



## Dynamics of ecosystem services over the last 200 past years - first results from the Bassiès Valley (Ariège, France)

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### ► To cite this version:

Yael Schwertz, Florence Mazier, Stéphane Binet, Cédric Gaucherel, Didier Galop, et al.. Dynamics of ecosystem services over the last 200 past years - first results from the Bassiès Valley (Ariège, France). International Symposium of LabEx DRIIHM 2022, Jun 2022, Nantes, France. , 2022, 10.34972/driihm-2b34cb . hal-03754602

**HAL Id: hal-03754602**

**<https://hal.science/hal-03754602>**

Submitted on 19 Aug 2022

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# Dynamics of ecosystem services over the last 200 years

## First results from the Bassiès valley (Ariège, France)



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## Context and aim of the study

Mountains provide various Ecosystem Services (ES) <sup>1,2</sup> and are heavily affected by climatic and land-cover changes <sup>3</sup>  
Most studies on ES temporal changes are based on photographic and cartographic analyses and cover only few decades <sup>4,5</sup>  
Studies on longer time scale are necessary to assess ES sustainability, synergies, interactions and time lags <sup>4</sup>

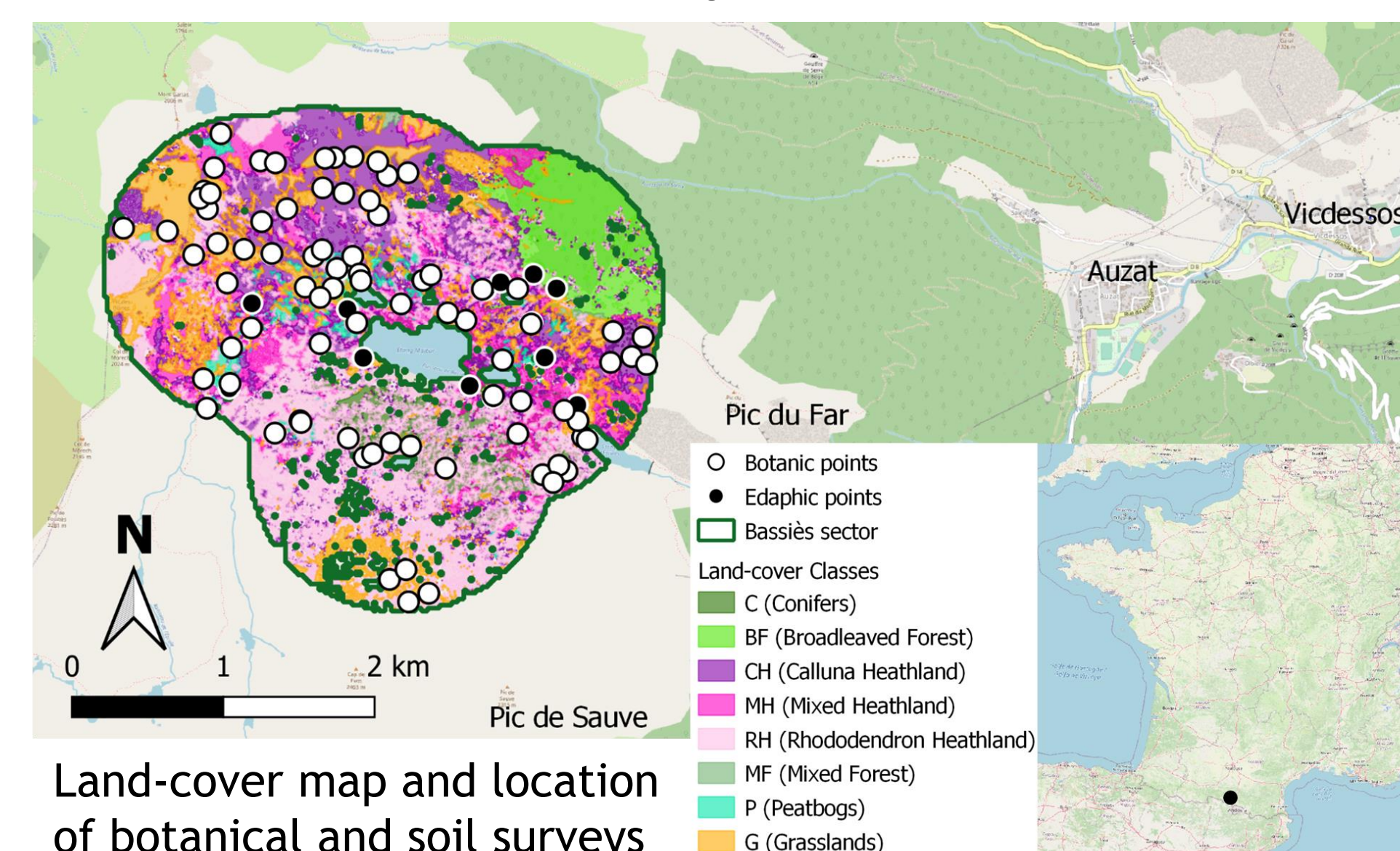
**We aimed to reconstruct the trajectory of ES over the last 200 years in the Bassiès valley, by combining data on ES provided by current land-cover types and pollen-based land cover maps available for the last 200 years**

## Materials and Methods

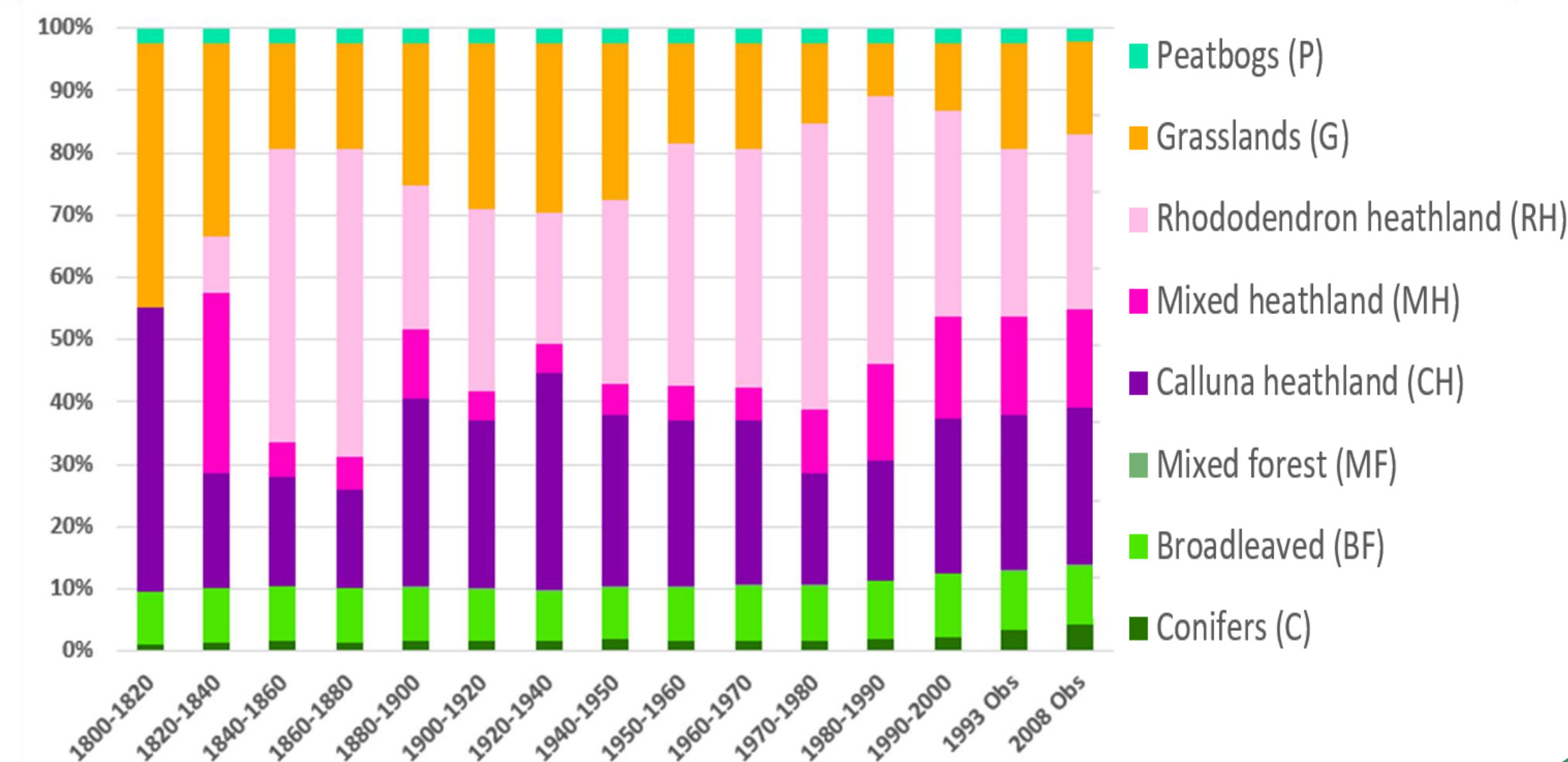
### 1° Selection of ES proxies relevant in mountains, based on literature

Type of SE	Potential Indice	Measured variable
Production	Pastoral value	Total cover of plants with pastoral value (%)
	Plant picking	Abundance of picked plants (%)
Cultural	Patrimonial value	Abundance of patrimonial plants (%)
	Flowers Aesthetics	Total cover of forbs flowers (%)
	Butterflies Aesthetics	Abundance of butterflies (occurrence)
Regulation (pollination)	Pollination	Abundance of entomogamous plants (%)
Regulation (Carbon Cycle)	Organic C fixation	Labile organic matter stabilizing factor
	Organic C stock	SOC* (kgC/m <sup>2</sup> )
	Inorganic C fixation	Capture CO <sup>2</sup> (g/m <sup>2</sup> /year)
Regulation (Water cycle)	Water retention	Useful Water Supply (mm)
	Water infiltration	Water flux (L/m <sup>2</sup> /year)
Regulation (Environnement quality)	Organic matter recycling	Biodegradation rate (g/day)
	Nutrient supply	Cation Exchange Capacity (cmol/kg)
	Biological activity	microbial biomass (µg/g)

### 2° On-site data collection on plants, butterflies and soil



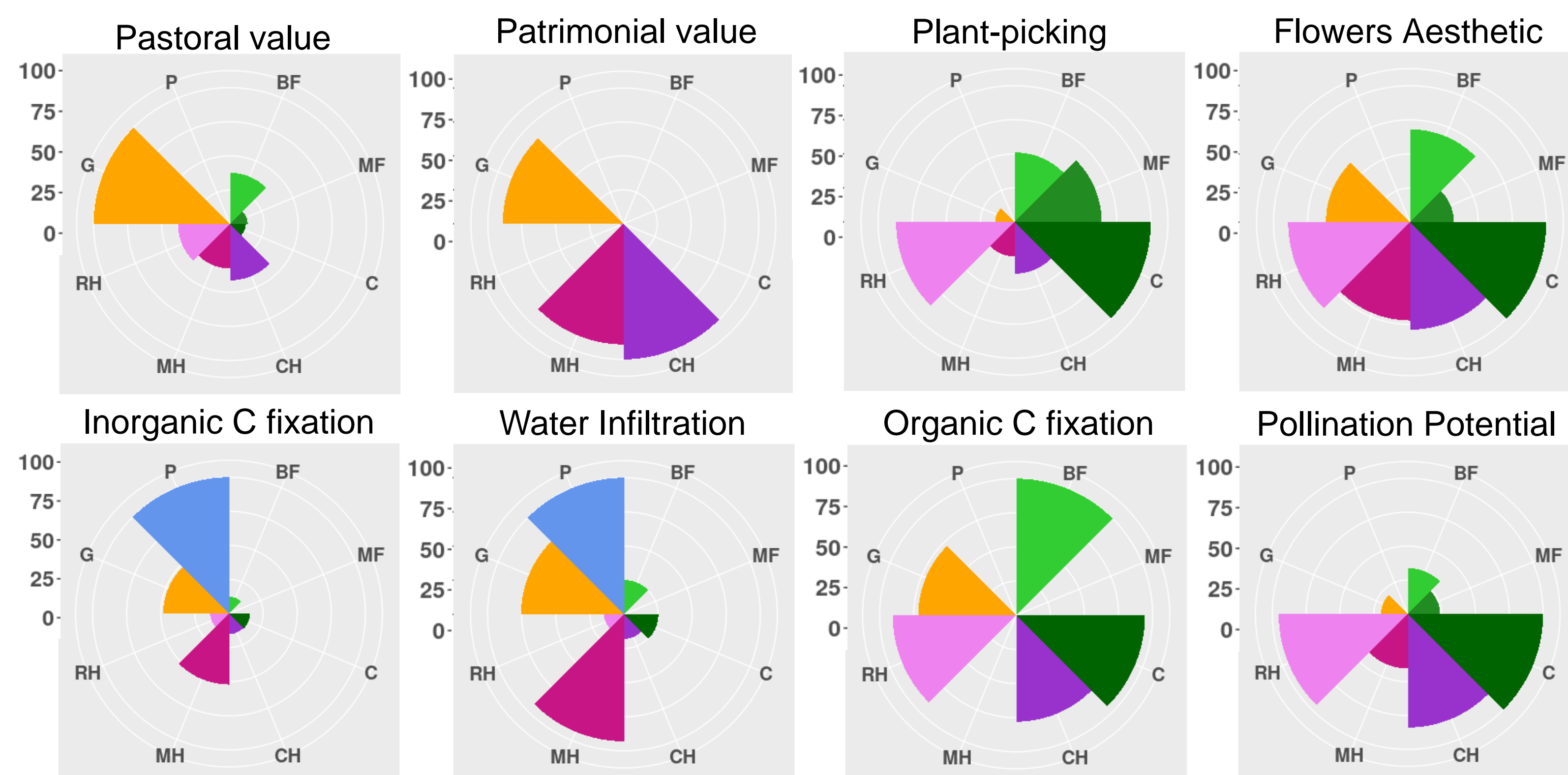
Land-cover map and location of botanic and soil surveys



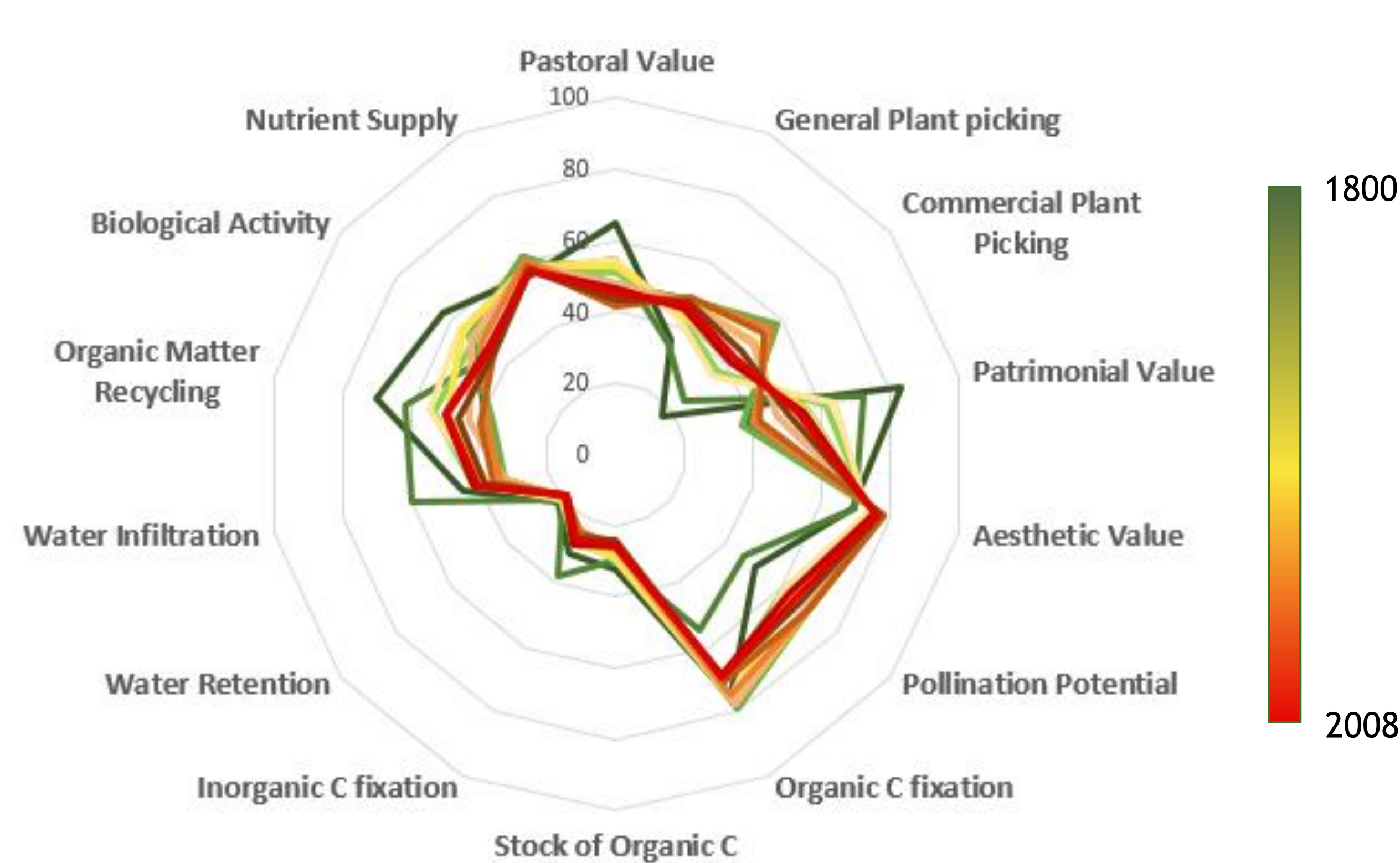
### 3° Use of historical land-cover maps to calculate the level of ES produced at the scale of the study site for each period between 1800 and 2008

## Results

### Land-cover types produce different ES bundles (see examples below)



### The production level of each ES changed through time



## Conclusions and perspectives

Land-cover types provide distinct combinations of ES and land abandonment therefore triggers a temporal change in ES bundles

- Grasslands mainly provide : production, patrimonial and regulation services <sup>1,7,8</sup>
- Heathlands and forests, abundant in flowers, mainly provide : plant picking, aesthetic and pollination services <sup>7,9</sup>

**Complementary surveys will be conducted to increase the precision of some soil-related regulating ES. The relationship between land-cover diversity and ES diversity will be explored**

<sup>1</sup>EFEESE, les écosystèmes rocheux et de haute montagne français, 2018. ;

<sup>2</sup>Martin-Lopez et al., 2019. ; <sup>3</sup>Lavorel et al., 2017. ; <sup>4</sup>Jeffers et al., 2015. ; <sup>5</sup>Locatelli et al., 2017. ;

<sup>6</sup>Plancher et al. in prep ; <sup>7</sup>Crouzat et al., 2015. ; <sup>8</sup>Gis Sol, L'état des sols en France. 2011. ; <sup>9</sup>Zoderer et al., 2019. ; <sup>10</sup>Pornaro et al., 2017. ; <sup>11</sup>Briner et al., 2013.