL RECOMMENDATIONS

It is recommended to wear suitable clothing and footwear for mountain hiking, bring food and water, and sun protection.

The hike has a medium difficulty level and includes elevation changes and uneven terrain. From Closa, the route totals 12 km, and from Fonts, 13.5 km. Not recommended for children under 8 or people with reduced mobility.

CULTURAL HERITAGE

This hike runs through a protected cultural landscape, and all traces of human activity are considered archaeological reserves. They are fragile and must be respected. Avoid any behavior that could damage them. Except in marked shelters or public bivouac areas, do not enter any buildings, huts, or abandoned constructions (ruins). Observing them does not require entering.

Climbing on dry-stone walls is strictly prohibited.

**cf. Glossary*

1 Coll Jovell. The VMPC, a protected area

Coord. 536463.293,22739.473 EPSG:27563 / 42°30'06"N 1°33'49"E EPSG:4326

We have crossed the cultural landscape protection area and are entering the cultural heritage site. Human activity has developed here since prehistory. Livestock farming and agriculture, later iron and steel production, and finally, tourism have prospered here. The valley has provided cereals, game meat, fish, berries, plants, mushrooms, grass for livestock, tobacco, pitch, charcoal, wood, and iron. Today, it supplies Escaldes-Engordany with drinking water and participates in national electricity production.

It looks like a natural setting, but the landscape has been shaped by human activity. Most Pyrenean areas are the result of a symbiosis between nature and culture, and the integral conservation of the testimonies of this history gives the VMPC an exceptional character. In 2004, the Andorran State committed to safeguarding its cultural values for future generations and inscribed it on the UNESCO World Heritage List *. Later, the 350 wetlands with habitats and species of fauna and flora of great interest constituted the second area in the country to be designated as an internationally important site by the Ramsar Convention *, to ensure their conservation and sustainable use.

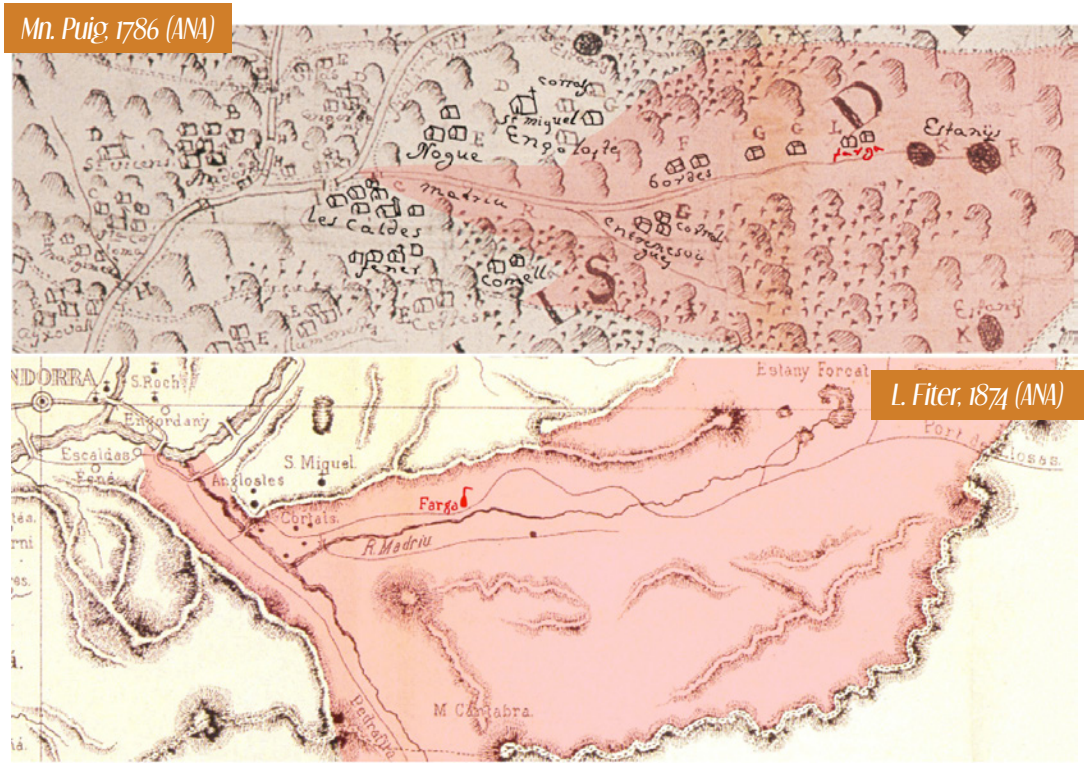
Cultural knowledge about the VMPC

From 2004 to 2014, with the aim of developing the Cultural Landscape Conservation Plan, various phases of archaeological documentation have been carried out in the VMPC. Currently, half of the 4,247 protected hectares have been surveyed, and 1,699 archaeological elements have been inventoried, one-third of which are directly or indirectly related to iron and steel production. Another prominent category is linear dry-stone constructions, which total about 6.5 km of disused paths, 6.5 km of irrigation channels and canals, and about 18 km of various walls, mostly concentrated in the narrow valley floor, between la Plana and the forge's hammer. They constitute one of the main – and most visible – testimonies of this history.

For its part, from 2021 to 2024, the Madriu forge safeguarding program has allowed for the study and recovery of the main archaeological complex of the VMPC. In contrast, the charcoal burners' habitat has left few traces and is barely detectable. The explanation is simple: they have not been preserved because they were wooden constructions, and all that remains is the preparation of the land for their construction or, in some cases, barely a stone plinth of the hut.

**cf. Glossary*

Path to the first viewpoint, view towards Claror.
Elevation gain / Length: + 48 m / 275 m



Andorra, Escaldes, the VMPC and the forge on historical maps

View at the head of the Madriu Valley

2 Claror Viewpoint. The Madriu Mines — A Predictable Failure?

Coord. 536463.293,22739.473 EPSG:27563 / 42°30'06"N 1°33'49"E EPSG:4327

In 1732, along with the rights to build the forge and produce charcoal, the concession holders also obtained the right to extract ore from the Maiana. Since the granites of the Madriu are not fertile in iron oxides, the geographic area of interest in the valley was the upper part of Perafita and Claror, where iron-rich outcrops appear.

Ancient miners interpreted surface iron oxides as the visible part of a vein running deep into the mountain. Their work can still be seen in the surface scrapes made on the outcrops at the Basses Roges (south of our current location). In this area, the opening of a mine for the nearby forge of La Llosa (Cerdanya) was authorized by the Comú of Sant Julià.

The mining operation failed; there is no evidence of gallery openings. The ore deposits were not sufficient to supply the forge regularly. In Madriu, the forge masters compensated for this shortage by negotiating the right to obtain ore from the Pimorent mine (Carol), paying 84 Barcelona pounds per season. Later, the Comú decided to formalize this arrangement, and the agreement was transferred to the Administration.

The Institutionalization of Ore Rights

This mining reality was not limited to these two forges. Aside from nearby factories in L'Hospitalet, Merenç (Ariège), and Cerdanya, ore from Carol was exported to the forges of Moles, Fórnols, Bagà, and Castellar de n'Hug. It was also occasionally smuggled as far as northern Gironès.

In Andorra, at the beginning of the 18th century, the only mine with a sufficient output was the one at the Collada dels Meners (Ransol). The importation of ore was a novelty that had to be regulated to ensure continuous work for the forges. In 1767, at the request of the General Council, the right to import French ore was included in the regulatory decree granted by the King of France. This led to a special arrangement for the forges that had no access to the Collada.

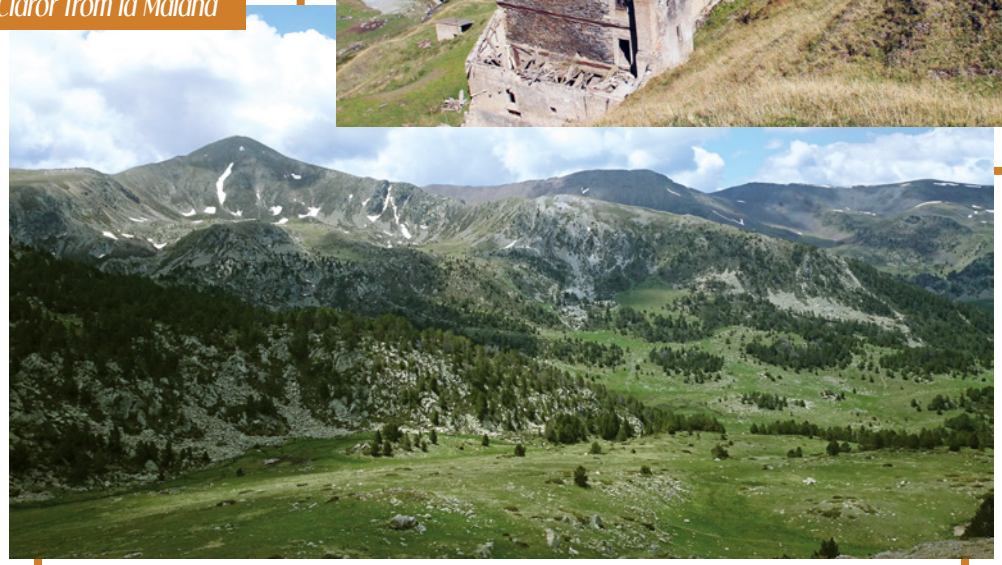
At Madriu, throughout its period of operation, the forge was an Andorran factory that worked ore obtained through a concession negotiated with a Catalan family and governed by French mining law. Proof of this is that, until it closed, the tenants were exempt from rent if the French nation prevented them from "extracting ore from the Querol deposit for delivery to any forge in Spain."

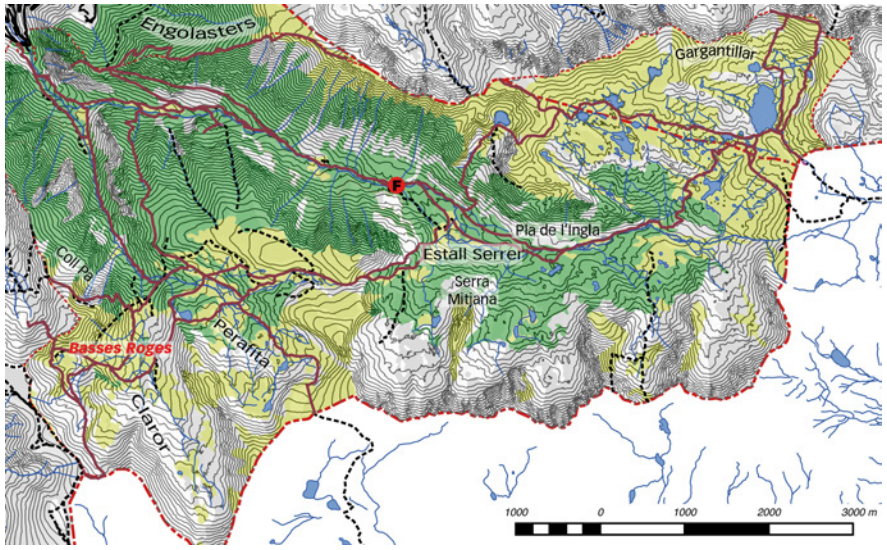
Path to the second viewpoint, view towards the head of the VMPC.
Elevation gain / Length: + 5 m / 566 m

**cf. Glossary*

Buildings of the Pimorent mine

Claror from la Maiana





Location of VMPC mining works

3 Management of the VMPC Communal Forest

Coord. 536463.293,22739.473 EPSG:27563 / 42°30'06"N 1°33'49"E EPSG:4328

With hundreds of charcoal platforms* reaching up to 2,400 meters in altitude, the iron industry left a major imprint on the VMPC.

In 1732, the Comú of Andorra authorized the Raguer brothers from Campdevànol to produce charcoal in the valley of dels Orris and at Estall Serrer. In 1788, the charcoal territory was expanded to Baell and the shaded slopes of the Farga. Then, until 1836, new forest plots were demarcated, and gradually, the charcoal zone extended to Coll Pa, Sulls, and Engolasters. The entire valley was not exploited simultaneously; defining a new forest section* implied the closure of previous ones.

The goal of the forgers and the Comú was the same: to preserve the forest so as not to exhaust an essential resource for iron production. By protecting young pines (pinetells) and certain notable trees (sementers), the regulations encouraged reforestation, limiting cutting to mature trees. Reserve areas were also designated. In the 19th century, when the last charcoal burners worked in the western end of the valley, the upper part of Madriu had already been abandoned for nearly a century and trees had begun to grow again.

Had the forge eradicated the forest in the VMPC?

Unlike other regions where centuries of competition between forges on the same territory devastated the forest or led to the replacement of conifers with deciduous trees (as in Ariège), in Madriu, charcoal resale was forbidden and all charcoal was used in a single forge. This limited pressure and the short exploitation period of around 100 years fostered forest regeneration.

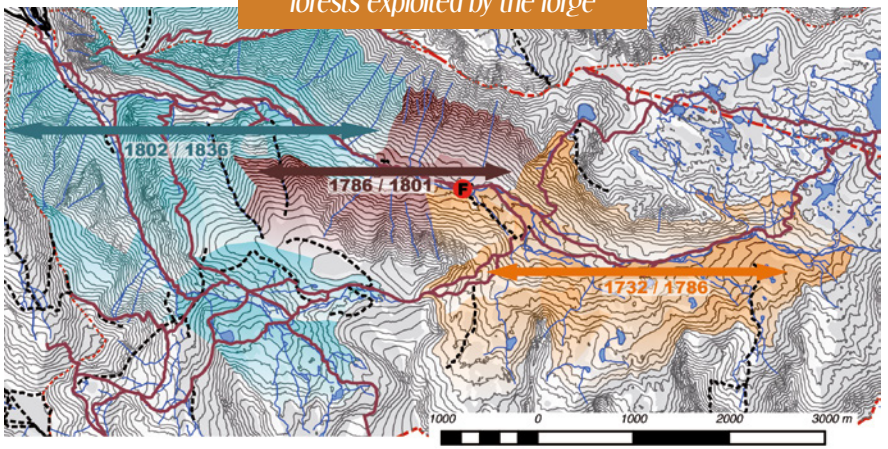
After the forge closed, the slopes began to be recolonized, but trees could not grow across all areas cleared by the charcoal burners. At Pla de l'Ingla, Estall Serrer, or the Perafita gully —visible across the valley— the absence of forest results from later livestock use. In the 20th century, a sharp reduction in livestock herds accelerated forest expansion toward the ridges, though, as shown by the presence of charcoal sites above the tree line, this was not a new phenomenon. Broadly speaking, today's forest stands in the places where 18th-century charcoal burners once felled the trees.

Path to a coalfield.
Elevation gain / Length: + 2 m / 1.120 m

**cf. Glossary*

Covering the charcoal briquette before lighting

Estanyons and Estall Serrer. The first forests exploited by the forge



Main coal sectors of the Madriu forge

4 Huts, charcoal burners and charcoal production sites*

Coord. 536463.293,22739.473 EPSG:27563 / 42°30'06"N 1°33'49"E EPSG:4329

In its best years, the forge operated for about four months, during which time it produced 408 "massers" (iron blooms). To do this, about 158 tons of charcoal were burned, for which, depending on the orography, tree density, and age, between nine and nineteen hectares of forest were exploited.

The charcoal burners lived at the foot of the initial felling area. There, they prepared one or more flat surfaces to build the charcoal piles and their huts. From these charcoal production sites, they monitored the wood's carbonization during the days or weeks the burning lasted.

Depending on the slope, the wood was dragged or thrown down towards the lower part of the "cabanada" (felling area), creating a fan- or funnel-shaped forest exploitation area, the narrowest part of which led to the charcoal production site, located about 120 m further down. When the distance between the felling site and the charcoal production site was too long, they abandoned the camp and created a new site adjacent to the previous "cabanada". And so on, either gaining altitude or horizontally following the contour line, they exploited the entirety of the allocated plot.

Charcoal making and forest workers

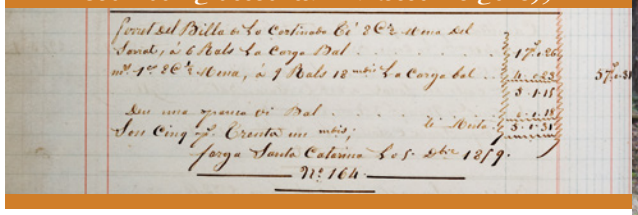
At the top of the path, we observe several embankments supported by dry-stone walls; these are the remains of charcoal kilns. Below the trail, there is a larger one that probably served a dual purpose, both as a dwelling and for production. Charcoal was made by internal combustion of a pile of logs, covered with leaves and earth, assembled vertically around a central chimney. This task was primarily entrusted to specialized teams led by a master who ensured the high production levels needed by the forge.

Occasionally, some Andorran charcoal burners worked there, but mostly the workers came from Ariège. In contrast, the wages generated by the transport of charcoal were reserved for local inhabitants; price for price, the master blacksmiths * had to hire residents from the village that had sold the forest plot. Furthermore, to facilitate access to new plots, paths were opened to connect them directly to the forge. One of the longest crossed the north face of Fontverd to connect the factory with Perafita without going through the valley floor.

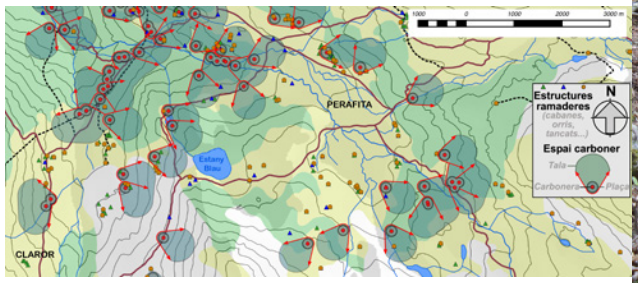
Path to Fontverd.
Elevation gain / Length: + 47 m / 455 m

**cf. Glossary*

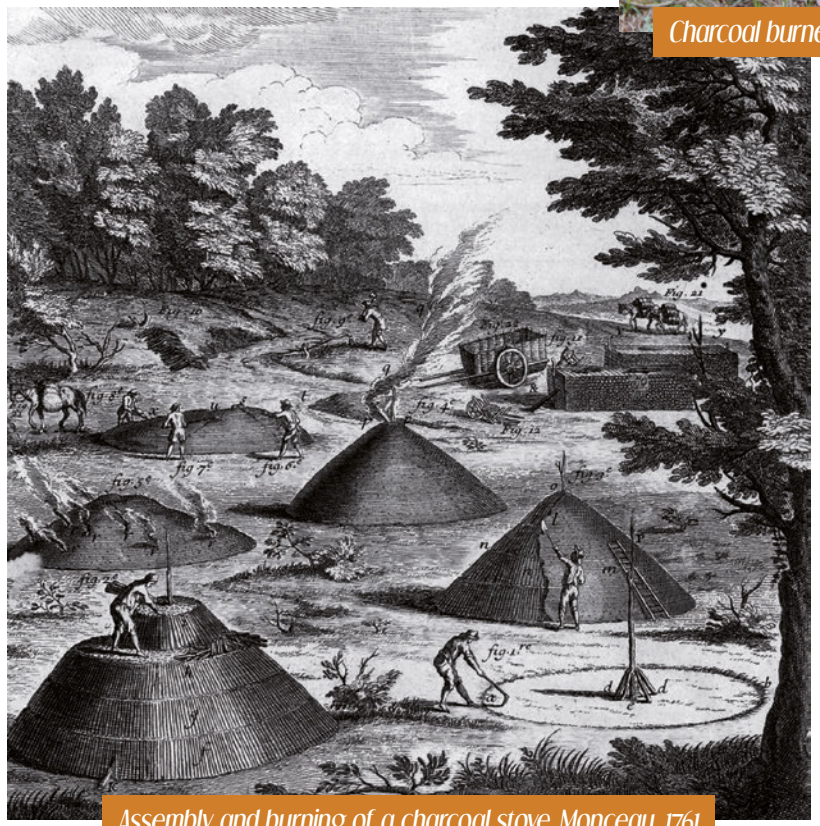
Coal hauling accounts. ANA. Rossell Forge 1859



Theoretical exploitation model.
Cabins in Claror and Perafita



Charcoal burners in the Ramio sunroom



Assembly and burning of a charcoal stove. Monceau, 1761

5 Cortal de Fontverd. Ancient agriculture and charcoal burning

Coord. 539023.88,21623.07 EPSG:27563 / 42°29'30"N 1°35'42"E EPSG:4326

We access the meadows, skirt the refuge, and turn left to ascend to a series of walls located near the eastern edge of the forest.

Little is known about these constructions. They consist of a series of buildings, among which some corrals, huts, and larger rectangular constructions than the rest are identified. The latter are distinguished by the size of their interior space, which notably exceeds the classic dimensions of a livestock hut.

Compared to other buildings, these constructions, made with large undressed stones where only the corner stones of the walls and doors are partially squared, have been classified as "bordas" (Andorran farmhouses/barns). Their internal characteristics and the organization of the slope, with a succession of terraces and "bordas" structured along the same path, suggest that it is a "cortal" (farmstead) used for both agriculture and livestock farming.

Cortal and charcoal burning

The remains of various charcoal kilns detected in the agricultural lands contemporary with this "cortal" indicate a sufficiently long period of abandonment to allow a mature forest to thrive.

It was during the 18th century that the charcoal burners of the Madriu forge cleared this forest that had grown over the fields and orchards. Therefore, although we cannot precisely determine its date of origin, this agricultural and livestock settlement illustrates the oldest occupation currently identified in Fontverd. Its use dates back at least to the beginning of the 16th century.

Given that at that time the consequences of the Little Ice Age caused a displacement of the country's agriculture towards the lower parts of the valleys, it is not impossible that the activity of this "cortal" has its roots in the medieval period.

Path to Baell.
Elevation gain / Length: + 111 m / 1.160 m

Sector of the "cortal", refuge and north face of Fontverd

Fontverd. Example of "borda"

Partial view of the ancient agricultural and livestock complex of Fontverd

6 Baell. A summer agro-pastoral village

Coord. 539931.29,21411.99 EPSG:27563 / 42°29'24"N 1°36'22"E EPSG:4326

The path leads us to the plains of Baell. We cross the plots to the east until we reach a large meadow surrounded by a stone fence that gently leads us towards the Muntanya path and, further down, towards the forge area.

During the traverse, we pass through some cultivated terraces where there are remains of isolated huts. In the lower part of the meadow, to the right, there is a settlement built taking advantage of the scree slope. It consists of relatively complex constructive elements, organized among themselves by paths. To the west, on the other side of the scree, there is another smaller group of similar constructions that is not observable from this location.

In both complexes, the buildings were erected using the dry-stone construction technique. The use of erratic blocks, along with the regular use of large undressed granite stones, clearly differs from the methods employed by builders of the 18th and 19th centuries. Even more than in Fontverd, the dimensions and, especially, the interior distribution show that these constructions differ from most high mountain livestock buildings. Furthermore, it should be noted that, since this type of settlement has been characterized, others have been documented at the limit of the Andorran high mountains, which demonstrates that Baell was not a singular example.

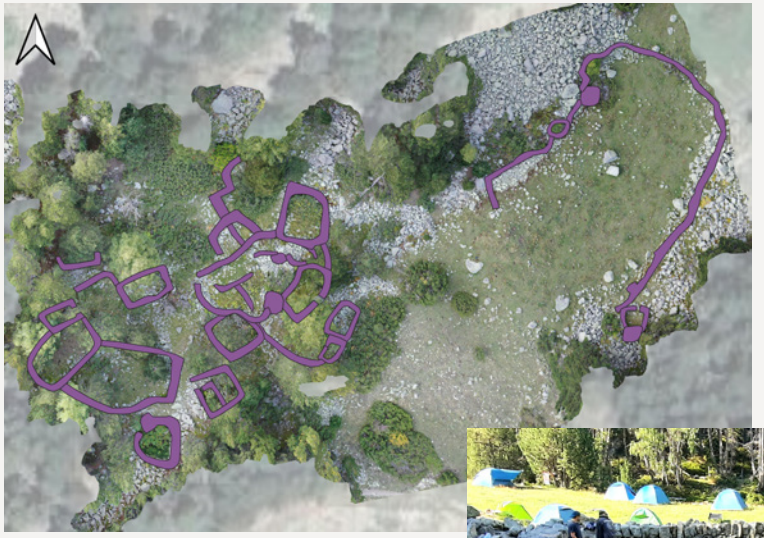
Baell imagined and re-used

The function of these two complexes had been associated with a habitat for charcoal burners or a "cortal" for pigs. The first assumption does not reflect historical truth, because charcoal burners followed the progression of forest clearings that extended throughout the valley. The second suggests a phase of reuse, but the excavation of the building closest to the Paleta meadow has revealed a period of exploitation prior to the establishment of the forge in 1732. The use made of it also does not match what the elders remember.

The agricultural exploitation of the land and the architectural differences with modern livestock constructions suggest that this was not a place reserved exclusively for livestock farming. With its fields, enclosures, and "bordas", it corresponds to a "cortal" that would date from the late Middle Ages or early modern period.

Although a chronological correspondence cannot be established, it should be noted that the construction system shows similarities with the buildings excavated in the Roureda de la Margineda. Another similarity with this site, dated from the 12th to 14th centuries, is the structuring into different enclosed units, which suggests that the operation of Baell was not collective; it was exploited by differentiated domestic groups.

Path to the Brancs de la Farga bridge.
Elevation gain / Length: - 5 m / 220 m



Approximate plan of the constructive units of Baell 1

Excavation and documentation of the Baell complex near the Paleta meadow (2024)

Archaeological inventory in Baell 1 (2013)

7 The Madriu forge conservation program

Coord. 540130.55,21377.42 EPSG:27563 / 42°29'23"N 1°36'30"E EPSG:4326

We arrive at the place where water from a branch of the Madriu was diverted to the forge. As you see it today, the site is the result of a conservation operation aimed at safeguarding the remains threatened by ruin.

This project, born from the collaboration between the VMPC Management Commission and the Ministry of Culture, had as its main objective to study the site to provide the necessary keys for its correct restoration, consolidation, and interpretation. Between 2021 and 2025, specialists in the archaeology of iron and steel production, high mountain areas, hydraulics, and construction worked there, as well as expert dry-stone craftsmen.

The team, made up of up to 35 people working at an altitude of almost 2,000 meters, also included a 3D specialist engineer and a technical and artistic draughtsman, as well as a professional photographer and an environmental engineer. However, most of the team consisted of students training in dry stone construction from private companies and three of the institutions that collaborate in the ordinary maintenance of the Madriu-Perafita-Claror Valley: the Management Commission and the communes of Escaldes-Engordany and Andorra la Vella.

Water and upper reservoir

Excavations have uncovered buildings related to iron, as well as structures from other periods that occupy the same area. The Department of Cultural Heritage of Andorra and the Pierre Sue laboratory of the CNRS (France) have led the research work on all the elements found from Les Brancs to the western limit of the Paleta meadow. Over about 200 meters, two houses, two bread ovens, and a charcoal store have been documented, as well as a forge and a blacksmith's shop that preserved the remains of different tools (furnaces, hammers, anvils, etc.), in addition to various paths, huts, enclosures, and "bordas".

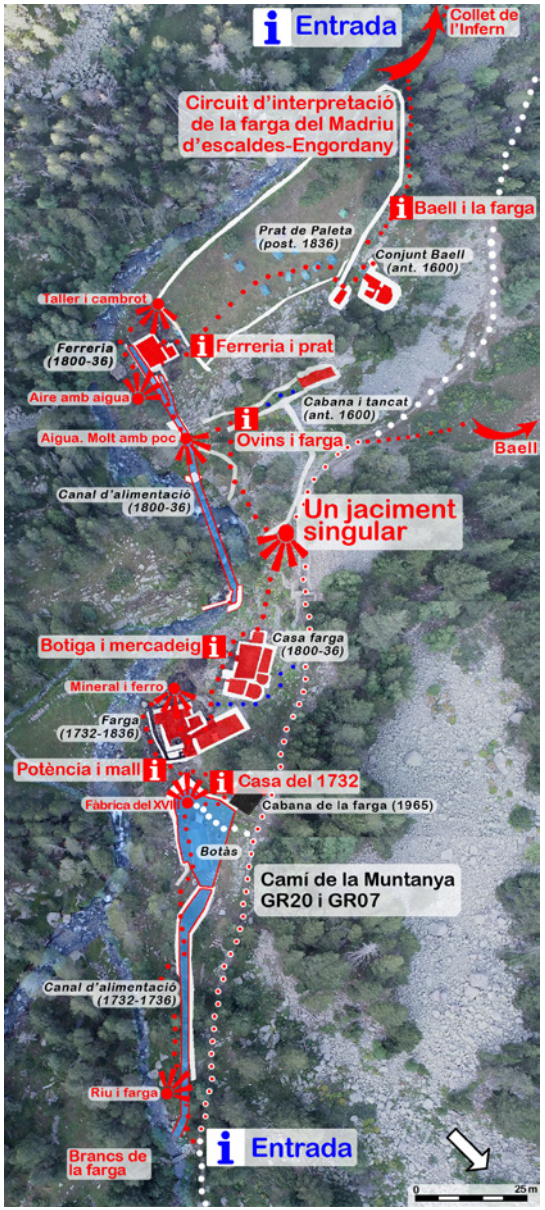
Currently, it is one of the high mountain sites in Andorra that has provided the most material for study. The structures and objects, such as metallurgical waste (slag, iron, etc.), ceramics, coins, crockery, and tools, have allowed for a clear understanding of the value of this place, which illustrates five centuries of history in the Madriu Valley. Elements showing the technological progress of the factory between 1732 and 1836 have been identified, while also revealing the daily life of the workers who worked there.

To complete the visit, we encourage you to consult the information available on the panels of the forge's interpretive trail, which highlight various aspects of this complex and valuable site.

We follow the course of the water to the forge hut.

Elevation gain / Length: - 5 m / 65 m

Forge interpretation circuit, heritage elements and themes



Initial state, excavation and restoration of the factory sector and the forge house

8 1732. Establishment of the forge

Coord. 540049.115,21341.282 EPSG:27563 / 42°29'22"N 1°36'27"E EPSG:4326

To minimize the cost of charcoal transport, the factory was established in the upper part of the valley (1,990 m), near the first forest plots granted by the Comú. At that time, it was feasible to use this location because, compared to forges built in the 19th century, this establishment consumed little water.

The elongated structure we follow to reach the esplanade is the base of the channel, whose outlet has been restored. The landing is the place where the reservoir (botàs*) was erected, which distributed water to the factory via two aerial channels. One poured water onto the hammer wheel*. The other carried it to the wind machine (trompa*). Only the stone foundations of these wooden hydraulic installations are preserved.

It was a first-generation "Catalan direct reduction" forge that still retained some medieval characteristics. While in the Basque Country, Cantabria, or Galicia, the hydraulic bellows invented in the 14th century continued to be modernized, in Aragon, Languedoc, Catalonia, and northern Italy, from the second half of the 17th century, a new device was chosen: the trompa*, with its windbox that blew air into the blast furnace*. In contrast, to compact the "masser" and draw out the iron bars, an old model of a hydraulic hammer (mall) was still used.

Working and living at the first Madriu forge

To the right, below the Muntanya path, only the remains of the southern part of the factor*'s house have been excavated. The semi-basement was a stable and served as a warehouse, while the upper floor was the dwelling. Like the hut built in the 20th century, this building had two entrances. The southern gate, still visible, was used by the carriers, while the administrator accessed it directly from the upper path.

From this location, the factor* managed stocks, dispatched metal, and administered the grocery store (oil, wine, salt, bread, etc.), which served to pay part of the wages of the charcoal burners, carriers, and blacksmiths. To sell iron, there was also a forge in Escaldes where some of the raw bars were transformed into objects.

As for the blacksmiths, organized into two teams, they lived all season in the forge workshop's small room. On Monday at dawn, one team received charcoal and ore for a smelt and was responsible for transforming it into metal (reduction). When it moved to the hammer to shape the ingots, the other team started their shift at the furnace. Thus, successively, they worked until Saturday evening. The more iron they produced, the more they were paid.

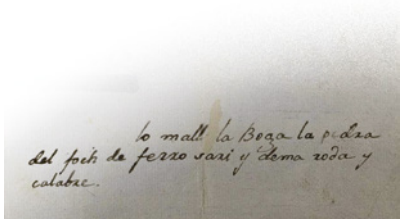
Until the end of the 18th century, there were only four constructions at the forge: the house, the workshop, and the charcoal store ; consequently, all the work was done with a hammer that also served as a trip hammer.

We descend to the forge, by the river.

Elevation gain / Length: - 6 m / 70 m

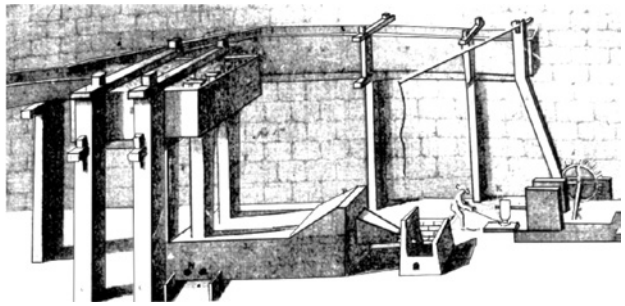
*cf. Glossary

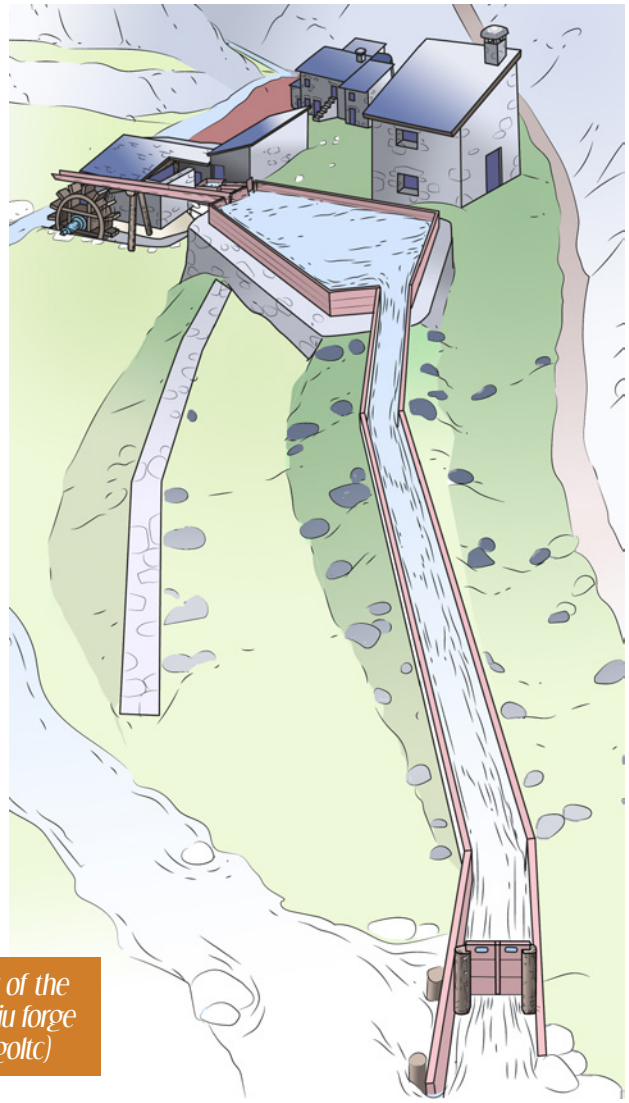
The head of the Madriu forge hammer



Inventory fragment (ANA/ACA* - Madriu forge. 1806)

Windbox, blast furnace and hammer according to Bouchu and Coutrivon (1761)





Perspective view of the 19th century Madriu forge (drawing O. Vingoltc)

9 The 19th-century forge

Coord. 540019.510,21333.139 EPSG:27563 / 42°29'22"N 1°36'26"E EPSG:4326

We walk around the "botàs" (reservoir) and cross the footbridge over the canal to reach the forge's courtyard. Against the slope, the charcoal store is the result of a 19th-century expansion designed to increase its capacity. A part of the rubble has been left on site to allow you to visualize what the site was like before the archaeologists' intervention. The main damage it suffered has completely disappeared. About twenty large trees were growing on the walls. They prevented the reading of the building and, above all, destroyed the remains.

The blast furnace was the element that had suffered the most. However, thanks to the gradual removal of its damaged components, the base could be preserved, and the upper part has been restored exactly as it was to allow this piece to regain its position at the heart of the forge. To the left of the entrance, the ore processing platform did not exist from the beginning. The hammer structure was also improved over time, while the anvil and the wooden fixing system maintain their kinship with medieval hydraulic hammers. Unlike the forges of the late 18th century, the insufficient water flow prevented the slag* from being poured into the river to dispose of it (risk of obstruction). The workers threw it downhill, which created a large deposit on the riverbank. The land gained by leveling more than fifty years of waste was used to build a new forge house.

The new forge house

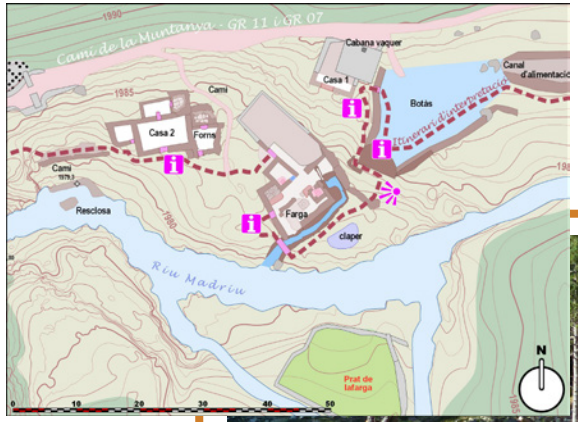
The initial concession granted to the Raguer brothers ended in 1794, on Saint John's Day. The forge then became communal property. The large livestock-owning houses of the parish were the main tenants and, at least from this moment, as other forges in the country did, the blacksmiths* were hired from Ariège. The new house with its extensions corresponds to this phase of exploitation.

On the ground floor there was a stable, a warehouse for iron, and two others for storing food and wood. The exterior staircase led to the dwelling which opened onto two "pastadors" (kneading troughs or similar work surfaces). Although not built at the same time, the existence of two bread ovens, which worked together until 1836, is clear evidence of the importance of the right to have a shop that the tenants received.

This increase in supply indicates that, unlike the first house, this building was not exclusively intended for ironworkers. Among others, it offered salted foods, bread, and wine to all users of the valley (shepherds, transporters, travelers). The blacksmiths supplemented this diet with river trout which, probably, were fished in the "botàs".

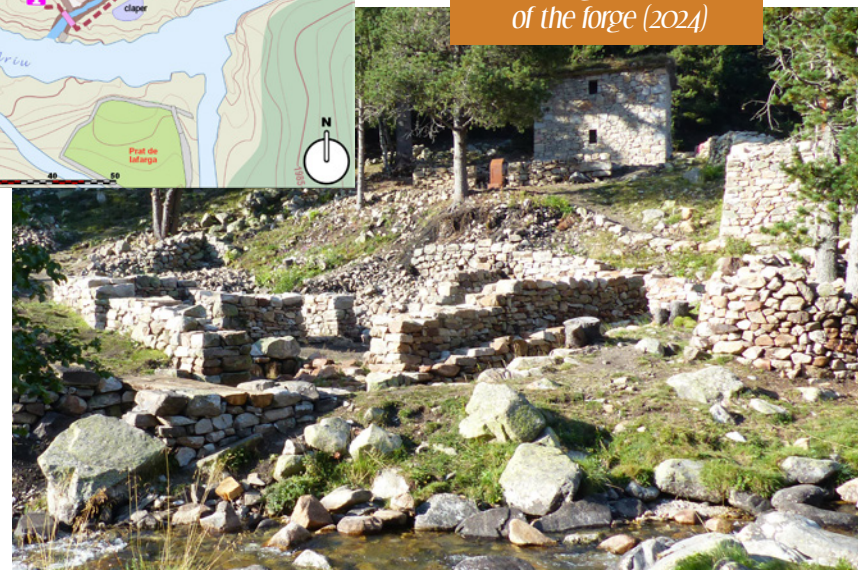
Let's go to the Madriu forge.
Elevation gain / Length: - 10 m / 118 m

**cf. Glossary*



Constructions and buildings of the Madriu forge (19th/20th century)

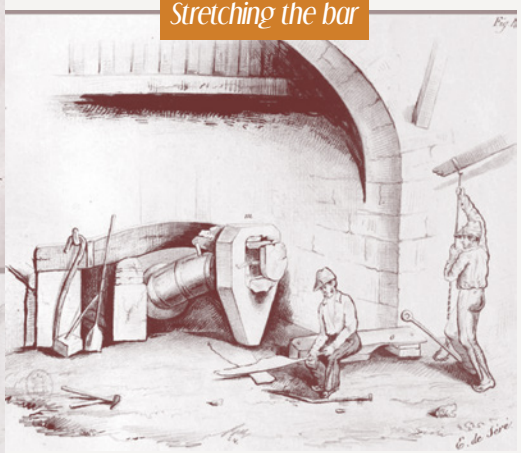
Restoration of the archaeological structures of the forge (2024)



Extracting the "masser"

Working the "massoca"

Stretching the bar



(T. Richard, 1848, Drawings E. Serre)

10 The Madriu ironworks

Coord. 539942.338,21291.446 EPSG:27563 / 42°29'20"N 1°36'22"E EPSG:4326

Archival documentation only mentioned one hammer (mall) ; but, from 1800 onwards, both a hammer (mall) and a trip hammer (martinet) are listed. With the construction of the new ironworking workshop, the final part of the production process that transformed the reduction ingots (massoques*) into iron bars (treure cues*) was relocated. Two buildings formed the ironworks: a small room and a workshop where the forge and anvil have been recovered and the interior spaces recreated.

The distribution of the work phases shows that the ironworking technique used in Madriu was less efficient than that of 19th-century forges. Divided between the forge and the trip hammer, it required two heating phases, while in others, the transformation of ore into bars was done with a single hot operation.

By contract, the tenant had one month to work the metal at the beginning of the next season. The new tenant could not use the trip hammer until the previous one had finished this work, without which they could not commercialize the metal. The previous tenant had a hammer, much smaller and more precise than the forge's, for shaping iron, but did not have access to the new forge house's warehouse. The need to store the bars that were to be loaded by the carriers motivated the use of the livestock enclosure documented by archaeology, located at the other end of the meadow.

Livestock farming in the Paleta meadow

At first glance, two successive stages of exploitation are clearly perceptible. Initially, there was an agro-pastoral exploitation associated with the Baell complexes. Ultimately, as demonstrated by the fact that the walls surrounding the meadow block the passage of the ironworks path, once the workshop was abandoned in 1836, the objective was to utilize the hay meadow.

The main roads indicate a similar chronology. The first path leading to the upper part of the valley bordered the meadow, climbed the ridge, and followed the river until it joined the path coming from Baell and continued towards Les Brancs. Subsequently, when the forge was established, the current section of the Muntanya path (GR) was opened, crossing the Baell slope to lead directly to the Collet de l'Infern. Around 1800, the ironworks path was created by reusing the old trail. This stage was brief, as it was abandoned to enclose the pasture and prevent livestock summering in the valley from accessing the grass. In parallel, the ironworks was converted into a "borda". The Paleta meadow had become a dead end.

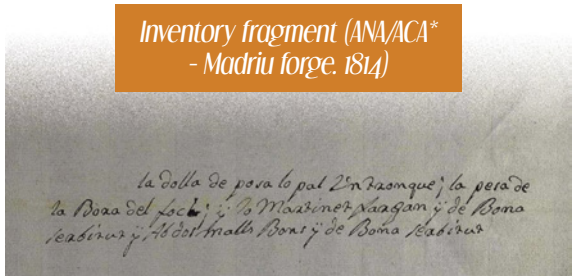
Here, as in many other places in the VMPC, the chronology of events shows that the perception of the livestock area based on visible dry-stone elements is recent and the transformations mask a large part of the site's history.

We pass to the Collet de l'Infern.

Elevation gain / Length: + 5 m / 320 m

**cf. Glossary*

Start of archaeological work in the Paleta sector and the ironworks (camp 2021)



Inventory fragment (ANA/ACA* - Madriu forge. 1814)

Consolidation of the base of the ironworks' supply canal (2024)

Hypothetical restitution of work at the Madriu ironworks (drawing, O. Vingoltc)

11 Collet de l'Infern. The memory of the path

Coord. 539684.61,21399.60 EPSG:27563 / 42°29'23"N 1°36'11"E EPSG:4326

We arrive at the crossroads between the Camí de la Muntanya and the ironwork trail. From here, the metal coming down from the forge's hammer or storage site was taken to transformation centres where raw iron was made into objects. It went to La Seu or Castellciutat or, following the Segre River, muleteers delivered it to Urgell and Lleida, or branched off toward Bages and Anoia en route to Barcelona.

Day labourers, mineral or coal transport, and the iron trade supported the local job market. Transporting metal could yield a 50% profit, and often the iron—owned by the master forgers or bought by muleteers—was turned into goods to be resold on the return journey (fabrics, chocolate, wine, oil, nails, etc.). In 1800, leasing the Madriu Valley brought in half the revenue of the Comú of Andorra la Vella, and selling timber to supply the country's six other forges supported all the parishes.

Andorrans were not involved in the specialised forge trades, but they fully controlled ironmaking investments and the market for their iron, which had become, after livestock, the second most important source of income for the valleys.

The path as a witness to shifting activities

The VMPC is covered by a dense network of paths. Valley floor trails led to pastures and, crossing the mountain passes, reached foreign lands. Inside the valley, agricultural spurs, charcoal paths and trails interconnected the high grazing areas. The Camí de la Muntanya adapted to each need. It was the backbone of activity and remains its main witness; the pass at Collet de l'Infern is a good example.

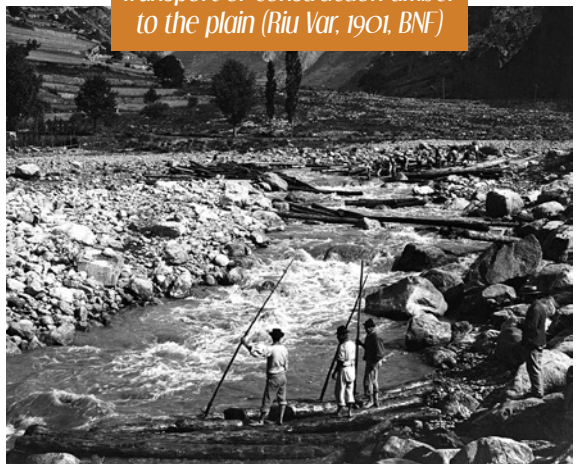
Descending to our left, the winding stretch was used by herds and muleteers. On the other side, a spur cuts across its curves. This is the tirader, where logs were dragged down toward the sawmills of Andorra and Alt Urgell after the forge closed. Unlike the first path, where stones were embedded to prevent animals from slipping, the loggers' path was paved with large blocks aligned with the slope to ease log sliding.

The tiraders illustrate a later use of these paths, developed when charcoal production ceased. Sustainable forest management was no longer applied to timber production. Travellers had blamed deforestation on the forges, but the timeline shows that it was primarily caused by the sawmill loggers.

Path to the Rector's "borda" (Fontverd).
Elevation gain / Length: - 103 m / 845 m

**cf. Glossari*

Since the closure of the forge and the cessation of logging, the forest has regained the head of the valley



Transport of construction timber to the plain (Riu Var, 1901, BNF)

Collet de l'Infern. The cattle path cut perpendicularly by the bridleway

Interpretive circuit of the Farga del Madriu. Link with the Mountain path

12 Fontverd. Grassland, cabin and hiking

Coord. 538931.09,21646.70 EPSG:27563 / 42°29'31"N 1°35'38"E EPSG:4326

We head to some terraces located in the lower part of Fontverd, where the remains of a borda (stone hut) are found. Behind it, at the base of the rock wall, it's worth visiting the cool-storage cabin, built using large erratic boulders. This nearly buried shelter has the year 1879 carved into a stone on the doorframe. Since the *borda* is documented some decades earlier, the cabin was likely built after the original hut was founded.

The logging activities for the forge reopened and expanded the pastureland. On the opposite slope, charcoal pits reach down to the riverbank, and the clearing of the shady hillside was used to create a hay meadow. The maintenance of this forest clearing into the 20th century was thus due to livestock herders, not charcoal burners.

Four phases of occupation have been identified in this sector: agro-pastoral before 1600, forested and abandoned between the 16th and 17th centuries, charcoal production in the 18th century, and exclusively pastoral in the 19th.

Changes from the 18th to the 21st century

It is worth noting that the joint use of the *borda* and its surrounding land reflects a form of family-based herding, while the earlier complex represents collective land use. The land concessionaires had requested a right known as *defens*. In exchange for a fee, and provided the land was used to grow hay, they could enclose the parcel with a wall and enjoy exclusive use throughout the year. As seen in the shady hillside meadows, they were also granted permission to dig irrigation channels. These systems—sometimes associated with a *borda* and sometimes not—can be found in all *defens* areas, from the central Valira valley up to the entrances to summer pastures or *cortons*.

Next to the trail, the rectangular cabin with a vegetated roof dates from 1950 and is part of a network of nine shelters for communal cowherds. Milk consumption developed from 1900 onward, followed by beef production. Moreover, as transportation and farming became motorized, cows replaced the mules that had previously justified the creation of irrigated meadows.

With the construction of the hikers' refuge, the most recent stage began. Through seven successive transformations from the 16th to the 21st century, Fontverd clearly illustrates the evolving dynamics of the cultural landscape—far removed from the romantic narrative that portrays the mountains as an unchanging natural space.

Path to the Ràmio viewpoint.
Elevation gain / Length: - 197 m / 2.135 m

1950's ranch cabin

Fontverd cabin

13 Ràmio Viewpoint. Tradition and innovation

Coord. 537516.35,22191.30 EPSG:27563 / 42°29'49"N 1°34'36"E EPSG:4326

We take the turnoff toward Coll Jovell to gain an overview of Ràmio.

This site represents a relatively old settlement, with agro-pastoral buildings from the Sant Miquel cultivation zone and peripheral expansions promoted by ironworking. The construction or alteration of certain *bordes* (huts), as well as enclosure walls around shaded meadows, can be attributed to this phase.

However, Ràmio's layout is not only the result of that change. With the construction of the dam to supply the Escaldes hydroelectric power station, an improved irrigation system was agreed upon. Some plots were reshaped, and expanded irrigation encouraged tobacco cultivation alongside traditional crops.

The dam, the guard's cabin, and the remains of the workers' canteen and housing mark this transformation (1941–1943). The sunny-side trail crosses over the spoil heap from the tunnel that connects the dam to Lake Engolasters. Once again, the apparent stillness of the landscape hides profound transformations.

Recent changes in the ecosystem

As we continue ascending toward Coll Jovell, the view opens up, allowing us once more to observe the upper part of the valley, where the latest transformations in the cultural landscape become apparent.

In front of us, from Serra Mitjana to the upper Ròdol area, young forest is growing on land cleared by sawmills (1860–1960), abandoned by livestock (second half of the 20th century), or naturally regenerating after events such as avalanches. The upper birch forest is particularly noteworthy. The replacement of conifers with birch was once attributed to the forges, but current research shows it stems from more recent changes.
Little by little, the appearance of the VMPC is evolving, and forests are reclaiming the highlands where charcoal burners once found them in the 18th century.

The valley was managed to make use of its resources. The activity of farmers, charcoal makers, forgers, muleteers and shepherds has slowed. What remains are a few current practices and heritage elements that bear witness to this long story.

We continue climbing to Coll Jovell.
Elevation gain / Length: + 103 m / 960 m

Dam and house of the Ramio's guard

Sheaves and flocks in Ràmio

Ràmio's "bordes"

14 Coll Jovell. The VMPC trail and the Iron Route

The traces of ironworking bring us back to the starting point, Coll Jovell.

The information along the Madriu ironworking trail can be complemented by other heritage sites that form part of the Iron Route in the Pyrenees.

In Andorra, you can visit the Farga Rossell in La Massana and the Iron Trail in Ordino. The former is an interpretation centre housed in a 19th-century forge that illustrates the final stage of forge technology and the important role it played in the history of Andorra and the Pyrenees through engaging audiovisuals and a live forging demonstration. The latter follows the final section of the historic path linking the mines of the Coma de Ransol with the forges of Serrat, Ordino and La Massana. It's a short, family-friendly walk where you can enjoy several international contemporary sculptures inspired by the world of iron, and visit notable heritage landmarks (Sant Martí de la Cortinada, Cal Pal sawmill, Llorts mine).

Beyond the valleys of Andorra

For hiking enthusiasts, the cross-border section of the Iron Route in the Pyrenees is a must. This three- to four-day hike offers two options: connect Auzat with Cerdanya, or follow the trail starting in La Massana that leads to the Pyrenees National Park via Os de Civís and the Gall Fer refuge, ending in Alins.

Further west, the route continues through the Mining Museum of Cercs, the Molí Gros in Campdevànol, the Farga Palau, the Ethnological Museum of Ripoll, and the charcoal trail in Sant Joan de les Abadesses, finally reaching the Canigó Massif. Here, various aspects of this "iron mountain" are interpreted, telling the story of this vast industrial landscape (mines of Pinosa, Salver and Batera, and the museum of Escaró).

To the east, from the forges of Pyrène in Montgailhard (Ariège) to the Atlantic, the adventure continues into the Basque Country, where the centres, museums and monuments of the cross-border Iron Route network showcase a long Pyrenean ironworking tradition that was not "Catalan-style".

All the information you need: *https://rutadelferroalspirineus.ad/*

We return to the parking.
Elevation gain / Length: - 157 m / 1535 m
and - 265 m / 2.255 m

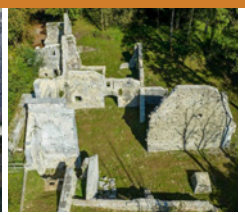
Pirinioetako **Burdinaren Bidea**
Ruta del Hierro en los Pirineos
Route du Fer dans les Pyrénées
Iron Route in the Pyrenees
Ruta del Ferro als Pirineus

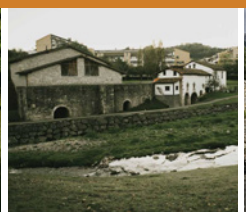
Cultural route of the Council of Europe
Itinéraire culturel du Conseil de l'Europe

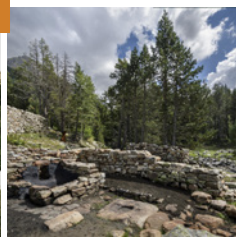
COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

The forges of the Iron Route in the Pyrenees


Agorregi (Aia, Gipuzkoa)


Arthez (Arthez d'Asson, Pays de Nay)

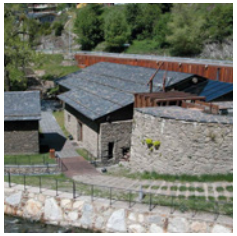

Igartza (Beasain, Pays de Nay)

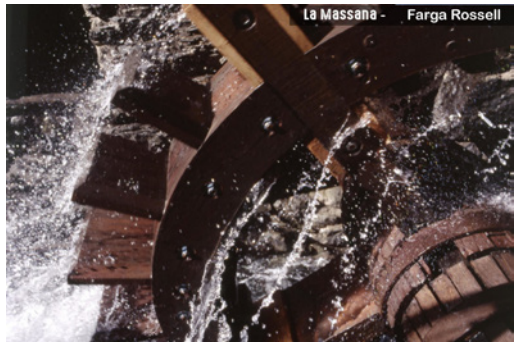

Madriu (Escaldes-Engordany, Andorra)


Mirandaola (Legazpi, Gipuzkoa)


Pyréne (Montgailhard, Ariège)


Palau (Ripoll, Catalonia)


Rossell (La Massana, Andorra)



Other Notable Traces in the VMPC

Contemporary sculpture

1. Sculpture: "Pep, Iu, Canòlic, Ton, Meritxell, Romà, Anna, Pau, Carles, Eugènia... and the others". Erik Dietman
2. Sculpture: "UNDR". Josep Cerdà

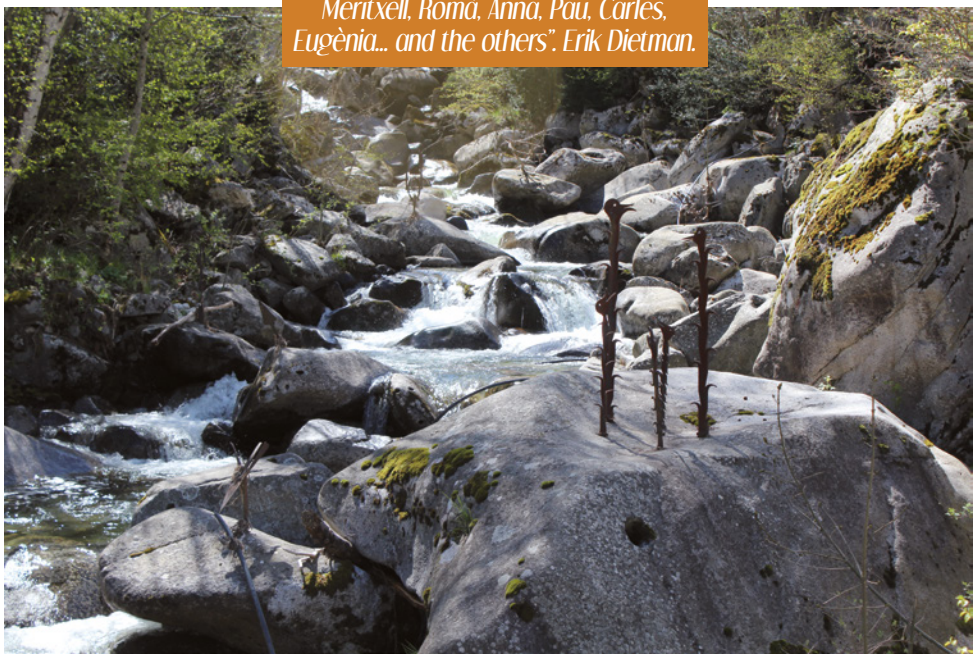
Remarkable Trees of Andorra

3. Remarkable Trees of Andorra. Larch: an exotic plantation in the Madriu
4. Remarkable Trees of Andorra. Birch with eight branches
5. Remarkable Trees of Andorra. Maple of Prat de l'Estall (private property)
6. Remarkable Trees of Andorra. Rowan of Prat de l'Estall (private property)

Heritage elements

7. Entrance to the FEDA tunnel
8. Borda de Ràmio. Open to the public from May 1st to September 30th, 10 am to 4 pm.
9. Ràmio dam and construction remains
10. Cabin / cool-storage shelter of Fontverd
11. Romanesque church of Engolasters
12. Hydroelectric dam and Lake Engolasters

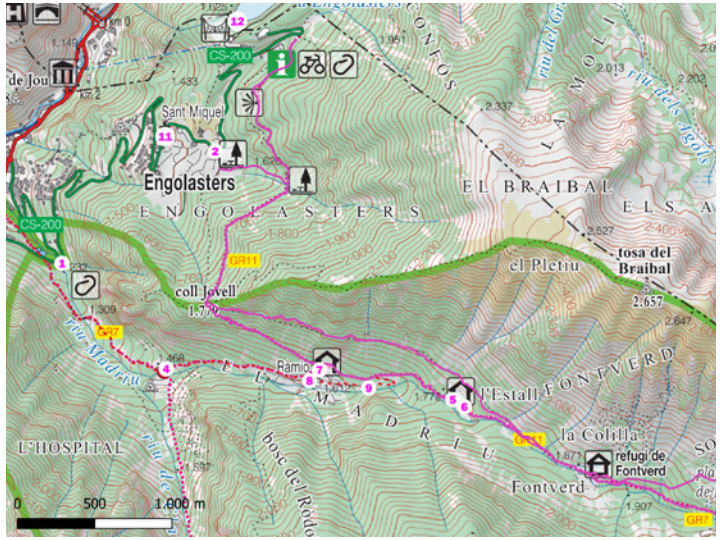
**Please note that entry into private properties is not allowed. These elements can be viewed without entering.*



Sculpture "Pep, Iu, Canòlic, Ton, Meritxell, Romà, Anna, Pau, Carles, Eugènia... and the others". Erik Dietman.

Estany de la Bova

Sculpture "UNDR". Josep Cerdà



Abbreviated Glossary

ANA: Andorra National Archive.

Arbres (pipes): Vertical conduits receiving water from the botàs, aspirating air via the Venturi effect; the mix drops into the wind box.

Bloomery (low furnace): Hearth reducing ore by charcoal heat. Unlike a blast furnace producing molten pig iron, the bloomery yields metallic iron. "Catalan-style" bloomery used charcoal while blast furnaces used coke.

Botàs: Intermediate masonry or wooden reservoir storing river water to regulate or interrupt the farga machinery flow.

Cabanada: Portion of forest annually delimited for charcoal pits. A partida grouped one or more cabanadas.

Wind box: Circular or trapezoidal wooden reservoir where water–air mixture separated.

Calaibre: Walnut or chestnut trunk reinforced with iron rings, with wheel arms mounted.

Chio: Hole just above the crucible bottom for slag tapping during smelting.

Slag: Mineral waste from ore's gangue not transformed into metal. Removed via chio in liquid phase; iron oxides remained viscous.

Scoria heap: Accumulation of waste outside the farga; if river flow allowed, slag was dumped into it, avoiding heap.

Factor: Farga manager—managed stores, workers, iron distribution, and accounts; sometimes also master smith.

Fargaire: Farga worker producing iron, organized in two teams of 6–8 under two master fargaires.

Ferrer (smith): Worker who forged and repaired objects with raw iron.

World Heritage List: UNESCO title since 03/01/1997.

Masser: Spongy, glowing iron mass from bloomery ready to be compacted and cut into massoques.

Massoca: First division of masser into two square iron blocks.

Massoqueta: Division of massoca into two bars ready for "drawing tails"; one masser yields two massoques → four massoquetas.

Master of farga: Owner or tenant managing finances and sales; not a smith in Andorra.

Master fargaire: Two per farga: foguer (low furnace) and maller (hammer); assisted by apprentices (escola & picamena), plus vailet in larger operations.

Partida: Agrarian/forest territory division; forest sales organised in partidas.

Charcoal pitch (plaza carbonera): Site for charcoal kilns: small wood burned, large trunks split into tions to build kilns.

Ramsar: International wetland conservation treaty from 1971; Andorra joined on 23/11/2012.

Direct reduction: Operation to obtain ferrous iron/steel directly from ore and charcoal without fusion—ancient method, modern variant in Catalan-style farga.

Indirect reduction: Two-step iron production—liquid pig iron followed by decarburization to steel; used since medieval times in blast furnaces.

Reduction: Removing oxygen from iron oxides to get metallic iron.

Drawing tails: Stretching massoquetas' ends to produce four marketable bars.

Trompa (blower): Hydraulic device delivering air to the bloomery; water falling through "pipes" created suction, separated in wind box; air sent to furnace via trompa, water drained downward.

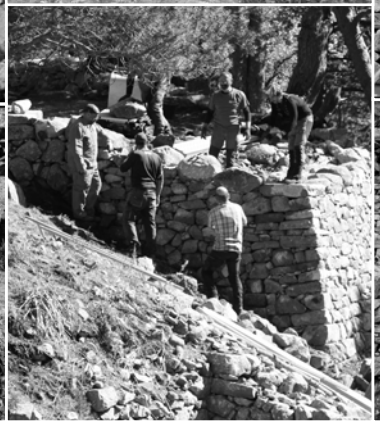
The conservation works of the Madriu forge (2021–2024)















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