EVALLCHA

A digital tool for assessing the health of chestnut groves in Vallespir (France)

Why assess the health of chestnut groves in Vallespir ?

The chestnut groves in Vallespir (Mediterranean territory of Southern France) originated from large plantations in the 18th century, intended to supply Catalan forges with firewood and charcoal.

Emblematic of the Vallespir region, it has long provided wood used for sand fences, stakes, and other traditional structures.

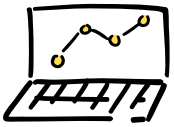
Since the end of the 20th century, **these stands have been increasingly declining under the combined pressure of several threats**:
- Parasite attacks (cancer, gall wasps)
- Water stress linked to climate change
- Rising temperatures
- Aging stumps

Today, chestnut trees cover more than 6,500 hectares in the Pays Pyrénées Méditerranée region: **it is the third most common forest species** in terms of surface area.

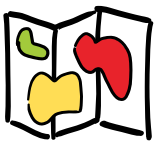
Faced with this decline, local stakeholders have expressed their **need** to:
- **Understand** the causes of the decline
- **Measure** the impact of drought
- **Anticipate** the consequences for the future of the forest

Indeed, there are **multiple issues** behind this phenomenon:
- Increased **fire risk**
- **Impact on outdoor activities** and tourism
- **Forest management** and sustainable exploitation
- **Biodiversity** and ecosystem balance
- **Preservation of the iconic landscapes** of Vallespir

What is EVallCha ?



EvallCha is **a computer tool that assesses the health of the Vallespir chestnut grove by analyzing images taken from a satellite**.
It is based on Geographic Information System (GIS) software.



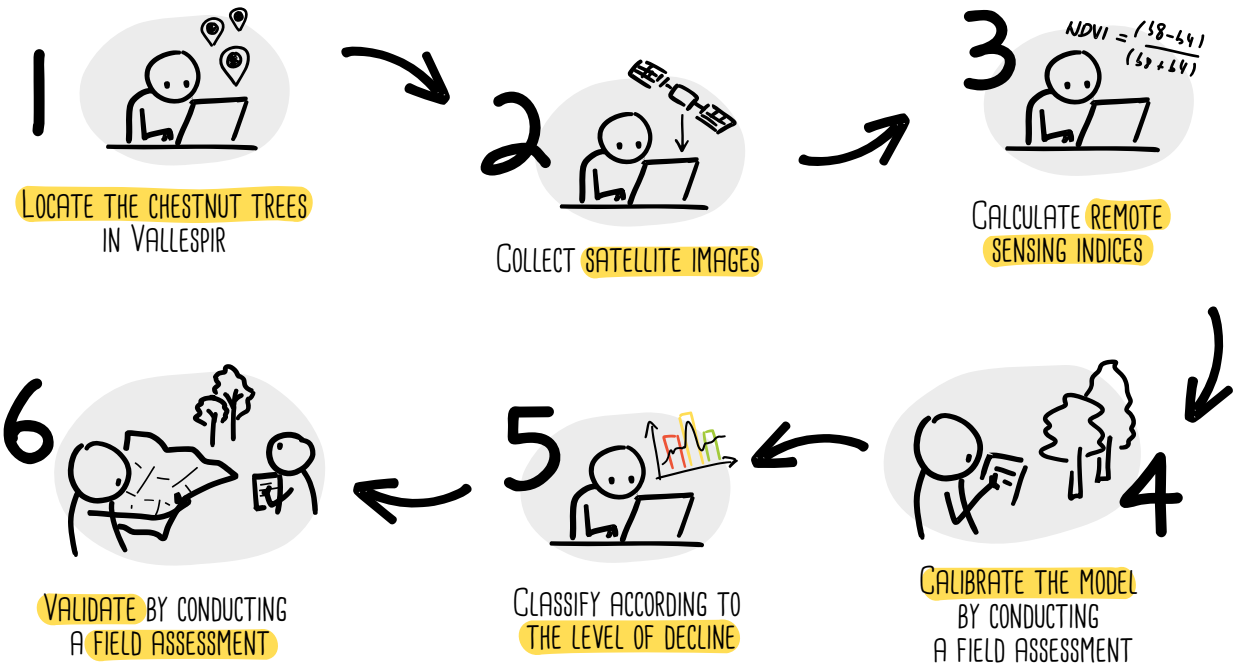
EvallCha provides **a map of forest areas in the Pays Pyrénées Méditerranée region covered by chestnut trees, with colours changing according to the state of health at a given time**.
The areas are classified according to whether they are healthy, moderately declining, or severely declining. The tool can be used to analyse satellite images taken on several dates, allowing to monitor the forest health evolution.

EVallCha is **a modelling tool**: it uses satellite images of the entire chestnut grove, including a few reference areas where the health of the trees has been assessed in the field. By analysing the characteristics of the images of these areas in relation to the known level of decline, it "guesses" and estimates the health of the entire chestnut grove.

EVallCha is **the result of collaboration between stakeholders in the Vallespir forest (operators, managers, owners) and researchers** in the field of earth observation and remote sensing.
It was designed and based on initial work carried out in the Dordogne region as part of the *CastelDiag* project.

What were the steps to set up EVallCha?

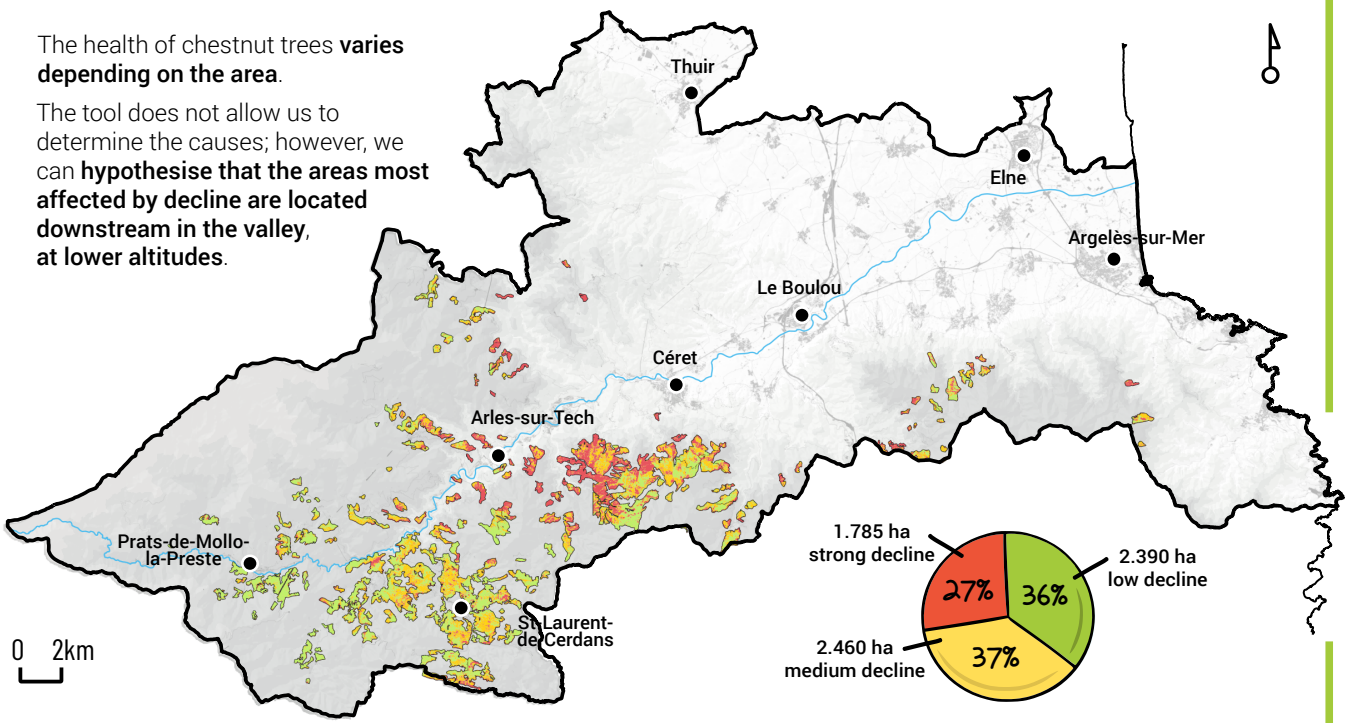
EVallCha is a freely accessible tool, supported by documentation including an internship report and a tutorial. Its implementation involves six steps including **the acquisition and processing of geographic data** (forest inventory and satellite images) as well as **two field phases** (calibration and validation).



What is the state of decline of the Vallespir chestnut grove?

The health of chestnut trees **varies depending on the area**.

The tool does not allow us to determine the causes; however, we can **hypothesise that the areas most affected by decline are located downstream in the valley, at lower altitudes**.



SOURCES MALATIER F. 2025, BDTOPO IGN 2021, OCSID 2021

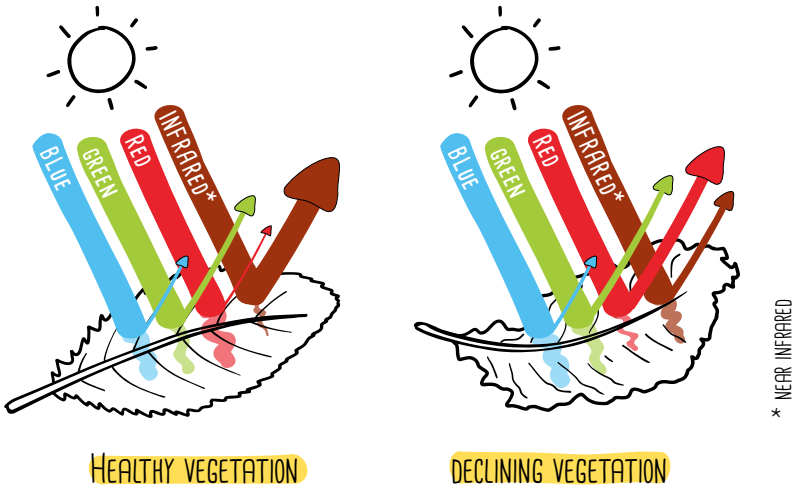
What is remote sensing?

Remote sensing is a technique that **allows the Earth's surface to be observed and analysed remotely** from satellites, aircraft, or drones. These are equipped with sensors that collect data from images or physical measurements (temperature, altitude, etc.) to deduce information about the soil, vegetation, or infrastructure.

For the EVallCha project, remote sensing was **used to assess the health of chestnut trees by analysing satellite images** provided by the European Copernicus program.

These satellites **capture light reflected from the Earth's surface across different "spectral bands"** - i.e., specific intervals of the light spectrum in the visible (blue, green, red) and infrared ranges.
Since light is not reflected in the same way depending on the surface it hits, each spectral band provides specific information.

By combining some of these bands, it is possible to "read" the physiological state of vegetation from a distance and identify areas where it is drier or in decline.



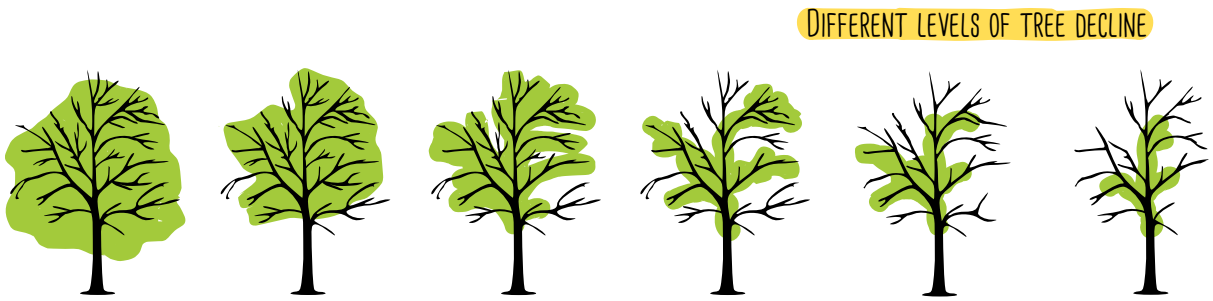
For the EVallCha project, satellite images cross-referenced with the boundaries of the chestnut grove (IGN forest inventory) and a sample of ground observations (DÉPÉRIS) made it possible to map areas where trees show signs of stress or decline.

The advantage of remote sensing in this type of approach is that it **covers large areas quickly and repeatedly**, which is often impossible to achieve through field observations alone!

What is DÉPÉRIS ?

It is a **protocol for assessing the health of forest stands**, developed and validated by the French Department of Forest Health.

It is based on **objective visual criteria described and informed for each species**: the presence of dead branches and the lack of branching. Designed to be simple, quick, and usable by everyone, DÉPÉRIS allows trees to be classified according to six levels of decline, thereby measuring and monitoring the health of forests.



For the EVallCha project, this method was applied to 15 plots spread across the territory to **collect reference data**. These field observations were **used to "train" a computer model** able to recognize signs of decline in satellite images. DÉPÉRIS has therefore made it possible to **link the field and remote sensing by calibrating remote analyses on real data**: the combined use of these two tools in this project has made it possible to map 100% of the Vallespir chestnut grove, with 75% reliability.

What next steps should be taken for the EVallCha project?

During the workshop held on September 2025, local stakeholders outlined several courses of action to be taken together:

Continue and improve monitoring of the chestnut grove

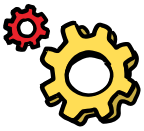
- **Run the model regularly to monitor changes** in the health of the chestnut grove
- **Build a living, collaborative database**, fed by local stakeholders (owners, forest managers, researchers), and incorporating climate, topographical, and/or soil data
- **Mobilize participatory science to increase the number of monitoring plots** and strengthen the spatial and temporal coverage of observations

Share knowledge and mobilize

- **Organize a day dedicated to forest owners** to present the results, challenges, and courses of action.

Investigate the causes of decline

- **Investigate which factors have the greatest impact** on the health of chestnut trees: age of the stumps, exposure to wind, soil quality, slope, altitude, forestry practices, presence of diseases, etc.
- **A monitoring plot dedicated to chestnut trees, set up by the French Forest Health Department**, could enable targeted and sustainable monitoring of these parameters in the field.



Adapt forest management

- **Update forestry guides** to include new climate data.
- Support foresters with **targeted technical advice and financial assistance to test new resilient forestry approaches**.

Support and amplify local dynamics

- **Advise foresters on the most relevant economic sectors**.
- **Map local demand** for chestnut wood.
- **Encourage experimentation with silvicultural approaches adapted** to the future climate.

Who did what?

The EVallCha tool was created thanks to Fanny Malatier's accomplished work during an internship between March and August 2025.

The Occitanie Region funded the internship through the Défi Clé O3T (Earth Observation and Territories in Transition).

The internship was designed and its results promoted as part of the living lab of the European research project GRANULAR.

The CIHEAM (International Center for Advanced Mediterranean Agronomic Studies) in Montpellier and the Pays Pyrénées Méditerranée designed and supported the internship.

The partners of the Pyrénées Méditerranée Forest Charter actively participated in the internship.

To learn more:

Contact the coordinator of the Forest Charter for the Pyrenees Mediterranean Region (cft@payspyrenees mediterranee.org)

CONCEPTION Pays Pyrénées Méditerranée 2025

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